EPSRC The Engineering and Physical Sciences Research Council

Issue 24

newsline

Research & prosper

WEALTH SPECIAL REPORT

Can science make sense of volatile markets?

Retail refits: How to keep customers moving

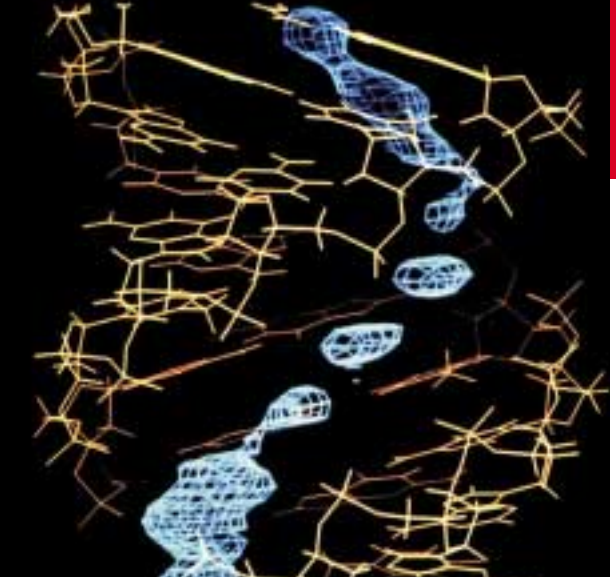
Why e-commerce needs personalised systems

Outward sound

Listening to how noise travels

Rock vs microwave

Discover the art of breaking up



A fresh perspective on biological macromolecules: Here the water around A-DNA is revealed using neutron diffraction (Trevor Forsyth – ILL, Grenoble).

EPSRC-funded projects at the Grenoble ILL/EMBL Deuteration Laboratory open up a new 'window' on biological structures.

Macromolecules: The Bigger Picture

Work about to start in the UK and at the Institut Laue Langevin in Grenoble will lead to a better understanding of the structure of biological macromolecules in fibres, crystals and solutions. A consortium led by Professor Watson Fuller and Dr Trevor Forsyth (Keele University) aims to use neutron scattering techniques, complemented by a solid state NMR programme coordinated by Professor Tony Watts (Oxford University), to study a range of biomolecular structures. The programme, driven by UK project activity involving the universities of Cambridge, Glasgow, Keele, King's College London, Oxford, Portsmouth and Southampton, and staff at the ILL and the EMBL, has a key aim of developing the UK user base for these techniques.

With x-ray diffraction, it is often difficult to obtain complete 'images' of biological structures – for example, key information on the location of water and hydrogen atoms is often missing. One solution is to use neutrons. "X-rays are scattered by the electrons around a nucleus," Professor Fuller explains, "but if you are using neutrons, scattering is by the nucleus, giving you a different 'view.'" Neutrons have been particularly successful in locating water around macromolecules and deuterium labelling, in which hydrogen atoms attached to carbons are replaced by deuterium, can dramatically extend this by giving crucial information about the biological macromolecules themselves. The Deuteration Laboratory (headed by Dr M Haertlein) will be installed in a specially designed building on the ESRF/EMBL/ILL joint site that hosts the 'Partnership for Structural Biology'.

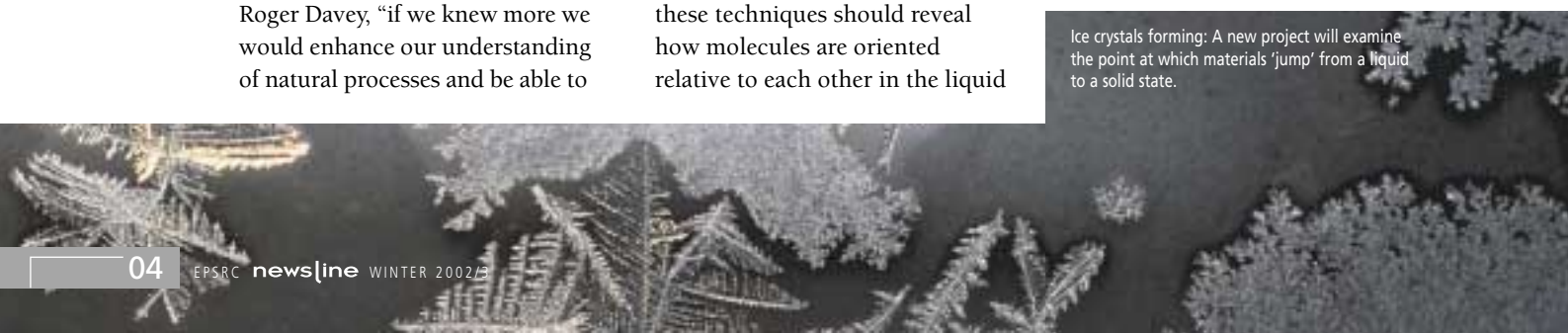
Contact: Dr Forsyth at tforsyth@ill.fr or Professor Fuller at w.fuller@keele.ac.uk Researchers interested in gaining access to the facilities (which is by peer review) should contact Dr Haertlein haertlein@ill.fr

Crystal Clear

Imagine a world without snow, rocks and teeth and you get some idea of how strange our lives would be without crystalline materials. Yet the processes that control how a material changes from a liquid like water into a solid like a crystal of ice are poorly understood. "Both scientists and technologists would like to know more about the point where materials make the 'jump' from liquid to solid," says EPSRC Senior Research Fellow Professor Roger Davey, "if we knew more we would enhance our understanding of natural processes and be able to exert sophisticated control over the process of nucleation enabling us, for example, to create new products."

In a new project Professor Davey (UMIST) and Professor John Finney (UCL) will attempt to discover how nucleation occurs in fluids at the molecular level. "For solids we traditionally study this process with crystallography," says Professor Davey, "now we are entering an era where the equivalent experiment can be performed for solutions using neutron scattering and structure refinement methodologies." Using these techniques should reveal how molecules are oriented relative to each other in the liquid solution and what changes must then occur to form the related crystalline solid. It is also hoped that computer models of the kinetic 'movements' of these molecules during nucleation can begin to be built. Plenty of challenging experimental and theoretical work lies ahead: "If, for two or three systems, we end up with a full molecular scale description of the supersaturated state I will be very happy," says Professor Davey.

Contact: Professor Roger Davey r.j.davey@umist.ac.uk



Ice crystals forming: A new project will examine the point at which materials 'jump' from a liquid to a solid state.