
Newsletter of the Applied Catalysis Group

Issue 9

Spring 2009

Mike Wood -New Chair of the Applied Catalysis Group



Mike in his day role is Vice-President - Research and Development for Davy Process Technology (DPT), part of the JM group. He joined DPT in 1980 after undertaking a senior developmental role within ICI.

Mike is operationally responsible for Davy Process Technology's Technology Centre based in the North East of England, and has been actively involved in Petrochemical development for over thirty years. In that period he has gained extensive experience in the fields of heterogeneous and homogeneous catalysis, latterly focussing on heterogeneous catalysis.

He worked initially as a member of the team that developed several key steps in two of Davy Process Technology's processes, namely 1,4-BDO and Natural Detergent Alcohols which encompassed, not only the development of a novel catalyst, but the use of that catalyst in the most suitable reactor. During this period the importance of close interaction of the chemist with the development engineer ensured that a commercial viable process could be realised. In any process it starts with the chemistry or the catalyst but the end result (as a working facility) requires input from a multi disciplined team.

Mike's background includes research in organic synthesis, applied research into commercial process development leading to superior catalyst performance and improved efficiencies. Mike believes that any worthwhile data is hard to get and as always the devil is in the detail. Any successful process developed by DPT was achieved by many thousands of hours of experimental work generated by the chemist before the idea could be transferred to commercial reality.

Speaking about his current views on the future of catalysis, Mike states:

"As we move into an extremely challenging period for the petrochemical area & business in general the need to continue with the development of "new" catalysts encompassing the cradle to cradle concept will be a key to a commercial success. This can only be achieved by close interaction between the development chemist and the catalytic chemist, supported by an evaluation of the catalyst in the most appropriate laboratory reactor over an extended period."

EFCATS Update

EFCATS - The European Federation of Catalysis Societies - was founded in 1990 by a group of academics, under the auspices of the French Chemical Society, as an organisation for disseminating high class scientific information and promoting networking in catalysis. EFCATS was conceived to bring together the growing number of European Catalysis societies and Catalysis research groups and is a non profit organisation managed by a committee taken from the elite of the catalysis community. The chair and secretary for 2007-2009 are Professors Roel Prins and Jim Anderson. From inception EFCATS has rapidly grown in importance and in its reach across European and International Catalysis communities and currently there are 25 European country members each providing delegates and expertise to the central body.

EFCATS promotes a significant number of activities which bring together many aspects of catalysis to support the founding principles of information dissemination and networking. These range from the flagship EUROPACAT conferences, Schools in Catalysis, the joint EFCATS-NACS Michel Boudart Award for the Advancement of Catalysis, student awards, the Francois Gault lectureship to joint meetings with complementary catalysis organisations. 2009 brings the EUROPACAT 1X conference, in Salamanca, with the theme of 'Catalysis for a Sustainable World'. Professor Avelino Corma Canos has received the 2009 Michel Boudart Award for the Advancement of Catalysis and Professor Robbie Burch was awarded the 2007-2009 Francois Gault lectureship. The 2009 bi-annual Summer School in Catalysis, to be held in Greece, will be a joint event between EFCATS and ACENET (Applied Catalysis European Networks) with topics covering Environmental and Renewables Catalysis. The next EUROPACAT conference will be in Glasgow, U.K.

With the level of European support, the calibre of membership and the breadth of its scope and contacts it is clear that EFCATS will remain a significant force in the promotion of Catalysis in Europe.

The EFCATS website is at www.efcats.org

Committee Changes

Since the last newsletter, several members have retired from the committee at the end of their terms of office: Barry Nay, Alan Comyns, Martin Lok, Keith Simons and Andrew Holt. In addition Chris Mitchell decided to step down this year due to travel difficulties. The Officers and Committee wish to thank all the past committee members for their contributions to the work of the Applied Catalysis Group, in some cases over many years of service and through some difficult times. This year we had two nominations (Paul Collier and Andy Whiting) for just one vacancy, and so for the first time I had to organise a ballot. Notification was by e-mail and the ACG website. The turnout was 25% and everyone opted to vote by e-mail. Paul won the vote, but Andy was also appointed when Chris decided to stand down. Paul and Andy can claim some additional authority as members of the committee because members have actually voted for them! As retiring secretary, I am pleased that more members are keen to serve on the committee, and that we now have a workable mechanism (the e-ballot) for elections.

