Formulation Mission USA Report
July 2011

Knowledge Transfer Network

Chemistry Innovation

Executive *Summary*

Formulation Mission USA was a five day programme designed and delivered by Chemistry Innovation during May 2011.

The aim was to deliver a business-led knowledge exchange mission to connect a world class knowledge base and promote broader collaboration in formulation science and technology to benefit UK plc.

Over the course of the week, the delegation of UK leaders in formulation engaged with their US counterparts from across industry, academia and Government via a series of seminars, workshops and centre visits. Formulation Mission USA was focussed primarily on science and innovation. However, secondary benefits through new trade opportunities and improved supply chain connectivity were also delivered, in partnership with UK Trade and Investment.

Delivery against objectives

- Create new connections with a strong overseas knowledge base
  - » Re-established strong link between UK chemistry-using industries and National Institute of Standards and Technology (NIST).
  - » Established strong link with the National Formulation Science Laboratory (NFSL) and associated community.
  - » Other direct links established – Dow Chemical, Princeton University.
- Showcase and benchmark best practice in formulation science and technology
  - » Delivered useful learning from US leaders in high throughput technologies, polymers (Dow Chemical, NFSL) and measurement (NIST).
  - » Delivered confirmation that UK is globally competitive in many aspects of formulation science and technology (including high throughput technologies, measurement and polymers).
  - » Delivered confirmation that UK formulation community is ahead of the US in terms of connectivity and external collaboration culture.
  - » Gained valuable learning from successful centres for collaboration at NIST and NFSL, to be used to inform the development of Chemistry Innovation's Top Ten deliverable; "To establish a centre in science-based formulation that will increase penetration in global markets for UK based companies".
- Stimulate global R&D/innovation collaborations that deliver effective knowledge exchange and net benefit to UK business
  - » 40 new business connections reported (including US-UK and UK–UK).
  - » Identified and established several key themes for ongoing UK-US formulation network activities.
    - * Measurements for complex fluids
    - * Formulation Centre best practice
    - * Formulation skills and training
    - * A return mission from the US to the UK

Next Steps

- Deliver against actions detailed in the full report.
- Chemistry Innovation to monitor and evaluate value generated through new connections established on the mission, at 6 and 12 monthly intervals.
- Maintain and restructure '_connect' website group to enable UK and US counterparts, from within and outside the mission, to engage and promote their interests and offerings.
- Chemistry Innovation to actively disseminate mission outputs at key events and meetings.

Formulation Mission USA was a business-led knowledge exchange mission which has connected a world class knowledge base and promoted broader collaboration in formulation science and technology to benefit UK plc.

To be able to access all linked content within this mission report and to follow ongoing UK-US collaborative activities, please join this free online group https://ktn.innovateuk.org/web/formulation-mission-usa1

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Mission *Summary*

Delegates

The Coordinators
Darren Ragheb, Chemistry Innovation (Mission Leader)
Dr. Colin Tattam, Chemistry Innovation

The Hi-Tech SMEs
Dr. Stephen Bysouth, Automaxion
Prof. David Goodall, Paraytec
Dr. David Healy, Giltech
Dr. Ashvin Patel, Kuecept
Dr. Martin Stocks, PBL / the model gut
Prof. Richard Holdich, Micropore Technologies / Loughborough University

The Large Companies
Dr. Mark Baker, Unilever
Vicky Burkitt, Reckitt Benckiser
Dr. Judith Hardy, AkzoNobel
Prof. David York, Procter and Gamble

The Universities/Research Centres
Dr. Richard Greenwood, University of Birmingham
Dr. Neil Jones, University of Liverpool / Centre for Materials Discovery
Dr. Simon Lawson, University of Leeds / Particles CIC
Dr. Helen Dutton, University of Manchester / InForm

Support/Networks
Dr. Jim Bullock, Intelligent Formulation Ltd
Tricia Francis, UK Trade and Investment

Several of the delegates also represented subject groups from the Royal Society of Chemistry and The Institution of Chemical Engineers:

- Formulation Science and Technology Group (RSC)
- Particle Technology Group (IChemE)
- Formulated Product Engineering Group (IChemE)

Programme Overview

May 3 - National Institute of Standards and Technology (NIST), Gaithersburg, Maryland;

A Federal technology agency that develops and promotes measurement, standards and technology. Their work is application focused and they have strong links with US industry. Areas of particular relevance include complex fluids, polymers, nanotechnology, microfluidics, combinatorial methods and measurement.

May 4 - Chemspec USA 2011, Philadelphia;

A “Formulation Science and Technology Day” was delivered at this focal conference to provide a platform to exchange knowledge, network and engage with the broader US formulation community, from both universities and industry.

May 6 - The Accelerator / The National Formulation Science Laboratory (NFSL), Hattiesburg, Mississippi;

A $30m, 60,000 square feet centre of excellence provides an open access facility and incubator for innovative companies to exploit in-house expertise and resources in high throughput formulation technologies, polymers, process / pilot scale-up and technology commercialisation.

Sponsor: Technology Strategy Board Driving Innovation

Delivery Partners

UK Trade & Investment
Intelligent Formulation
RSC Advancing the Chemical Sciences
Formulation Science & Technology Group
InForm Integrating Nanomaterials in Formulations

The Importance of *Formulated Products*

Formulation, the creation of multicomponent often multi-phase products, is an enabling capability which underpins many sectors in our economy and high value manufacturing industries globally.

It is a topic which was highlighted in both the RSC and IChemE roadmaps and the Yorkshire based Intelligent Formulation Innovation Network has recently been funded to provide business benefit by accelerating innovation in this area.

A critical enabler to deploying technology to meet consumer needs is formulation science and technology. This is the capacity to translate consumer needs, often expressed in complex non-technical language, into precise specification of product properties – and then develop complex product assemblies that will supply these properties.

The present state-of-the-art relies heavily on inefficient empirical optimisation; in order to move to a different level of capability there is a need to address multidimensional nonlinear problems at the limit of current understanding. The application of novel science and technology will increase the capacity for innovation and the creation of added value by UK industry. There are several worldleading companies with business, manufacturing and R&D activities in the UK who supply products directly into consumer markets such as home and personal care (Unilever, Procter & Gamble, Reckitt Benckiser), pharmaceuticals (AstraZeneca, GlaxoSmithKline), coatings (AkzoNobel), agrochemicals (Syngenta) and oil and fuel additives (Infineum and Innospec).

The current size of the formulated products market in the UK is approximately £180 billion (annual sales) with an associated GVA of approximately £65 billion. The potential market for UK companies in emerging overseas markets is estimated at £1000 billion.

Companies operating in these markets are facing a number of pressures. These arise from more stringent consumer demands which vary from country to country, ever reducing product life cycles, regulation which is restricting the pallet of available ingredients and the various drivers to use more “bio-based products” from renewable feedstocks.

