

# Leeds Centre for Crystallization

- Huge expertise in crystallization at the UoL

Pharmaceuticals, modelling, biomineralization, solid state materials, crystal engineering, geology, protein crystallization ....

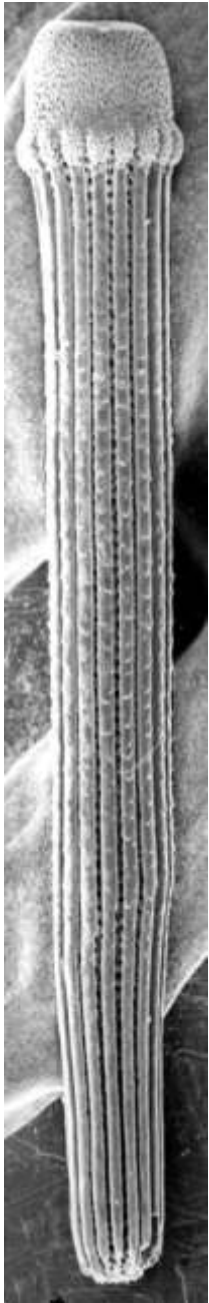
- Goal for the centre is to bring people together

- ⇒ provide a forum for discussion
- ⇒ exchange of expertise and facilities
- ⇒ PhD students and postdocs

- Establish new collaborations and extend possibilities of funding

# Membership

Chemistry	Physics	Earth Sciences	Biological Sciences	Mechanical Engineering	Civil Engineering	SPEME	Electrical Engineering	Dentistry/ Medicine	Food Science
Fiona Meldrum	Hugo Christenson	Liane Benning	Arwen Pearson	Anne Neville	Ian Richardson	Kevin Roberts	Ed Linfield	Jennifer Kirkham	Malcolm Povey
Michaele Hardie	Sarah Harris	Ben Murray	Adam Nelson	Nik Kapur		Rik Brydson		Steve Brookes	
Malcolm Halcrow	Sarah Staniland	Sam Shaw	Sheena Radford	Mark Wilson		Rob Hammond		David Wood	
Stefan Auer (CMNS)		Caroline Peacock	Steve Baldwin			Andrew Brown		Phil Conaghan	
Geoff Hyett			Nicky Stonehouse			Xiaojun Lai		Xuebin Yang	
John Blacker (iPRD)			Thomas Edwards			Andrew Bell			
Frans Muller (iPRD)			Stephanie Wright			Andrew Scott			
						Antonia Borissova			
						Xue Wang			
						Tariq Mahmud			



# Management Group

## ***Director***

Fiona Meldrum (Chemistry)

## ***Deputy-Director***

Liane Benning (Earth Sciences)

## ***Group***

Hugo Christenson (Physics)

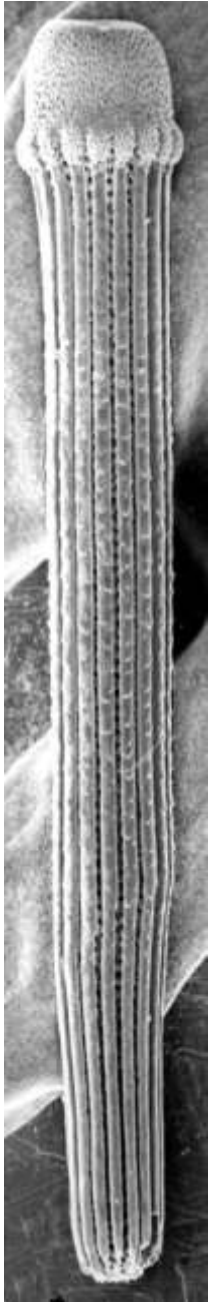
Arwen Pearson (Biological Sciences)