John Birtill

Change of ACG Secretary

After 5 years as Secretary of the Applied Catalysis Group, John Birtill has decided to step down and hand over to Nick Gudde. When asked to reflect on his time as secretary, he wrote the following:

I define 'applied catalysis' as doing something useful with catalysts. What I enjoyed most during my time as secretary of the Group was the interaction with so many practitioners of applied catalysis.

When I joined the committee, it was dominated by folks like me from the traditional chemical industries (ICI, BP, Unilever etc) and some catalyst manufacturers, although my own industrial background already stretched from bulk petrochemicals to fine chemical intermediates. At first, I was dismayed when Andy Ward suggested that we develop a new mission statement, but this rather tortuous exercise helped us to re-examine the breadth of applied catalysis. Basically, we decided that if it was 'applied' and 'catalysis', then it was our business. Frank King then proposed that we expand the committee to include pharmaceuticals and fine chemicals, and some more academic representation as well. The resulting committee is rather large, and in some ways a nightmare for a secretary (especially writing the minutes!), but it is powerful network.

My greatest satisfaction came from the series of successful scientific meetings over the past 5 years. These were mostly well-supported by our members, although the growing tendency to late booking did cause me a lot of angst.

My greatest dissatisfaction has been the accelerated demise of the UK chemical industry. The break-up of ICI was driven by reckless financial re-engineering on an enormous scale, but its chief architect still has his knighthood, as do so many of our leading failed bankers. Many committee members regretted that the RSC had so little to say about the damage to the UK science base, and so I was appointed chief 'trouble-maker' in 2001 for a while, trying to arouse a strategic interest in the industrial science base. I suppose that I did ruffle some feathers, but they needed ruffling.

Anyway, I decided a year ago that I should stand down at the natural end of my 4-year term as secretary. Basically, 4 years is long enough for anyone. Unfortunately, it took another year to find a replacement. I hope that Nick is not too worried at taking on the mantle. I am sure that he will do a great job. I would encourage anyone, who thinks that he or she can take on a role, to do so. I am not kidding. There is satisfaction to be found.

Finally, I must thank everyone who helped me in many different ways during my tenure, especially Frank for his ideas which more than compensated for his anarchic organization, and Barry, Mimi and Alan for helping with scientific meetings and Andy for organising one himself. My apologies to anyone whose feathers didn't need ruffling quite so much - I will insist on driving things along. I will be around for a while, and so you haven't seen the back of me yet. All the best.

John Birtill

In response, our incoming secretary, Nick Gudde, stated:

Applied catalysis always strikes me as ubiquitous - nearly all polymers, chemicals and personal /healthcare products contain vital components made by catalysis; transport fuels are cleaner and only perform properly because of catalytic processes; catalytic devices protect our environment. Throughout my career, the Applied Catalysis Group has been a feature of the catalyst landscape so I am pleased to have the opportunity to contribute to its work. John Birtill will be a very tough act to follow as secretary - he brought great enthusiasm & commitment to his activities for the ACG. I hope that I can help maintain the momentum that John and the other committee members have created.

New Committee Members

Nick Gudde is the new secretary of the Applied Catalysis Group. His PhD was on the surface science of CO/NO reactions with Richard Lambert at Cambridge. He moved to AEA Harwell to do contract R&D on catalysts - including syngas conversion and combustion catalysts followed by a couple of years with JM at Sonning Common working mainly on precious metal process catalysts. In 1989, he moved to BP Refining where he looked after BP's central fluid cracking catalyst (FCC) technical service and research. This included direct technical support for BP's refinery FCC units, including a year at the Rotterdam refinery.

Since 2001, he has had a more general technological role in BP Refining mainly relating to strategic areas such as clean fuels, greenhouse gas reduction and biofuels. This has ranged from technology foresighting / strategy through to development projects & commercial trials.



Rob Parry is an Executive Account Manager with the newly formed BASF Catalysts division (formerly Engelhard) based in Guildford England. He has more than 25 years experience in the European Chemical Industry, as well as several assignments in India and South Africa.