Novel chemical entities or materials, such as renewables or nanomaterials, increase the pallet from which products can be made; but rapid re-formulation incorporating new components while preserving the properties or effect of the product is a major challenge.

There is a massive potential business opportunity for the UK to satisfy the needs of the emerging economies – and there is a strong business base in the UK which could take advantage of this. In addition there is a major opportunity for UK industry to share the cost and risk of developing new science and technology.

Many companies in non-competing sectors require similar underlying technology, much of which has still to be developed. For example colloid and particle science, measurement of complex effects and the use of computer based modelling apply equally to the personal care, agrochemicals, oil additive and pharmaceutical sectors.

Much of the basic science is known but requires either knowledge transfer or further development (rather than basic research) to stimulate its application in industry.

Some public investment to develop the technology capabilities required to underpin the UK’s formulation based businesses would provide a massive return for the UK. The issues of sustainability and new bio-based materials are also highly relevant to this topic.

Demand in consumer markets is driving increased use of renewable or green raw materials to produce active ingredients which match or exceed the performance of their less sustainable relatives – at an acceptable price. Regulation is also encouraging companies to look for more sustainable alternatives to incorporate in their products. Biodegradability and low ecotoxicity are also key attributes to consider, since many formulated products in home and personal care end their life as effluent.

*Taken from Chemistry Innovation’s Strategy Report 2010 (view it here)

National Institute of Standards and Technology
Gaithersburg, Maryland

Overview

The National Institute of Standards and Technology (NIST) is a Federal technology agency of the U.S. Department of Commerce that develops and promotes measurement, standards and technology. NIST was founded in 1901 as the nation's first Federal physical science research laboratory. Their work is application focussed and has strong links with US industry. Building on existing links with Chemistry Innovation, NIST readily saw the alignment between our respective interests and were keen to host our delegation.

This meeting was very much about identifying and networking with leading researchers doing industrially relevant applied research and in turn opening a dialogue to work with them to identify industry challenges and define areas for future research. To this end, the emphasis for the day was on Measurements for Complex Fluids formulation. As is common in similar UK research institutions, NIST does not have a dedicated formulation programme. However there were several relevant divisions and groups to engage with including Polymers, Complex Fluids, Biomaterials and Bioprocess measurement. Embedded within these groups was additional experience and activity in areas such as nanotechnology, microfluidics and combinatorial methods.

The workshop involved several presentations from NIST researchers, the UK delegation and other invited speakers. This was followed up by an open group discussion. Our thanks go to our host Steve Hudson for coordinating the day.

Benefits of visit

- Re-establish connection between UK chemistry-using industries and NIST.
  - » Several company connections reported.
  - » Identified 'Measurements for Complex Fluids' as theme for ongoing global collaborations.
- Recognition that the UK knowledge base is comparable in competence with NIST and therefore well placed for future collaboration.
- Learning on best practice for industrial collaboration (e.g. Combinatorial Methods Center, nSoft neutron studies club).
- Identified additional groups and contacts for follow-up aligned to other KTNs and Chemistry Innovation priority areas i.e. sustainable polymers, organic electronics and photovoltaics, bioformulation and nanotechnology.

Workshop Content

'Measurements for Complex Fluids Formulation: A NIST/UK Dialogue'. The workshop aimed to be an international dialogue on state-of-the-art measurement methods and emerging needs in the formulation and manufacture of complex fluids. Topics of interest included Material property testing; Product performance testing; Composition screening; Manufacturing process evaluation and optimization.

Discussion

The discussion session, entitled 'Properties/Performance/Process/Screening - The Complex Fluids Quartet' evidenced a clear indication that this was an area for future activity.

Building on the questions/issues raised by the NIST team….

- *Is screening appropriate for manufacturing processes (unit operations and conditions)? What processes do you want to understand better?*
- *To screen composition, is it better to measure material properties or to devise a test based on a key process step and measure characteristics of the output? What are the relative merits of each if both are necessary?*
- *What are the best measures for product stability? (Improved test precision or implementing adverse conditions?)*
- *What are the best performance metrics? For which performance metrics are there needs to develop better tests or models?*
- *How to connect performance measures to measures of material properties? What constitutive relationships, models and modelling techniques are lacking?*
- *For which material properties are there needs to develop better tests or models?*

…the UK delegation also added some thoughts on priority needs:

- *How can we better integrate measurements at an earlier stage in the product development process to discover optimal product candidates faster and lower the risk of a costly product failure?*
- *How can we better translate expensive, complicated, high-tech test methods and associated measurements to cheaper, more practical alternatives for more routine screening and quality control?*
- *What is the best way to integrate the knowledge generated through various measurement into your design process?*
- *Where are the overlaps between traditional (e.g. coatings, home and personal care, food) and emerging biopharmaceutical formulation measurement needs?*
- *How can we address the trend towards miniaturisation of characterisation for high throughput experimentation?*
- *How can we better relate measurements and associated physical properties to effects and in particular the consumer perception of those effects?*

Actions

- Chemistry Innovation to monitor and evaluate value generated through new connections established at this meeting, at 6 and 12 monthly intervals
- Chemistry Innovation and NIST to maintain Measurements for Complex Fluids working group, with the primary aim to answer the questions raised.
- Chemistry Innovation to facilitate appropriate links between NIST groups / researchers and other KTNs.

Contact

Website: http://www.nist.gov/index.html

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Programme

Introductions to NIST and UK Formulations

Overview of NIST and the NIST Material Measurement Laboratory
Mike Fasolka (Scientific Advisor to the Laboratory Director, Material Measurement Laboratory)

UK innovation landscape & national strategy for chemistry-using industries
Colin Tattam (Projects Director, Chemistry Innovation)

NIST Programs

Complex Fluids Intro
Kalman Migler (NIST Complex Fluids Group Leader)

Micro Rheometry and Processing
Kalman Migler (NIST Complex Fluids Group Leader)

Addressing Carbon Nanotube Polydispersity
Jeff Fagan (NIST, Polymers Division, Complex Fluids Group)

Causal Factors in Protein Stability
Marc Cicerone (NIST, Polymers Division, Biomaterials Group)

Fast Dynamics of Glass-Forming Liquids for Protein Preservation: What Exactly Are We Measuring?
David Simmons (NIST, Polymers Division, Biomaterials Group)

Particle Standards for Protein Stability
Dean Ripple (NIST, Bioprocess Measurements Group)

Droplet-based interfacial rheometry methods for evaluating mobility of fluid interfaces
Kendra Erk (NIST, Polymers Division, Complex Fluids Group)

The nSoft Consortium – Advancing Neutron Methods for Soft Materials Manufacturing
Ron Jones (NIST, nSoft Director, Polymers Division)

Industry Needs and Capabilities

Characterisation Challenges for Home and Personal Care Products
Mark Baker (HT Sciences Research Manager, Unilever, UK)