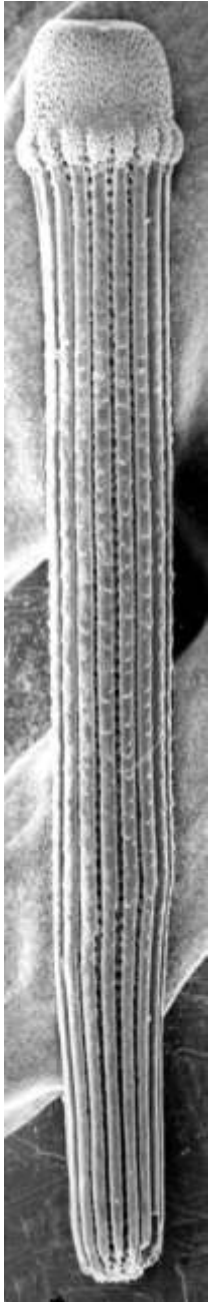
Kevin Roberts (SPEME)

Anne Neville (Mechanical Engineering)

Rik Brydson (SPEME)

Jennifer Kirkham (Dental Institute)





## Seminar Series

- Organised by Hugo Christenson (physics)
- Internal and External speakers
- Every 1-2 months
- Start after Easter

## Official Launch Meeting

- Held in September
- Invite external academics and industrialists
- Presentation and poster sessions
- Chance to show-case and raise awareness of the work in crystallization at the University
- **Extend this to an annual meeting**

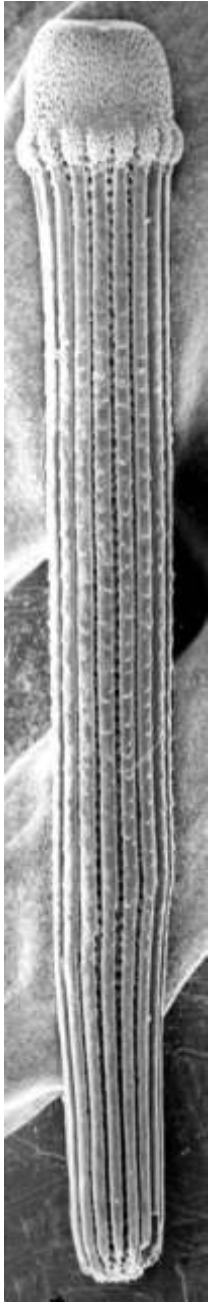
# Summer Studentships

## Goal is to Kick-Start Collaborations

- 6 per year
- 8-10 weeks duration
- Undergraduate students
- **MUST BE COLLABORATIVE** – with another school of faculty
- New project
- Strong preference for **NEW COLLABORATIONS**

**CLOSING DATE** March 11th

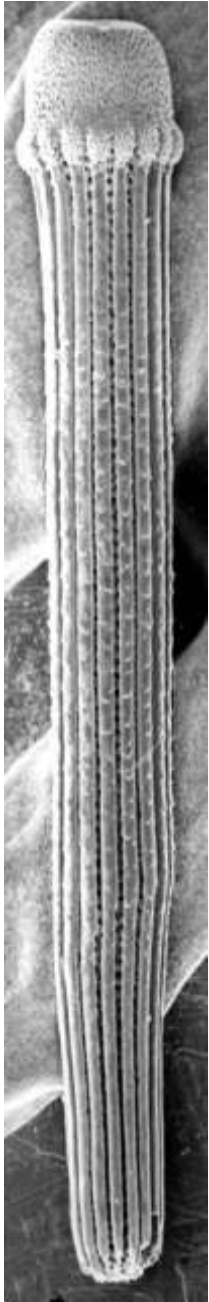
Application Form can be obtained from [crystals@leeds.ac.uk](mailto:crystals@leeds.ac.uk)



## Involvement of PhD Students and Postdocs

- Would like to get PhD students and Postdocs involved
- Regular seminars/ discussion meetings
- Contribute to planning seminar series
- Representatives on Management Committee