At BASF Catalysts, he is currently responsible for technical and commercial catalyst applications and supply to the Petrochemical and Refining Industries in the UK and Nordic Countries. His other responsibilities include proposal and contract preparation, key account management, technical support, advice on precious metal financing and recovery from spent catalysts. He has recently written and presented several training courses for catalysts and petrochemicals. He has a BSc joint Honours in Organic Chemistry and Biochemistry from UCW Aberystwyth and is a Chartered Chemist with the Royal Society of Chemistry.

Paul Murray completed his Natural Science degree at Trinity College Dublin in 1994, followed by a PhD with Professor T Brian H McMurry on "The synthesis of selected heterocyclic compounds as potential inhibitors of O6-alkylguanine-DNA-alkyltransferase (ATase)".

In 1998, he joined Zeneca Pharmaceuticals (now AstraZeneca) as a process chemist, working on early stage chemistry (scale up of medicinal chemistry processes) and then on later stage development and some life-cycle management. He then spent a year working on AstraZeneca's Pilot scale facility at Loughborough before returning to Process Chemistry. In 2003 he became involved in the AstraZeneca Catalysis Group where he designed and set up their first dedicated catalyst screening facility, which now provides a global service to AstraZeneca Process R&D as well as supporting Discovery chemistry.



Alan Pettman was recruited in 1977 as a technician to Pfizer's Sandwich (UK) based Process Research and Development department. After 5 years part-time study he was awarded his Graduate of the Royal Society of Chemistry degree. He has remained in the same department ever since and currently hold a position of Research Fellow with responsibility for the identification of commercial routes and processes to both Human Health and Veterinary products. He has a broad interest in organic synthesis and particularly catalysis and biocatalysis.

Paul Collier joined Johnson Matthey in 2000 after 3½ years postdoctoral experience in heterogeneous catalysis with Professor Graham Hutchings at the University of Cardiff.

Paul has a technical role managing an R&D team researching heterogeneous catalysis and materials technology at Johnson Matthey's Technology Centre in Sonning Common, Reading. As an author and contributor to 30 patents and publications Paul has a keen understanding of what innovation means at the "coal face" of science and technology.



Andy Whiting started his professional career in Central Research at Ciba-Geigy before becoming an academic at UMIST in 1989, followed by moving to Durham in 2001. His research has spanned wide areas of organic synthesis, with the major focus increasingly being on catalysis, both using transition metal catalysed processes and environmentally benign, water-based or water tolerant organo-bifunctional catalysts, as tools for stereocontrolled synthesis.

Symposium Report: Challenges in Catalysis for Pharmaceuticals and Fine Chemicals

The last symposium on 'Challenges in Catalysis & Fine Chemicals' in November 2007 was very well attended. We received lots of positive feedback. Delegates gave an approval rating of 4 out of 5, equivalent to 'very good'. The article below was written by Chris Barnard of Johnson Matthey Catalysts, based on an article which appeared in *Platinum Metals Review* vol 52. Apologies that it is a bit late. There was another positive review in *Specialty Chemicals Magazine*, Dec 2007, vol27 (10), pp36-39. The symposium was organized jointly with the SCI Fine Chemicals Group. On behalf of the organizing committee, thanks once again to all who helped to make it a memorable event, including speakers, students who presented posters, our hosts at the SCI, and our sponsors, Chemistry Innovation Knowledge Transfer Network and Johnson Matthey Catalysts. We are organising a repeat event in October this year. See the 'Forthcoming Events' on page 8 for details.

John Birtill, Frank King, Alan Pettman, Mimi Hii, Fred Hancock

The pharmaceutical industry has long been castigated for the quantity of waste produced per ton of product in comparison with the high atom efficiency of the bulk chemicals industry. The driving force for pharmaceutical and fine chemical syntheses has been the need for highly robust processes yielding high purity products. Catalytic processes have generally been seen as sensitive and difficult to operate in comparison with stoichiometric chemistry and thus have found only limited application. Increased focus on environmental issues has encouraged pharmaceutical and fine chemicals companies to look at catalysis anew and identify areas where improvements in the chemistry could lead to significant benefits for their processes. This was the focus of a symposium "Challenges in Catalysis for Pharmaceuticals and Fine Chemicals" held by the Society of Chemical Industry Fine Chemicals Group and the RSC Applied Catalysis Group, in London on November 6th where around 80 participants discussed a wide range of homogeneous catalysis applications covering both metallo- and organo-catalysis. A series of 8 oral presentations was supported by a poster session where students presented their work on environmental improvements in chemistry.