High Throughput Formulation at the Centre for Materials Discovery
Neil Jones (Laboratory Operations Manager, Centre for Material Discovery, University of Liverpool)

Understanding drug formulation behaviour through gastric modeling
Martin Stocks (Business Manager, The Model Gut)

Characterising complex fluids for particles: Some in line opportunities
David York (Research Fellow, Process Development, P&G)

Complex phase behaviour of liquid crystalline phases for a commercial non-ionic surfactant system
Helen Dutton (InForm Project Manager, University of Manchester)

Parallel detection and particle characterisation in concentrated systems
David Goodall (Chief Scientific Officer, Paraytec)

Emulsion/Dispersion Manufacturing and Image Analysis
Richard Holdich (Research Director, Micropore Technologies and Loughborough University)

Large Scale Nanomaterial Production Using Microfluidizer High Shear Processing: "Top Down" and "Bottom Up" Approaches
Mimi Panagiotou (Chief Technology Officer, Microfluidics)

Formulation Science and Technology Day at Chemspec USA 2011
Pennsylvania Convention Center, Philadelphia

Overview

In the early planning stages of Formulation Mission USA, an extensive shortlist of research centres, companies and universities to visit was generated. In order to maximise opportunities for engagement with these and other contacts it was decided that we should attend and meet with them at a focal conference or event.

The intention was that this event should provide a platform for UK and US counterparts to explore the importance of formulation, new business challenges/opportunities and approaches to collaboration and open innovation. An event that would showcase the latest formulation technologies and associated R&D expertise and ultimately stimulate ongoing international collaborations.

In the absence of any forthcoming formulation-focused conference in the US, Chemistry Innovation created its own one day meeting as an adjunct to the specialty chemicals conference, Chemspec USA. Sincere thanks go to the Chemspec organisers and UKTI for their support in making this event possible.

Benefits of the event

- Excellent presentations from Dow on industrial application of high throughput technologies for formulation and other applications. Dow are clearly world leaders in this field.
- Provided a useful platform for the UK formulation community to present themselves as global leaders in formulation as well as an integrated network open to collaboration.
- In turn, an interesting discovery that the US formulation community is not particularly coherent or geared up for collaborative activity.
- Some good quality connections were made and almost all of the UK delegates reflected that the UK-UK networking was of significant value.

"A number of new business contacts, and possible future technical collaborators within the USA were made whilst at the events. We would not have had the resources to do this without the help of Formulation Mission USA , thank you!"
-Richard Holdich (Micropore Technologies)

Event Content

The first session, *'The Importance of Formulation - An international perspective'* provided an insight into the value and growing importance of formulation science, technology and associated products. Expert presentations included cross-sector overviews from a UK perspective as well as more detailed analyses from UK and US industry leaders in home and personal care, food and coatings.

The second session, *'Formulation Science and Technology Showcase'*, provided an introduction to world leading expertise and technologies to enable the development of the next generation of formulated products. Quick-fire elevator pitches were given by UK and US universities, companies and networks covering a wide range of themes.

The last session, entitled *'Stimulating Collaborations'*, built on the opportunities introduced in the morning, by enabling delegates to partake in one-on-one networking as well as a facilitated group discussion to propose and test ideas for future strategic collaborations between the broader UK and US formulation communities.

Support for a Global Formulation Network was forthcoming and there was much interest in a return mission to the UK. However, it was recognised that this network, to stand a good chance of being successful and sustainable, must have some clear objectives and a strong sense of purpose. To this end, the stand-out theme identified was to collaborate with regard to improving standards in skills and training in formulation, in particular at a graduate and professional level.

Actions

- Chemistry Innovation to monitor and evaluate value generated through new connections established at this meeting, at 6 and 12 monthly intervals.
- Chemistry Innovation to feed back information on skills and training needs to relevant Sector Skills Councils and other key stakeholders.
- Chemistry Innovation to explore and look to support specific training models e.g. Doctoral Training Centre.
- Chemistry Innovation to modify online '_connect' group to;
  - » enable broader dissemination of materials presented at Chemspec
  - » provide a platform for the growing network to upload profiles/elevator slides
- Chemistry Innovation and delivery partners to support the development of a possible return mission to the UK.
- UKTI to work with various mission delegates to develop formulation content for forthcoming UKTI flagship brochure on 'Advanced Engineering and Manufacturing'.

Programme

The Importance of Formulation - An international perspective

Welcome/Introduction; Darren Ragheb, Chemistry Innovation

Getting more out of industry–academic research projects in the formulated products space; Prof David York, Procter & Gamble. *"Across the world governments are encouraging stronger links between industry and their academic institutions in the belief that this will provide greater commercial opportunities as well as bring more money into academia. However, there is not always a strong correlation between money spent and outcomes achieved. This is especially the case with formulated products, which have unique challenges and opportunities. This presentation will describe some ways to improve this situation and is based on actual experience within the UK."*

High Throughput Screening for Product Formulation Development; Dr. Richard Cesaretti, Associate R&D Director, The Dow Chemical Company, USA. *"In today's business environment, there are strong pressures to develop new formulations that accelerate speed to market and increase the probability of successful product introductions. The drive towards more highly formulated products offers an excellent opportunity to use the strengths of high throughput research to understand how complex interactions affect final properties. Rapid synthesis, formulation and application testing allows for the interactions between the variables to be investigated in much more depth and breadth. This includes the use of designed experiments, high throughput tools and informatics for data handling. An example of how Dow is using high throughput formulation workflows to improve properties for new formulated products will be presented."*

Formulation for the 21st Century: Doing More with Less; Dr. Judith Hardy, AkzoNobel, UK; *"The urbanization of a rapidly growing population coupled with environmental concerns and raw material shortages present opportunities and challenges in equal measure for many industries, not least the coatings industry. These global trends have major implications for commonly accepted ways of formulating and making products. This presentation will look at some of the options being explored in formulation practice in architectural coatings to support sustainable growth."*

Open Innovation & Technology Sourcing in formulating FMCG products; Vicky Burkitt, Reckitt Benckiser, UK; *"External influences are increasingly recognised as being key to sustained product formulation and innovation success. This presentation provides a brief overview of a company who have been advocates of OI for over 10 years and highlights how they have evolved to address current needs via a global website approach."*

The Unilever Sustainable Living Plan - A challenge and an opportunity for global formulated products; Dr. Mark Baker, Unilever, UK; *"Unilever's mission is to help people feel good, look good and get more out of life with brands and services that are good for them and good for others. Our ambitious goal is to develop new ways of doing business with the aim of doubling the size of our company while reducing our environmental impact. This is a stretching target which challenges the traditional way of developing new products."*

Formulation Science and Technology Showcase

Complex fluids research overview; Professor Robert Prud'homme, Princeton University