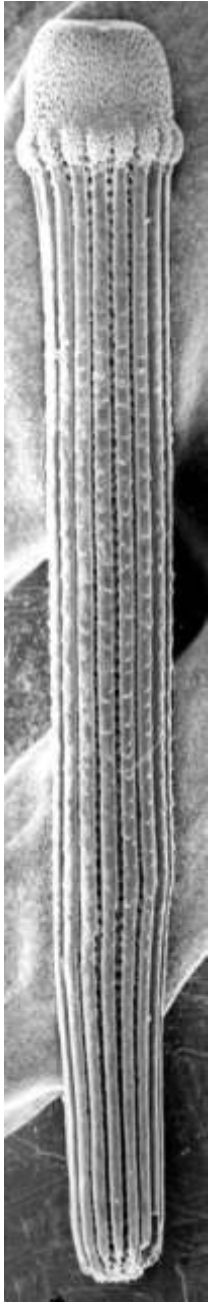
**Volunteers please!**



## We Need a LOGO!

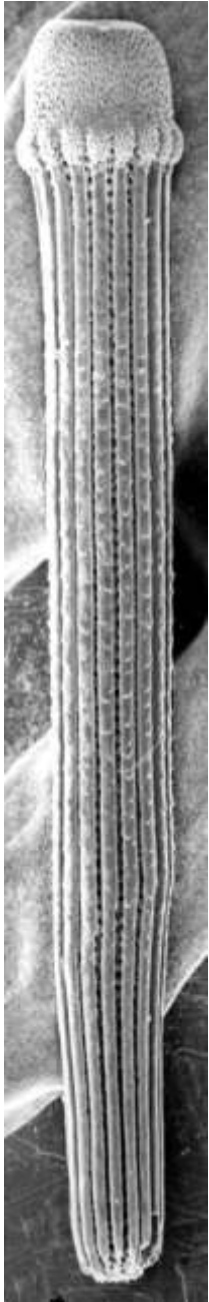
- Competition
- Winner gets £100 Amazon Voucher

Please submit to [crystals@leeds.ac.uk](mailto:crystals@leeds.ac.uk) by March 11th





# Website





UNIVERSITY OF LEEDS

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**Prof Fiona Meldrum**  
Director

**Useful links**

- ▶ [Faculty of Biological Sciences](#)
- ▶ [School of Chemistry](#)
- ▶ [Leeds Dental Institute](#)
- ▶ [School of Earth and Environment](#)
- ▶ [School of Mechanical Engineering](#)
- ▶ [School of Physics and Astronomy](#)
- ▶ [School of Process, Environmental and Materials Engineering \(SPEME\)](#)

## Crystallization

The Leeds Centre for Crystallization is a newly-established centre for crystallization studies and provides a focus for fundamental and applied research in the field of crystallization at the University of Leeds.

It brings together researchers from across the university, spanning disciplines ranging from engineering to earth sciences, chemistry to physics, and biology to medicine, and thereby facilitates significant cross department and faculty collaboration.

Crystallization is a hugely important topic that lies at the heart of technological processes and natural phenomena as diverse and significant as the production of pharmaceuticals, nanomaterials and biomaterials, bone and teeth formation and regeneration, the precipitation of ice in the atmosphere and the prevention of scale deposition. Understanding of crystal nucleation and growth processes is therefore essential.



**Positions currently available**

Positions are available for both PhD students and Postdoctoral researchers across the Leeds Centre for Crystallization.

[Learn more >](#)

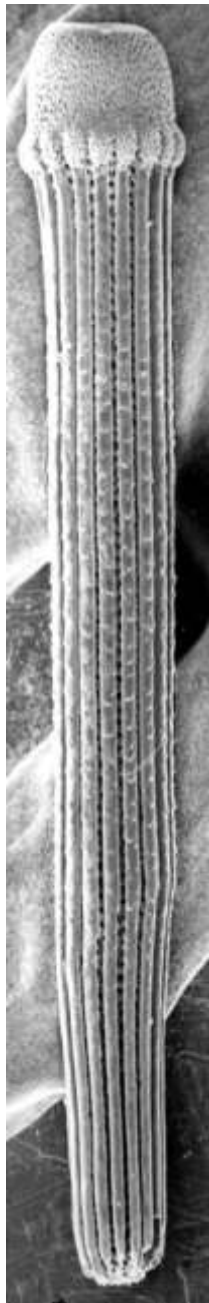
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**February 2013**  
Internal launch meeting with opportunity for researchers to introduce themselves and their research, and to discuss collaborative projects.

<http://crystals.leeds.ac.uk>





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## Research



The Leeds Centre for Crystallization brings together researchers from across the University of Leeds who work on many aspects of crystallization.