Peter Dunn (Pfizer) reviewed the background to this meeting and in particular the role of the ACS Green Chemistry Round Table. This forum allows an exchange of information between the major pharmaceutical companies with regard to improving the sustainability of manufacturing for pharmaceutical active ingredients. A survey of the reactions used in such preparations ⁽¹⁾ provided the background information for identifying those improvements which could make the most impact in reducing waste, reducing energy requirements and reducing the hazards associated with the reactions. The results of these further discussions were also published ⁽²⁾. The topics were split into the categories of common reactions requiring better reagents and more aspirational reactions where new technology is required for industrial application. A priority ranking was used to highlight five examples in each category, e.g. amide formation avoiding poor atom economy reagents was the highest priority item in the former category. The Round Table has the capability to offer research grants to meet these objectives, with two programmes already operating (one in hydrogenation of amides and one in C-H activation for biaryl coupling) and further grants are on offer for 2008 and 2009.



Frank King and Johannes de Vries

Johannes de Vries (DSM) discussed enantioselective hydrogenation, one of the few homogeneous catalysis processes regularly practiced in the pharmaceutical industry. He described the obstacles that must be overcome for the implementation of homogeneous catalysis processes, thus highlighting the improvements that must be made in reducing development time (by improved screening methods) reducing costs (using cheaper metals; simpler, cheaper ligands) improving synthesis for substrates and catalysts and broader substrate tolerance for catalyst systems. Improvements to catalyst screening have become available with the development of high throughput equipment, but for maximum effect this needs to be coupled to simple ligand synthesis. This can be achieved through a modular approach to ligand design, allowing ligand libraries to be generated by automated equipment. The development of chiral phosphoramidite ligands was described to illustrate this. Another elegant approach to the design of bidentate ligands is the use of supramolecular chemistry to bring two molecules together such that the donor atoms are brought into the correct positions for coordination.

With most metals currently at record prices, reduction in costs by the development of base metal alternatives to precious metal catalysts is an enduring aim. Copper and iron hydrogenation reactions have been known for a long time and the potential for the use of iron (instead of ruthenium) in enantioselective transfer hydrogenation of ketones was discussed.

While much attention has been given to developing catalysis for particular substrates, often insufficient attention has been paid to the impact of preparation of these substrates on the overall process efficiency. Thus the benefits of the catalytic step may be nullified if the synthesis and purification of the substrate adds extra steps. For example, the preparation of pure E- or Z-vinyl compounds is often difficult and the purification of imines may present an issue.

The lack of generality in application of catalytic methods can also be a limiting factor. Unfunctionalised olefins may give low enantioselectivity, and molecules containing sulphur donors may act as catalyst poisons. No effective catalyst is available for homogeneous hydrogenation of substituted aromatic compounds and the more reactive hetero-aromatic compounds generally give poor enantioselectivity.

One area where synthesis of the substrate has a major impact on catalytic chemistry is in use of aryl boronic acid derivatives as coupling partners in biaryl synthesis (Suzuki-Miyaura reaction). The process would be greatly simplified if C-H activation of aromatic groups could be achieved directly. This was discussed by Robin Bedford (Uni. Bristol). Significant progress in this area has been made for intramolecular systems, while, with the aid of directing groups, some intermolecular reactions can also be carried out effectively. The initial report of intramolecular reaction to form dibenzofurans and related heterocycles (5-membered ring formation) appeared in 1984⁽³⁾. Statistically it is more difficult to form larger rings, but 7- and 8-membered ring formation has now been reported. Bedford himself has shown how new rings can be formed by combining sequential aryl bromide and C-H activation reactions⁽⁴⁾.

The major challenges to the implementation of chemistry based on C-H activation are selectivity (both with regard to single versus multiple substitution and regioselectivity) catalyst loading/activity and the complexity and corresponding high cost of the catalysts. However, progress is being made on each of these issues.