It's a great time to innovate in formulation; Jim Bullock, Intelligent Formulation

Giltech overview; Dr David Healy, Giltech

Kuecept: Drug Delivery Technologies; Dr Ashvin Patel, Kuecept

Automaxion overview; Dr Stephen Bysouth, Automaxion

Novel instrumentation for characterising formulations of APIs and biopharmaceuticals; Professor David Goodall, Paraytec

The Dynamic Gastric Model: Bio-relevant in-vitro simulation of gastric processing for the study of orally delivered materials; Dr Martin Stocks, The Model Gut/PBL

Emulsions, Dispersions Manufacturing and Control; Professor Richard Holdich, Micropore Technologies / Loughborough University

Centre for Formulation Engineering, Birmingham; IChemE Formulated Product Engineering Subject Group; Dr Richard Greenwood, University of Birmingham

University of Manchester research overview; Inform: Integrating Nanomaterials in Formulations; Formulation Science and Technology Group (RSC); Dr Helen Dutton, University of Manchester

Particles CIC – Working with industry; Dr Simon Lawson, ParticlesCIC / University of Leeds

CMD – A high throughput research facility; Dr Neil Jones, Centre for Materials Discovery/University of Liverpool

Formulation Strategies to Accelerate Innovation; Prof. Robert Lochhead, National Formulation Science Laboratory

How can NIST promote industrial innovation in formulations?; Dr Steven Hudson, National Institute of Standards and Technology

The National Formulation Science Laboratory
Hattiesburg, Mississippi

Overview

In May 2009, the RSC Formulation Science and Technology group hosted a celebratory event, 'Gordon Tiddy: a lifetime in formulation science'. Several of the mission delegates attended this meeting and were for the first time introduced to Professor Robert Lochhead who presented an interesting mix of his current research and his ambitious plans to create a National Formulation Science Laboratory (NFSL) in the USA. Several meetings, teleconferences and a lot of building work later, the final stop for Formulation Mission USA was at the centre that was the original inspiration for visiting the US.

The UK formulation community was in strong agreement that it would be very useful to visit the centre to benchmark the in-house technologies and learn more about the US approach to using and integrating the high throughput toolkit into their product design processes and culture. In addition, several stakeholders were keen to learn more about the US approach to providing an open access facility that industry uses and values.

To this end, the day in Hattiesburg consisted of a combination of tours, presentations, plenty of Q&A and a roundtable discussion to identify ways to build on the newly formed relationship.

Benefits of visit

- Valuable learning on global best practice with regard to the creation and structuring of a 'formulation centre' that delivers demonstrable value to industry. This learning will be applied to Chemistry Innovation's Top Ten deliverable "to establish a centre in science-based formulation that will increase penetration in global markets for UK based companies".
- High throughput technology benchmarking that suggests the UK is globally competitive, both within industry and academic/open-access facilities.
- Potential centre users from the delegation, in particular global companies with a US base, have a raised awareness of the centre and point of contact.
- A strong UK-US connection has been established that will enable more effective signposting and partnering between UK and US formulation stakeholders. Primary benefits will come from linkages with the formulation centre. However, access to an extended US network will also be of significant value.
- Useful learning and case studies in positioning formulation as something of value, importance and relevance to the broader community.

> *"The mission provided more insight into options for managing and improving formulation practice, including high throughput techniques" - Judith Hardy (AkzoNobel)*

Event Content

When Formulation Mission USA was first conceived, our expectation and primary reason for visiting Hattiesburg, was to see what exciting and innovative high throughput capability they have in the centre. In reality, the most compelling thing we saw and learned from was how to create an environment for industry support and engagement, with a seamless interplay between several centres and service providers.

First Stop: The University of Mississippi, School of Polymers and High Performance Materials. In isolation a visit to this centre would have been a low priority in the context of a formulation mission but this centre has for several years been Prof Lochhead's base. It has provided the foundation and plays a key role in the broad vision. In many respects the department is very typical and comparable to several in the UK. A mix of post and undergraduate training with around 20 faculty leading research activities (e.g. Wiggins group), the school is highly-rated in the US and certainly stood out in terms of seemingly limitless resources and a strong emphasis on delivering young researchers with strong communication skills. It's difficult to evaluate the quality of the training and research without more investigation but certainly some parallels could be drawn with UK departments, such as Sheffield and Warwick in terms of polymer strengths and focus. Also, strong links with industry and a focus on very real-world applied research projects (e.g. composite materials for sporting helmets) was comparable to the approach at the Institute for Materials Research and Innovation, University of Bolton.

Embedded within the university department was the Mississippi Polymer Institute (MPI). Again, similar to many UK chemistry and chemical engineering departments, this is essentially a commercial arm set up to provide professional training, expert consultancy and technical services in areas such as materials selection, testing, product prototyping and development. A well established and apparently successful model, again comparable to similar success stories in the UK centres, e.g. ParticlesCIC in Leeds and the Polymer Centre in Sheffield. Nothing too revolutionary yet, but crucially the MPI also has an important role within the formulation centre.

Situated ten minutes from the main university campus, The Accelerator is a science and technology-based incubator with a difference. It has been designed to support companies of all sizes with a focus on enabling a step-change in innovation through the development and application of new materials science and technology

to ultimately deliver increasingly innovative products faster to market. We have seen similar initiatives set up in the UK in areas such as Biosciences (Stevenage Bioscience Catalyst and BioCity in Nottingham) and Food (Colworth Park) but notably none in materials science or formulation.

Built in 2009, using a combination of ~$30m of Federal grants and university and state support, the 60,000 sq foot centre appears to be flourishing. With an official launch in early 2010 the accelerator is already at ~80% occupancy with 10 companies housed there and the centre approaching its target to be financially sustainable. In addition to the technical focus, one caveat for acceptance as a tenant is that the company is at an embryonic stage in its lifecycle. If after, say 2-5 years, the company is well established and is actually getting limited value from being in the centre, then it's time to make space for someone else. Examples that currently meet these criteria and were described to us were:

- KDL Solutions (forensics)
- Ablitech Inc. (biotech/therapy delivery systems)
- Crosslink (electrically active materials)
- SCI Genesis (stimuli responsive films and coatings)
- Bracco diagnostics (global medical equipment)
- Radiance Technology (polymer composites for high temperature applications)

So what were the features that attracted these companies to the Accelerator?