### Main research areas

#### Bio-inspired crystallization

(Christenson, Kirkham, Meldrum, Neville, Staniland)

#### Biomaterials

(Kirkham, Wood)

#### Biominerization

(Kirkham, Meldrum, Staniland, Peacock)

#### Characterization

(Brydson, Lloyd, Pearson, Scott)

#### Crystal Engineering and Porous Materials

(Halcrow, Hardie)

#### Crystallization in the Atmosphere

(Murray, Scott)

#### Crystallization in the Food Industry

(Povey)

#### Fundamental Nucleation Studies

(Auer, Borissova, Christenson, Povey, Peacock)

#### Geochemistry

(Benning, Morgan, Peacock)

#### Nanomaterials

(Brown, Brydson, Halcrow, Povey, Staniland, Wood)

#### Pharmaceuticals and Fine Chemicals

(Blacker, Borissova, Roberts)

#### Porous Solids

(Halcrow, Hardie)

#### Protein Crystallization

(Muench, Pearson, Wright)

#### Scale deposition and inhibition

(Borissova, Kapur, Neville, Peacock)

#### Scale up and Process Control

(Blacker, Müller)

#### Simulations of Crystallization and Nucleation

(Auer, Borissova, Hammond, Harris, Scott)

#### Solid state materials

(Bell, Halcrow, Lloyd, Staniland)

#### Thermodynamics and Kinetics of Crystallization

(Borissova)



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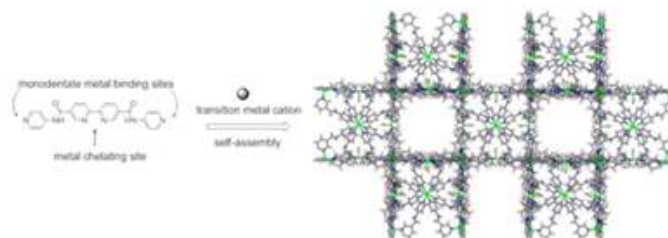
## Crystal Engineering and Porous Materials

Crystal engineering is the design and synthesis of well ordered solid state materials from molecular or ionic components using intermolecular interactions.

The ultimate aim is to control the orientation of molecules as they form a crystal lattice in order to control properties and function of the material.

Crystal engineering relies on a knowledge and understanding of how supramolecular and other relatively labile interactions can be manipulated to produce materials with desired properties. Hydrogen bonding,  $\pi$ - $\pi$  stacking, halogen bonding and metal-ligand coordination are the most commonly used interactions. Molecular or ionic building blocks are termed tectons, and these are designed to self-assemble into a crystalline material with a desired structure. Coordination polymers, for example, use the stereochemical preferences of transition metals combined with multifunctional organic ligands to generate materials with polymeric 1D, 2D or 3D structures.

Crystal engineering principles are also being used to investigate and understand polymorphism.



A number of different functionalities or applications can be targeted through crystal engineering. These include applications where control over the orientation of molecular components is crucial such as in non-linear optics, applications where having an ordered array of metal cations is important such as in magnetic materials including spin crossover materials as switching devices, and polymorphism in pharmaceuticals. However, the area that has received most attention is using crystal engineering to create new types of porous materials. 3D coordination polymers with scaffolding-like structures that contain pores and channels, and where the network does not collapse on de-solvation are often termed metal-organic frameworks (MOFs).

### In this section

- > [More research](#)
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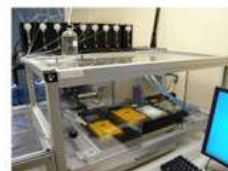
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## Equipment



Cohen Instrument Laboratory



Crystallization Robot



Leeds Electron Microscopy and Spectroscopy (LEMAS)



Scanning Probe Microscopy (LENNF)



Infrared and Raman Microscopy



Institute of Process Research and Development (IPRD)