Hydroformylation has been a very successful process for the bulk preparation of simple aldehydes and their derivatives over many years. However, this reaction has been little used in the pharmaceutical industry. Graham Meek (Dow Pharma) set out show why his company believes that greater exploitation of this chemistry, whether by themselves as a service provider or by others independently, would be beneficial. Having inherited Union Carbide expertise following that takeover, Dow Pharma have developed a range of bis-phosphite ligands and particularly one known as BIPHEPHOS that gives satisfactory rates and high yields of linear aldehydes for a wide variety of substrates. Reactions can typically be carried out at 3 bar pressure and 80°C with S/C of around 1000.

For enantioselective hydroformylation, early work studied the reaction of styrene, with Binaphos a preferred ligand. More recently, chiral phosphites and diazaphospholanes have been developed by Dow Pharma. The enantioselectivity of these reactions is often highly sensitive to minor structural changes in the ligand, so the availability of an extensive ligand library of these compounds is a distinct advantage.

The reactivity of the aldehyde product means that under certain circumstances tandem reactions can be carried out. Thus, for example, hydroaminomethylation (the combination of hydroformylation and reductive amination) may be used to synthesise secondary and tertiary amines from olefins.

Organocatalysis is not a new area of chemistry, with examples being published from early 1900s, but much more attention and effort has been focussed on this area in recent years. A review of research was provided by Matthew Gaunt (Uni. Cambridge). Familiar examples are Brønsted acid or base catalysis, or phase transfer catalysis. For enantioselective reactions, organocatalysis potentially offers a more environmentally desirable option than metalocatalysis, although the amounts of catalyst required may negate this advantage. Chiral α -amination of aldehydes was first reported in 2002 using L-proline as catalyst (5-10mol%) and many further examples of the use of this cheap catalyst have been published. More effective but more elaborate (and hence costly) pyrrolidine derivatives have since been developed⁽⁵⁾. Given the range of potential interactions between organocatalysts and substrates that can provide enantioselectivity, it is not surprising that a very wide range of reactions can be catalysed and that many different catalyst types have been identified.



David Parker of meeting sponsor, Chemistry Innovation



Fred Hancock of meeting sponsor Johnson Matthey catalysts with author Chris Barnard

The synthesis of amides is conceptually, and often practically, simple, but it results in large quantities of waste products. Thus, more direct methods to form amides are desirable and this area was reviewed by Andy Whiting (Uni. Durham). The direct reaction of acid and amine forms the ammonium salt, which can be converted to the amide by heating, often leading to decomposition and poor yields. Success with this reaction can only be achieved by the effective removal of water, for example by distillation or trapping using molecular sieves. The reaction can be catalysed through the formation of suitable intermediates, with the use of electron-deficient boronic acid catalysts being favoured. However, reasonable results have been obtained using boric acid as catalyst at 1mol% in toluene! The reaction is believed to proceed via reaction of the acid to form a dimeric or trimeric boron species, which is then attacked by the amine to form the amide. However, it remains difficult to differentiate between the catalytic cycle and the uncatalysed one in many cases. Various alternative catalytic routes to amides are available with results being reported recently by Milstein et al using Ru-pincer complex⁽⁶⁾ and Buchwald⁽⁷⁾ on improvements to the aminocarbonylation of aryl chlorides.

The asymmetric addition of –NH and –OH functions to C=C bonds was reviewed by Mimi Hii (Imperial College). Previously, the chiral amine or alcohol products have been obtained by routes such as hydroboration or hydrogenation, but conditions for more direct reaction are desirable. The majority of the research has been carried out on the hydroamination reaction. The alkene substrates for this reaction can be classified as activated or unactivated to describe their behaviour in this reaction. The intermolecular enantioselective reaction was first reported by Togni in 1997⁽⁸⁾ using Ir(I) catalysts but later work by Hartwig⁽⁹⁾ and by Hii⁽¹⁰⁾ has shown that significantly improved results can be obtained with palladium catalysts. Thermodynamics provides a constraint for these conversions since there can be little driving force for the reaction (i.e. DG ~ 0). Only limited yields of products are possible in these cases. The reaction of activated alkenes is also known as the aza-Michael reaction. Here, reaction of primary aromatic amines has been achieved under mild conditions (<60°C in toluene).

Compared to hydroamination, the addition of –OH has received little attention. Cyclisation by enantioselective –OH addition (an intramolecular, asymmetric version of the Wacker reaction) was first reported⁽¹¹⁾ in 1981 with modest ee. More recent work by Hayashi⁽¹²⁾ and others has improved these results but examples of this chemistry are still limited.