- The management and marketing of the centre is particularly professional and industry focused. (see presentation from Executive Director, Sunny Webb).
- The centre offers an attractive setting at a very competitive rate of $25 per square foot per year.
- Crucially the centre is materials science/formulation focused. The appeal here is two-fold. Firstly, this builds confidence that the centre is geared up to support companies with very specific needs. Secondly, the centre provides tenants with an excellent environment for networking and collaboration. One case study told of how one of the tenants was looking to rapidly develop a face paint to withstand high temperatures for military applications. Through a combination of skills and expertise within the centre the project was a success and has progressed to second stage funding.
- The centre has open-access facilities and associated expertise in pilot scale-up and of primary interest, high throughput technologies. The National Formulation Science Laboratory, slightly confusingly, is actually a large lab housed within the Accelerator. It is equipped with commercially available Chemspeed systems and it was also explained that through a close interplay with the University, novel high throughput capability/method development was also happening.
- Academic expertise was also embedded within the centre in the form of Mississippi Polymer Institute (see presentation from Institute Director, Bryan Brister). Whilst Prof Lochhead will continue to have a foot in the university the MPIs main base is now at the Accelerator with dedicated office and laboratory space. The important lesson here is that easy access to leading edge expertise will be of direct value, will also enable better exploitation of available technology and will ultimately help to keep the centre at the forefront of science and technology.
- Noetic technologies (see presentation from Kelli Booth VP of Marketing) also located within the Accelerator, is an innovation and commercialisation company that essentially partners up with fledgling companies to provide expertise in bringing new technology to market. Residents benefit to varying degrees, and are in no way obliged to work with them, but much needed support and skills in areas such as funding strategies, marketing and IP strategies are provided.

It is important to emphasise that whilst the priority with regard to tenancy is early-stage, materials / formulation science companies, essentially any other company, large or small, can access and if needed set up temporary residency in the centre to enable some dedicated collaborative project work. Currently, the prominent mechanism for stimulating these important partnerships is the Partners for Innovation scheme funded by

the National Science Foundation (NSF). This project funding enables a university student to spend some time in the academic year on an industry-led project with a focus on training in, and application of, combinatorial techniques within the NFSL. Partners include, Procter and Gamble, GSK, BASF, Dow, Johnson & Johnson, DSM and several smaller companies. Whilst the scheme is currently relatively modest in its scale, it represents an important intent to build the relationship between the centre and industry and should in theory lead to bigger projects and partnerships. Clearly this would be easier to do if the centre has a dedicated and flexible funding pot for collaborative R&D.

Building on this, Prof. Lochhead has needed to be proactive and resourceful in leveraging projects funding and it was impressive to see how well networked the Mississippi community were with Government departments e.g. the Ministry of Defence face paint project or the NSF funding for developing oil dispersant strategies in response to the Deepwater Horizon oil spill.

At the end of the day we held a discussion on areas for future collaboration between the centre, the UK delegates and the broader UK and US communities. One theme that dominated was around skills and training. Whilst there appears to be plenty of scope for collaborations for improvements in graduate and professional training, this is a topic that the appropriate mission delegates will look to develop in the future. However, it's worth flagging up that the body that Professor Lochhead has created to address the US education and training agenda is the Institute for Formulation Science. Currently a virtual concept that we didn't have time to explore in more detail however again this is another piece of the jigsaw towards a thriving innovation landscape in formulation and another indication that attempts are being made to address the bigger picture.

Whilst the immediate priority for the Accelerator is to grow a sustainable client base of varied companies, both locally and internationally, the long-term vision is to also create The Garden, a science and technology campus that would include office and lab space for more established companies and 'graduates' from the Accelerator. In addition, there would be a town center with retail, event space, a gym, day care facility, and park management facilities/services.

Actions

- Build learning into Chemistry Innovation Top Ten deliverable and other centre development activities for the chemistry-using industries.
- Establish mechanism for continued engagement
  - » Revisit of global training interests (engage relevant Sector Skills Councils)
  - » Support development of possible return US-UK Mission
  - » Establish ongoing UK-US Formulation Centre best practice forum.

Contact

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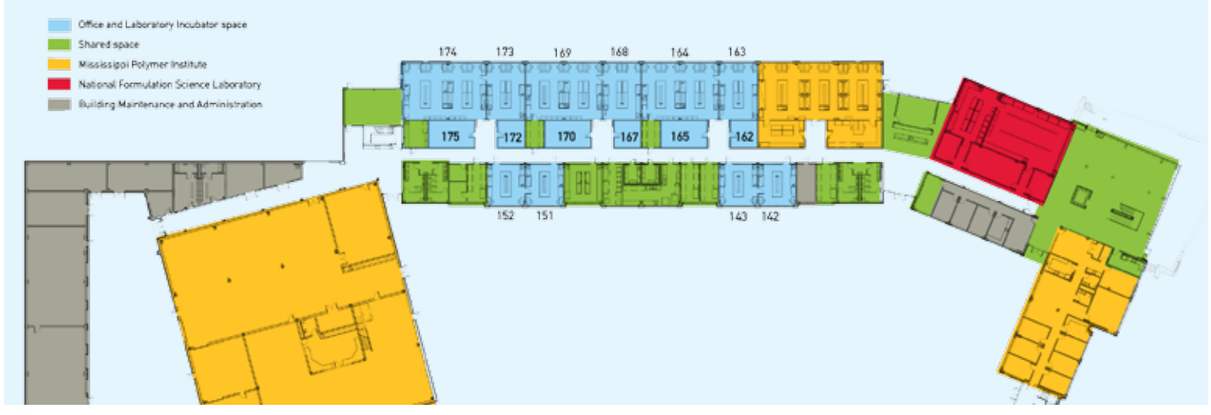

The Hi-Tech SMEs *Who's Who?*

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www.automaxionltd.com

Dr. Stephen Robert Bysouth, Owner

Dr Bysouth worked for Shell in Houston for 9 years, Avantium in Holland for 3 years and Mettler Toledo in Maryland for 2 years, and his company now brings this experience to High Throughput (HT) Formulation projects. He is currently working on a High Throughput screening system for cocrystals for the Pharma industry but he has worked in the past on projects ranging from oil well cementing to HT crop protection formulation.

Automaxion Ltd

Automaxion Ltd and it's sister company Automaxion SARL provide hardware solutions for unmet formulation challenges and consulting for companies wanting to implement High Throughput formulation technologies in their laboratories. An example would be the HT milling system (patented) originally used for screening in the Crop Protection industry. In addition, Automaxion SARL is a partner in the InForm project (represented by other delegates on this mission).

David Goodall

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paraytec.com
www.paraytec.com

Prof. David Goodall, Chief Scientific Officer

David Goodall is CSO and founder of Paraytec Limited, based in York, UK. He is also Emeritus Professor of Chemistry at the University of York, where his specialities were physical chemistry and analytical science. He has been involved in a range of collaborative projects with academic and industrial partners in the food, life sciences, pharmaceuticals and biopharmaceuticals sectors, and is an advocate of synergy and serendipity in science.