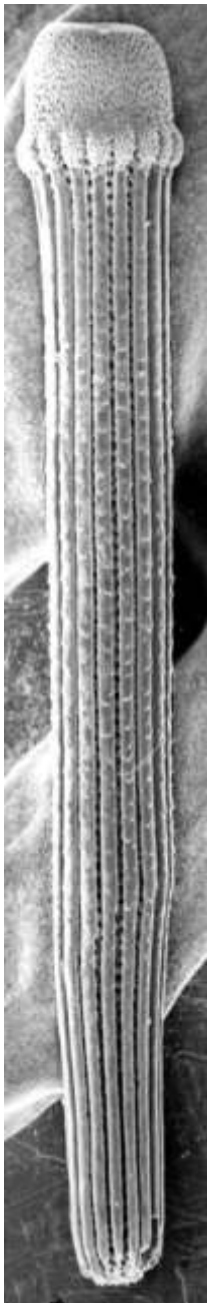


Scanning Acoustic Microscopy/Ultrasound Spectroscopy/Thermal Analysis



X-Ray Diffraction





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Fiona Meldrum (Chemistry)

### Deputy Director

Liane Benning (Earth Sciences)

### Organizer of Seminar Series

Hugo Christenson (Physics)

### Dental School

Jennifer Kirkham

### SPEME

Kevin Roberts

Rik Brydson

### Mechanical Engineering

Anne Neville

### Biological Sciences

Anwen Pearson

## Researcher profiles



### Dr Stefan Auer

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Personal webpage: [www.cmns.leeds.ac.uk/SA/](http://www.cmns.leeds.ac.uk/SA/)

My research is focused on the application of theoretical computational tools developed in soft condensed matter physics to investigate the phase behaviour and transitions of complex systems of biomolecules. Examples of transitions that I investigated include colloidal crystallization and the aggregation of proteins into amyloid fibrils. My long term goal is to understand more generally the nucleation and regulation of normal and aberrant self-assembly in biological systems, and how we can functionalise them as nanomaterials.

**Research areas:** Fundamental Nucleation Studies, Simulations of Crystallization and Nucleation



### Professor Andrew Bell

Head of the School of Process, Environmental and Materials Engineering  
Professor of Electronic Materials, Institute for Materials Research

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[a.j.bell@leeds.ac.uk](mailto:a.j.bell@leeds.ac.uk)

The Functional Materials Group within the Institute for Materials Research in SPEME focuses on the exploitation of perovskite and related structure oxides for industrial applications. As such the controlled crystallization of the oxides in ceramics, thin films and single crystals is at the core of our processes, with applied research being based on optimization of functional properties through the control of crystal morphology, orientation, and



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## Positions available

Positions are available for both PhD students and Postdoctoral researchers across the Leeds Centre for Crystallization.

### PhD students

PhD studentships are available for talented individuals to work in all areas of research related to crystallization. We aim to recruit outstanding research students and to train them to internationally competitive standards. The Leeds Centre for Crystallization provides an environment which unites academic staff working in interdisciplinary research areas relevant to crystallization across different faculties and departments at the University of Leeds. Research projects are led by internationally-leading researchers in purpose-built research laboratories which provide access to state-of-the-art equipment and facilities.

PhD students receive both training-through-research and generic skills training offered through a programme of taught courses. Research training is provided within the framework of the individual project, supported by tuition in areas such as scientific writing, the use of IT, and safety regulations. All students also take part in a programme of generic skills training either locally or via the University's Staff and Departmental Developmental Unit (SDDU). This provides training in areas including Information Skills, Research Methodology, Ethics, Communication and Writing Skills, Interpersonal Skills and Personal Effectiveness. All PhD students will also have the opportunity to present their work at national and international conferences.

### Positions available

A wide range of positions are available with academic staff from across the University. Some of these may be fully sponsored by industry, while CASE awards provide joint funding from research councils and industry. These projects typically focus on a specific industrial project, and may incorporate a period spent with the industrial supervisor. Some PhD studentships are also available which are funded by research councils, the European Union or by research charities.

A range of available PhD studentships are advertised here. Please also contact individual supervisors for more information.

- ▶ [Chemical records of early Earth evolution: Trace-element scavenging by iron minerals in banded iron formations](#)
- ▶ [Computer modeling of normal and aberrant self-assembly in biological systems](#)
- ▶ [Controlled fabrication of magnetic nanoparticle arrays using nanopatterned templating biomineralisation proteins](#)