In the poster presentations, Baljit Singh (Indian Institute of Technology, Roorkee, India) described the characterisation of copper(II) complexes of tetradentate pyridoxal-based ligands and their encapsulation using zeolites. These materials were active in oxidation reactions using peroxides with, in some cases, good conversion, but with limited selectivity. An alternative approach to oxidation catalysis was reported by Giorgio De Faveri (Queen Mary Uni., London). Methylphosphonic acid modified triazacyclononanes were prepared for study of their properties in catalytic bleaching using hydrogen peroxide. The use of this system plus chiral additives for the asymmetric synthesis of epoxides is also under investigation.



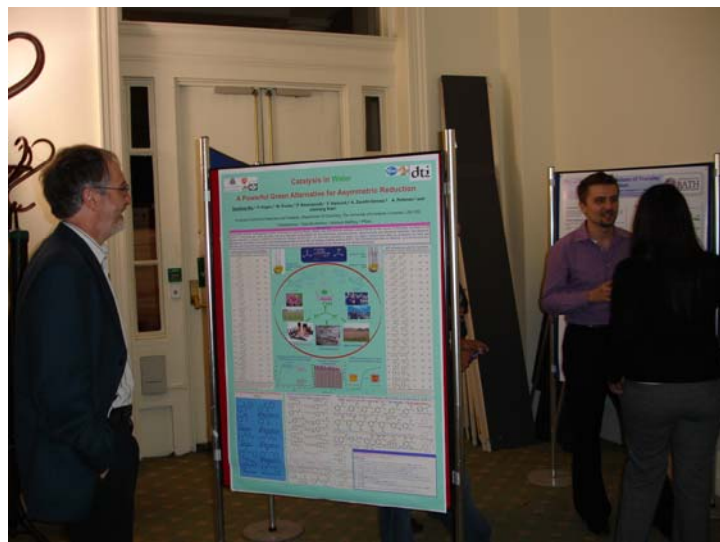
Some students with their posters

Various forms of palladium(II) immobilised on silica were studied by Asma Qazi (Queen Mary Uni., London). While palladium coordination to sulfur donors gave materials with low leaching, they showed low activity in Suzuki coupling (catalyst loading ca. 5 mol%). Better activity was seen for an ethylphosphatrioxadamantane palladium catalyst that was effective at 0.1 mol%. Direct arylation for heterocycles is often more efficient than for aryl compounds due to the strong directing effect of the heteroatom. The C-5 arylation of thiazoles was reported by Gemma Turner (Edinburgh Uni.). This reaction can be carried out with palladium catalysis in only 12 hours at 60°C using water as solvent.

Nathan Owston (Bath Uni.) reported on further studies of metal-catalysed amide preparation from alcohols. Catalyst

loadings can be significantly reduced by changing from an iridium catalyst to a ruthenium one, and the methodology has now been adapted to allow formation of a variety of acyl derivatives (e.g. esters). Xiaofeng Wu (Liverpool University) described a monotosylated ethylenediamine Ir(III) complex which can be used as catalyst for hydrogenation of aldehydes in water as solvent (using hydrogen gas or transfer hydrogenation).

The symposium provided an excellent forum for senior members of the academic and industrial community to exchange ideas on this topic, while bringing in contributions from younger academics and many students. The organisers are to be congratulated on balancing an interesting series of presentations with adequate opportunities for less formal, but equally productive, interactions. It is to be hoped that they will be able to extend this symposium into a series in years to come.



John Birtill, trying to figure out a poster

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Next Edition

The Editor would be delighted to hear from any member of the Applied Catalysis Group, or other potential contributors to the next edition of this Newsletter.

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E-mail Addresses

The Applied Catalysis Group sends out occasional communications to members by e-mail, for instance meeting notices, news, even an e-ballot for the committee. If you do not receive these communications then there are two possible explanations.

- (1) You have opted out of e-mails from the RSC on your RSC membership renewal form. This means the Applied Catalysis Group is obliged by the RSC to delete you from the RSC e-mail list when sending out news from the Applied Catalysis Group.
- (2) You have not supplied a valid e-mail address to the RSC or your e-mail address has changed.