Paraytec

Paraytec is a UK based scientific instrument company offering products and contract services for pharmaceutical and biopharmaceutical applications. All products use our patented ActiPix™ UV area imaging technology. The TDA200 is an ideal bench-top tool for bioformulations groups, providing quantitative information on size of proteins, antibodies and nanoparticles, levels of aggregation, presence of sub-visible particles, as well as viscosity, electrophoretic mobility and protein charge. The SDI300 surface dissolution imaging system can be used in a variety of areas including APIs, stents, gels, pastes, suspensions, dental erosion, transdermal patches. It has the unique ability to rapidly produce essential quantitative data regarding the solubility of sparingly available compounds, even those with extremely limited solubility, early in the pre-formulation process. The UV camera also gives valuable mechanistic detail about the process of dissolution directly at the dissolving surface.

David Healy

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www.giltech.biz

Mr David M. Healy, R&D Director

BSc in physiology, microbiology and biochemistry, MSc in Bioengineering. 28 years of R&D in new technologies, biomaterials, process and product developments has provided a wide-ranging practical experience in all aspects of product development. Since joining Giltech in 1988 my primary focus has been in the medical devices sector. My scientific and technical career within academia and Small Business has been multidisciplinary. Materials and technologies developed have provided technology platforms with countless possible product applications in virtually every commercial sector.

Giltech Ltd

Giltech specialises in biodegradable and controlled release technologies. Since 1984 Giltech technologies have been used to produce pioneering products including Sorbsan® and Arglaes®. Its current activities focus on three core technology platforms - alginates, water soluble glasses and biodegradable polymers and their combination as composites. The blend of versatile technology platforms, deep technical expertise and highly specialised manufacturing processes enables Giltech to deliver a distinct competitive advantage by offering custom formulations of its technologies for each of its commercial partners.

The Hi-Tech SMEs *Who's Who?*

Ashvin Patel

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www.kuecept.com

Dr. Ashvin Patel, Development Manager
Ashvin joined Kuecept Ltd in May 2009 and prior to this was a Consultant/Project Manager with a healthcare consultancy (now called Prescient Life Sciences) from July 2006 until April 2010. Prior to working as a Consultant, he was a Senior Scientist/Study Director for two and a half years at GE Healthcare and has held other technical positions in both academia/ industry as a Scientist. He received his B.Sc in biochemistry from the University of Manchester in 1996; M.Sc. in biopharmacy from King's College London in 1998; and his Ph.D. in biochemistry/cardiac toxicology from the University of Plymouth in 2003.

Kuecept Ltd.
Kuecept Ltd. is a pharmaceutical contract research organization based in the UK. Kuecept offers a range of specialist screening and formulation services to develop new and improved delivery systems for poorly soluble and challenging pharmaceutical/biopharmaceutical actives, with particular expertise in oral, parenteral and pulmonary dosage forms. Kuecept has developed its own portfolio of enabling drug delivery technologies to improve drug bioavailability, including rapid dissolution, nano-milling and amorphous form development. These bespoke approaches can be incorporated during any stage of a drug development program, whether there is a need to improve or modulate your compound's in vivo release profile and/or bioavailability, or identify LCM opportunities for existing pharmaceutical products.

Martin Stocks

martin.stocks@
modelgut.com
www.modelgut.com

Martin Stocks Ph.D, Business Manager
Martin joined PBL in 2007 and currently manages the Health and Medical Technology portfolio, including operational control of the Model Gut. Martin sits on the Investment Executive of the Iceni Seedcorn Fund and is a Director of Iceni Advisory Ltd.
Martin graduated from the University of Manchester, and obtained his Ph.D. from the University of London. A 20 year research career has included posts at the Institute of Rheumatology, the Howard Hughes Medical Institute and the MRC Laboratory of Molecular Biology.
In 2000, Martin co-founded and became CSO of a start-up biotechnology company, Iclectus Ltd. He has also provided consultancy for UK technology transfer and VC communities.

The Model Gut
The Model Gut is a technology-based service company which specializes in the research and development of advanced in vitro systems that simulate the digestion processes of the human gut. Our pioneering research, spanning over fifteen years at the Institute of Food Research (UK), has culminated in the development of the world's first Dynamic Gastric Model, providing exacting replication of the complex biomechanical and dynamic biochemical functions of the human stomach. This unique platform has applications in facilitating product research and development for the pharmaceutical, food and advanced nutritional supplement industries.

Richard Holdich

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co.uk ; R.G.Holdich@
Lboro.co.uk

Prof. Richard Holdich, Research Director
Research Director of Micropore Technologies and Professor of Chemical Engineering at Loughborough University (UK). A specialist in Particle Technology and characterization techniques. Over 25 years of experience in particle systems, including emulsions and colloids.

Micropore Technologies Ltd
Micropore Technologies Ltd spun-out from Loughborough University in 2004 and has a new way to make emulsions facilitating the production of water-in-oil-in-water emulsions, for low fat foods and controlled release applications, as well as a means to engineer the drop size for maximum effect in the product – all with a low energy requirement.

Loughborough University
The Department of Chemical Engineering at Loughborough University has a strong research focus on particulate systems, including foods and health care, and all types of emulsification, dispersion, particle production, encapsulation and particulate drying are researched. There are ten full-time faculty members active in these fields, from a total faculty staff of twenty. In addition, there are well over 50 post graduate research students and assistants active in this area.

www.micropore.co.uk
www.lboro.ac.uk/departments/cg/

The Large Companies *Who's Who?*

Mark Baker

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unilever.com
www.unilever.com

Dr Mark EJ Baker, HT Sciences Research Manager
Mark graduated from UMIST in Instrumentation and Analytical Science and then worked at Cussons, the owners of the Imperial Leather brand, for 3 years as a Development Manager working across the Cussons UK portfolio of HPC products. In 1999 he joined Unilever as a Research Manager working in the Hair category at Port Sunlight, first on Daily Hair Colour products and then on global hair conditioning technologies with a focus on the US and Japanese markets. In 2006 Mark joined the High Throughput Sciences team to lead HT Formulation and Product Characterisation.

Unilever
Unilever is global multinational company whose mission is to develop market leading products in Foods, Personal Care and Home Care that help consumers look good, feel good and get more out of life. Every day over 2 billion people use one of our 400 brands and we invest over €1 billion on R&D to create and deliver innovative products that delight our consumers.

Vicky Burkitt

vicky.burkitt@rb.com
www.rb.com

Vicky Burkitt, R&D Director, New Technology Group
Education: Applied Chemist, MBA
Experience: Pharmaceutical Analysis, Trade Marketing, Formulation Development, External Project Management, Healthcare R&D Management, Technology Platform Development, Scentsorial Innovation, Surface Care & Germ Protection Innovation Director, R&D Director Analgesics, Technology Sourcing & Foundations
Companies: SKB, Reckitt & Colman/Reckitt Benckiser
Hobbies: Mountain Biking, Hiking, Wine

Reckitt Benckiser
RB is one of the world's fastest growing companies in household, health and personal care products. You'll find our brands including Dettol, Airwick, Cillit Bang, Vanish, Finish, Nurofen, Strepsils, Veet and Durex in millions of homes worldwide. Our heritage goes back almost 200 years and already in this century we've doubled our net revenues and the market valuation of our company has quadrupled. Innovation is the key driver of our success and maintains our position as the global no. 1 or no. 2 in the majority of our fast growing categories.

