Dial-a-Molecule is a Grand Challenge Network funded by EPSRC to promote research aimed at step change in our ability to deliver molecules quickly and efficiently.

How can we make molecules in days not years?

Meeting the challenges set by Dial-a-Molecule requires a wide spread adoption of technology in both academia and industry to allow for a step change in synthetic capability and will require collaboration between many areas of science, engineering and mathematics.

FORTHCOMING MEETING
Next Generation Reaction Platforms; Technology Showcase

When: 4th April 2013

Where: Brunel University

What: An opportunity to

1. Showcase novel and prototype technology
2. Identify technology gaps in terms of DaM aims
3. Build collaborations to
    a. further develop (or find new applications for) the available technology
    b. develop equipment to fill the identified gaps
    c. apply for funding/draft funding proposals

Outline agenda:

Morning session – Technology Showcase including exhibition, posters and flash presentations
Afternoon session – Addressing key challenges through collaborative project proposals

Meeting outcomes: Proposals for a portfolio of technology projects.

Funding will be available for a small number of academia-led feasibility studies, which would be expected to lead to proposals for EPSRC funding.

The Dial-a-Molecule network will broker the establishment of proposed projects between academia and industry, providing support to access alternative funding mechanisms.

How to get involved:

1. Tell us your top priority needs for reactor platforms.
    - We are looking for flash presentations describing 1-3 priority needs aligned with Dial-a-Molecule goals
        – see below for a summary of themes and goals described in the DaM Roadmap for Next Generation Reaction Platforms
    - *If your company is willing to contribute to funding development within your priority area, please discuss this with the Dial-a-Molecule Network Co-ordinator*
2. Share your innovative equipment developments at the meeting.
    - We are offering free exhibition and poster space to showcase developments aligned with the Dial-a-Molecule EPSRC Grand Challenge.
    - *NB. Equipment suppliers will benefit from representation by technical staff at this meeting, to enable efficient participation in discussion groups*

This meeting will be free to attend To register your interest in this meeting, or to find out about showcasing your technology please contact the Dial-a-Molecule Network Coordinator Susanne Coles (L.S.Coles@soton.ac.uk) or the co-organisers Harris Makatsoris (Harris.Makatsoris@brunel.ac.uk) and Gill Smith (gesmithassociates@gmail.com).

Next Generation Reaction Platforms

Challenge	State-of-the-art	Short term	Medium term	Long term	Goal
Reactor Platforms	Lab batch reactors are pervasive as easy to use and reliable, but not scalable and limited access to range of synthetic parameters. Flow reactors, *e.g.* Oscillatory Baffled Reactors, emerging, but not widely used due to perceived complexity	Well characterised, easy to use 'plug and play' meso-scale flow reactors	Self-reconfigurable reactors covering 90% or more of chemical applications		Universal Synthesiser: Modular, reconfigurable reactor platform that is reliable, scalable, adaptable, automated, pervasive, covers nearly all chemical applications, allowing access to a wide parameter space for a range of materials, *e.g.* metastable states
			Low cost lab-on-a-chip devices combining a range of unit operations exploiting innovative fabrication techniques such as 3D printing		
		Laboratory flow reactors and ancillary components that can handle slurries and solids	Small scale supercritical fluid reactors. Address engineering challenges in supercritical CO2	Deal with reactions biologically	
		Intuitive software and open, multivariable control and acquisition platform for synthesis automation. Pervasive data logging			
Intelligent Feedback Control	Emerging area that currently involves application of existing control technology in the laboratory and in particular in discovery that is routinely used in industry today	Standardised, easy to use and low cost probes and flow cells. Employ innovative fabrication techniques	Smart, 'universal' molecular probes integrating new analytical techniques and time resolved measurements		Intelligent feedback controllers with on the fly reaction analysis driving self-building reaction models automating discovery, process optimisation and work up
		Capturing kinetic information out of the box to support scale up	Development of smart probes and algorithms for near real time molecular structure elucidation. Use this as feedback to control direction of reaction by manipulating synthetic parameters		
		Miniaturisation of key analytical techniques, e.g. low cost mass spec on a chip or low cost in-line NMR			
Microfluidics, Lab-on-a-chip	Microfluidic devices for reactions commercially available, but can be costly to redesign. Barrier to entry to the uninitiated, in easy only for single-phase systems	Well characterised, easy to use 'plug and play' microfluidic flow reactors with integrated ancillary components such as pumps, flow cells, *etc.*	Fully characterised, multiphase hydrodynamics	Alternative energy vectors introduction (light, micro-wave, ultra-sound). Topology, surface hetero-geneity effects. Confined geometries thermo-dynamics	Microfluidic systems with integrated reactors, separators, analytics, optimisation
		Innovative fabrication techniques such as 3D printing for microfluidic and lab-on-a-chip devices			
Networks of reactors	Certain commercial lab-scale reactors can be linked together for solution transfer from one reactor to the next	Integration and networking or reactor modules for multi step synthesis execution and pase/component separations		Handling and transferring of metastable solutions	Reconfigurable multi-unit operation reactor networks for complex multi-step synthesis incl. reactors, analytics and purification
		Standard interfaces between modules for control, data logging and material transfer			
		Integrated, low cost liquid/solids handling and preparation system. Handling and transfer of reactants			
Purification	Purification almost an afterthought as existing approaches are not considered together with the reaction at hand. Solvent switching, reuse and recycling not fully addressed currently	Integrated synthesis-purification/separation and pre-formulation at early stages			Adaptable, sustainable and in-line separation/ purification module with data logging. The goal includes modelling tools and controller development for high throughput work-up design
		Novel methods for reaction-separation including counter current chromatography, micro distillation, micro extraction, flow crystallisation. Challenge also tracks development of modular reactor platforms above			
		Low cost sustainable techniques and tools with new media incl. small scale supercritical fluid separators, ionic liquids, scavengers			
		Scale down tools used in process development and engineering for use at early stages of development			