If you are in either of these two categories and would like to receive e-news from the Applied Catalysis Group, then send your e-mail address to the secretary, Nick Gudde, at guddenj@bp.com

Forthcoming Events

28 th - 30 th April 2009	<p>Introduction to Petrochemicals Processing and Catalysts (Crowne Plaza, Houston, Texas, USA)</p> <p>A seminar developed specifically for engineering, R & D, and operations personnel who have limited experience, but who have substantial technical education or a technical operating background.</p> <p>Contact Rob Parry at BASF for more details: Mobile: +44 7831 883 864, E-Mail: rob.parry@basf.com</p>
27 th - 29 th May 2009	<p>ERTC Petrochemical Processes and Catalysis Training Course (Bloomsbury, London)</p> <p>http://preview.incisive-ewms.com/xmlpub/sites/pre/orp/2009/03/gt-forum/ERTC-Petrochemical-Processes-and-Catalysis-Trainin.html</p> <p>Contact Rob Parry at BASF for more details: Mobile: +44 7831 883 864, E-Mail: rob.parry@basf.com</p>
22 nd - 25 th June 2009	<p>Taylor Conference (Cardiff University)</p> <p>http://www.rsc.org/ConferencesAndEvents/conference/alldetails.cfm?evid=101026 and http://www.taylor.cf.ac.uk/</p> <p>Sponsored by: Surface Reactivity & Catalysis Group (SURCAT)</p>
3 rd August 2009	<p>Catalysis for a Sustainable Future 42nd IUPAC Congress Chemistry Solutions (SECC, Glasgow)</p> <p>Keynote speakers: Clark Landis (University of Wisconsin-Madison, USA), Avelino Corma (Universidad Politécnica de Valencia, Spain)</p> <p>http://www.rsc.org/ConferencesAndEvents/RSCConferences/IUPAC2009/ScientificProgramme/Themes/Industry/catalysis.asp</p> <p>To date, we have received 27 abstracts for 8 oral presentations. The review procedure will take place during February and March. Further news in due course. On behalf of the organisers, many thanks to all those who have submitted abstracts. Poster submissions are welcome (especially from students). Bursaries will be available from the RSC and the Applied Catalysis Group. This event is supported by the RSC Applied Catalysis Group and RSC Surface Reactivity & Catalysis Group (SURCAT).</p>
20 th October 2009	<p>Challenges in Catalysis for Pharmaceuticals and Fine Chemicals (SCI, London)</p> <p>Following the success of our first meeting (see review in this newsletter), the Applied Catalysis Group and the SCI Fine Chemicals Group are pleased to announce a one day meeting on 20/10/2009.</p> <p>Confirmed speakers include: John Blacker (NPIL/Leeds), Michael Krische (Texas), Matthias Beller (Rostock), David Cole-Hamilton (St Andrews), Peter Quaedflieg (DSM), Paul Murray (Astra Zeneca) and Alan Armstrong (Imperial College).</p> <p>Topics to be covered will include the latest developments in coupling redox processes with C-C bond formation, cross coupling reactions, nitrile hydrogenation, organocatalysis, amide bond formation by catalysis and novel techniques for development of catalysed reactions.</p> <p>Please note this date now in your 2009 diaries, and PLEASE, PLEASE DO BOOK EARLY. More information can be found at:</p> <p>http://www.rsc.org/Membership/Networking/InterestGroups/catalysis/ForthcomingEvents.asp and http://www.rsc.org/ConferencesAndEvents/conference/alldetails.cfm?evid=103507</p> <p>You can also register your interest for further information by contacting John Birtill (E-mail: john.birtill@ntlworld.com)</p> <p style="text-align: center;">If your company would like to sponsor this next event then please contact John Birtill or any of the organizing committee.</p> <p>Organising committee: Alan Pettman, Fred Hancock, Mimi Hii, Paul Murray, David Alker, Frank King, John Birtill</p> <p>See below for some links to speakers:</p> <p>http://www3.imperial.ac.uk/people/a.armstrong_ http://www.catalysis.de/index.php?id=20&L=1 http://www.chem.leeds.ac.uk/People/Blacker.html http://research.cm.utexas.edu/mkrische http://ch-www.st-andrews.ac.uk/eastchem/profiles/sta/cole-hamilton.html</p>