Judith Hardy

judith.hardy@
akzonobel.com
www.akzonobel.com

Dr. Judith Hardy, Global Category R&D Leader, Decorative Paints
After completing my education in Australia, I came to the UK to take up post-doctoral research work at Oxford University, and then joined ICI Paints as a research chemist. I have enjoyed a career encompassing a range of technical and marketing roles in the coatings industry, working for large multi-national corporations with global reach in architectural and automotive coatings, until my current role as an R&D Product Category Director for AkzoNobel Decorative Paints with a focus on specialty and high performance coatings.

AkzoNobel
AkzoNobel employs more than 55,000 people globally in 3 business areas: Performance Coatings, Decorative Coatings and Specialty Chemicals. Revenue in 2010 was €14.6bn, derived roughly equally from each of the 3 business areas. It is the world's largest coatings supplier and has headquarters in Amsterdam, NL.

David York

york.dw@pg.com
www.pg.com

Prof. David York, Research Fellow, Process Development
A chemical engineer with 35 years experience in the research and design of consumer products, particularly detergents. This has involved mostly process R&D all the way from bench scale to plant start up and trouble shooting. More recently time has been spent on upstream work on the top technical challenges for the future and involving academia to partner finding solutions.

Procter and Gamble
Procter & Gamble's (P&G) products are used by more than four billion times a day. P&G is the largest consumer products company in the world and is number one in global market share in all their core businesses. With 28 Research & Development facilities on four continents and more than 300 brands in 180 countries, connecting with P&G allows businesses to tap into unparalleled innovation opportunities, global distribution and worldwide marketing assets.

Universities/Research Centres
Who's Who?

Neil Jones

neil.jones@liverpool.ac.uk
www.liv.ac.uk/materials-discovery

Dr Neil Jones, Laboratory Operations Manager

Neil joined CMD in 2006 and has responsibility for the Centre's facilities and research activities. Prior to this he was Technology Manager at an optoelectronics business incubation and research centre in North Wales. His background is in analytical chemistry, and he holds MChem and PhD degrees from the University of Leeds. His doctorate, sponsored by Avecia, focused on the size distribution analysis of polymeric and particulate systems.

The Centre for Materials Discovery

The Centre for Materials Discovery is a shared-access research facility providing research, training and knowledge transfer services to business and academia in the areas of high throughput formulation, synthesis and characterisation. We provide access to state-of-the-art facilities supported by dedicated, highly-trained staff and relevant academic expertise at the University of Liverpool.

Richard Greenwood

r.w.greenwood@bham.ac.uk
www.eng.bham.ac.uk

Dr. Richard Greenwood, Engineering Doctorate Programme Manager

BSc Chemistry, University of Bristol
PhD Chemical Engineering, Imperial College

Centre for Formulation Engineering

The Engineering Doctorate in Formulation Engineering was established 2001 with a £ 4.5 million grant from the EPSRC and to date has recruited 79 students (65 EngD students or Research Engineers and 14 MRes students). In September 2009 the Centre was re funded with a second EPSRC grant of £ 5.5 million to fund an Industrial Doctorate Centre with a further 50 studentships. The current level of direct industrial support is over £2.5 million with in kind industrial contributions of approximately £40,000 p.a. per student. The centre concentrates on research into the physical, chemical and biological processes that create formulated product structure and the maintenance or breakdown of that structure in use. Examples of such products include foods, pharmaceuticals and speciality products such as paints, catalysts, detergents and agrochemicals.

http://www.eng.bham.ac.uk/chemical/study/postgrad/engd.shtm

Simon Lawson

s.lawson@leeds.ac.uk
www.leeds.ac.uk;
www.particlescic.com

Dr. Simon Lawson, Director

Based at the University of Leeds, Simon is currently Director of Enterprise & Knowledge Transfer for the Faculty of Engineering and Director and co-founder for ParticlesCIC. Simon is also founder and director of Escubed Ltd, a contract analytical SME providing high quality services to industry.
Simon holds graduate and postgraduate degrees in Materials from the University of Sunderland. Following post-doctoral research, funded by Tioxide Specialties, Simon worked as a Research Associate at BNFL and then as a Project Manager at Applied Photonics ltd.

University of Leeds; ParticlesCIC

The ParticlesCIC provides access to advanced analytical equipment and expertise. Founded in July 2003 we have an enviable track record of providing routine and problem solving services to industry. We have access to over 100 experts with experience in pharmaceutical, biotech, pigments, speciality and bulk chemicals, foods, agrochemical, cosmetics and personal care. Our main services are: contract analytical services, contract research, consultancy, and training.

ParticlesCIC is based within the Institute of Particle Science & Engineering (IPSE) – a centre of excellence helping to improve quality of life by addressing the engineering science of particulate processes and products. Research focuses on the engineering science of advanced particulate systems applied to a range of sectors including healthcare, personal and household products, minerals and fuels e.g. nuclear.

Helen Dutton

helen.dutton@manchester.ac.uk
www.nanoformulation.eu/ ; www.ceas.manchester.ac.uk

Dr. Helen Dutton, InForm Project Manager

Helen completed her MEng in Chemical Engineering from UMIST, The University of Manchester Institute of Science and Technology, in 2003. In 2007 she obtained her PhD at The University of Manchester working on 'The Behaviour of Surfactant Lamellar and Gel Phases Under Flow'. Subsequent work as a research associate on a number of interdisciplinary projects has involved collaborations with both academic and industrial institutions. Helen's expertise is in colloidal chemistry, specifically formulated products, and she is currently the Project Manager for InForm and secretary for the Formulation Science and Technology interest group of the Royal Society of Chemistry.

InForm

InForm stands for Integrating Nanomaterials in Formulations and is a partnership between 17 world-leading institutions which will bring together the scientific knowledge of formulation of nanomaterials and then pass this knowledge on. InForm will create appropriate platforms for dissemination between researchers from Europe, USA and Asia-Pacific working in academia, public research laboratories and industry in order to identify and enhance complementary interests. InForm is a 3 year funded project and started in July 2009. It will host annual events, NanoFormulation2010 (Stockholm), 2011 (Singapore) and 2012 (Barcelona) and the activities are distributed between six main thematic lines that are of fundamental importance to formulation science: formulation of biological nanomaterials, handling of nanopowders, processing and stabilization of nanoparticle suspensions, physical chemistry at the nanoscale, formulation of thin films and the health and safety aspects of nanomaterials.

The University of Manchester

The University of Manchester is a world-leader in higher education and research. The School of Chemical Engineering and Analytical Science offers students both undergraduate and postgraduate courses, as well as providing researchers and academics with state-of-the-art analytical equipment and unrivalled facilities, including the pilot-scale Morton Laboratory. The School undertakes leading-edge multidisciplinary, creative, innovative, and relevant research on distinctive topics including nanomaterials and interfaces, complex chemical and biological systems and molecular modelling, simulation and design.

Delegate Overview

kuecept Drug Delivery Technologies
P&G
Knowledge Transfer Network – Chemistry Innovation
InForm
Automaxion Ltd
ParticlesCIC
MANCHESTER 1824
Unilever
Formulation Science & Technology
RSC Advancing the Chemical Sciences
Micropore Technologies
IChemE
AkzoNobel
modelgut
Giltech
paraytec
THE UNIVERSITY of LIVERPOOL
UK TRADE & INVESTMENT
Centre for Materials Discovery
UNIVERSITY OF LEEDS
Reckitt Benckiser
Loughborough University
Intelligent Formulation
UNIVERSITY OF BIRMINGHAM

Support/Networks
Who's Who?

Tricia Francis

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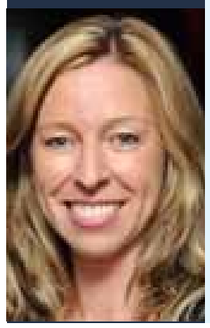
www.ukti.gov.uk



Ms Tricia Francis, International Trade Adviser
With a successful background in international sales and marketing my role within UKTI is to work closely with chemical sector companies in the North West of England assisting with their international trade agenda. I also have a strategic national role to identify focus areas where the UK chemical industry has business strengths, and where there are global opportunities.

UK Trade & Investment
With professional advisors across 96 international markets, UK Trade & Investment is the Government department that helps UK-based companies succeed in the global economy and assists overseas companies to bring high quality investment to the UK economy.

The Formulation Science and Technology Group (FSTG)

www.formulation.org.uk

The Formulation Science and Technology Group (FSTG) is subject group of the Royal Society of Chemistry which promotes technology exchange over all aspects of product formulation, from initial product concept to manufacture. The FSTG is the leading scientific organisation dedicated to product formulation which works for the benefit of its members and to further the awareness of formulation science across multi-disciplinary scientific sector. The FSTG is a charitable organisation which works for the benefits of its members as it fosters the advancement of formulation science through conferences, training days and networking events. Mission reps were Helen Dutton and Richard Greenwood.

Formulation Science & Technology

RSC | Advancing the Chemical Sciences

Jim Bullock

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www.intelligentformulation.org

Jim Bullock, CEO
Jim joined Intelligent Formulation in January 2010, before which he spent five years heading development and regulatory functions for BASF's global biocides business. Following a D.Phil in Materials Science from Oxford, Jim led R&D projects on engineered microcrystals in photographic systems at Ilford Ltd before joining ICI Specialties. There he led R&D activities working on crystal engineering and the chemistry of dyes. Jim also spent five years at BASF in Germany, heading formulation development for dyes and pigments before switching to oversee global marketing for the biocides business. For several years he was on the board of Agion Technologies, a specialist provider of antimicrobial materials.

Intelligent Formulation Ltd.
Intelligent Formulation Ltd. runs a unique Innovation Network which helps companies accelerate their innovation in formulation and provides knowledge transfer across industry sectors to address current and future challenges and opportunities. Our foresighting activities offer companies a future view on formulation technology to identify challenges, opportunities and technology gaps and to help drive business R&D priorities. Companies take part in and benefit from our conferences, workshops and webinars aimed at brokering constructive and profitable technology partnerships. We broker and manage collaborative projects in formulation which leverage your own internal R&D spend and reduce risk through collaboration and cost sharing. Our extensive network membership allows us to signpost you to relevant contacts and helps partnerships and collaborations to form. Finally, to provide you with the skills your company needs we offer CPD (professional training) programmes and events in formulation technology.

Particle Technology Subject Group

http://www.icheme.org

Mission reps were Richard Greenwood and Richard Holdich

Formulated Product Engineering Subject Group

www.icheme.org

Mission reps were Richard Greenwood and Darren Ragheb

IChemE

The Coordinators
Who's Who?

Darren Ragheb

Darren Ragheb, (Mission Leader)
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Darren Ragheb, Mission Leader
Darren manages the national Product Design programme at Chemistry Innovation, leading knowledge transfer and open innovation activities to enable better design and production of novel products which deliver benefits to consumers through their properties or function. Darren is also part of Chemistry Innovation's projects team, supporting industry access to R&D public funding and the development of winning consortia and compelling project proposals across the chemistry-using industries. Darren holds an MChem Chemistry degree from The University of Leeds and following a spell at the Forensic Science Service as a DNA Analyst, worked for Syngenta as a Formulation Design Chemist delivering novel products for global agrochemical markets.

Colin Tattam

Dr Colin Tattam, colin.tattam@ciktn.co.uk

Colin Tattam, Projects Director
Colin leads a team at Chemistry Innovation to initiate, build and oversee a portfolio of collaborative projects between industry and academia; to date this comprises 130 projects with an invested value in excess of £110million. Colin's track record of implementing knowledge transfer programmes is exemplified by the recent investment of £15million in the Knowledge Centre for Materials Chemistry – a national centre of excellence for business, based in the north west of England. Colin gained a first degree and PhD in materials science from the University of Birmingham and has since gained 15 years experience in business development, operations and general management roles; most recently within a high-growth, Queen's Award winning technology SME.

Chemistry Innovation

www.chemistryinnovation.co.uk
Chemistry Innovation is a Knowledge Transfer Network (KTN), an independent industry led initiative, backed by the Technology Strategy Board, driving innovation and delivering value across the chemistry-using industries. It works with both industry and academia and provides a leading, coherent voice to government, informing and advising on the technological needs of the chemistry-using industries and issues that enhance / inhibit innovation.

Last year, Chemistry Innovation released a national strategy for the chemistry-using industries, driven by the development of fundamental understanding of market drivers and industry challenges. Through four key 'priority' areas outlined by the strategy, the company works to identify and drive projects and collaborations across sector boundaries, bringing together industry and academic professionals whilst establishing partnerships with other organisations to provide a national support framework.

Knowledge Transfer Network
Chemistry Innovation

Formulation Mission USA, a global networking initiative, is aligned to Chemistry Innovation's Product Design priority area. The key deliverable in this area for 2011/2012 is to establish a centre in science-based formulation that will increase penetration in global markets for UK based companies.

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https://ktn.innovateuk.org/web/formulation-mission-usa1

To be able to access all content linked to within this mission report and to follow ongoing UK-US collaborative activities, please join this free online group https://ktn.innovateuk.org/web/formulation-mission-usa1