

# Soft Matter World Newsletter

April | 2011 | Issue 28

Dear Soft Matter Colleagues,

This month we report on the current events related to the earthquake disaster in Japan and how you can help your fellow global research network members affected. The Spring 2011 Noticeboard Bulletin is available for download.



## Complex Matter Physics - The Itai Cohen Group

Cornell University, Department of Physics

The Cohen Complex Matter group is based out of Cornell University, New York and is led by Prof. Itai Cohen. The group investigates the incorporation of structure into fluids at various length scales and the subsequent effect this has on their macroscopic flow properties.

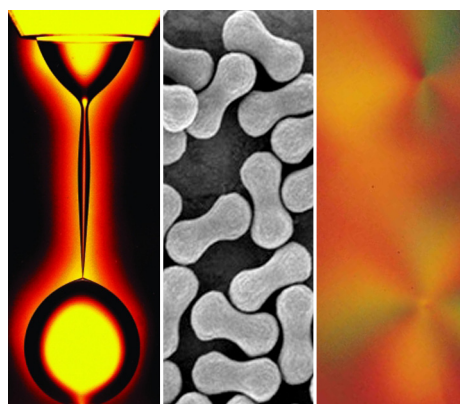
The three primary length scales involved are;

- Colloidal suspensions
- Biological tissues
- Fluid-membrane interfaces

Learning the design principles on each of these length scales will lead to fabrication of hybrid materials sensitive to combinations of stimuli and flow configurations. These novel materials will be used to engineer the next generation of products ranging from car seat cushions to lubricants to biological implants.

The research topics the group investigates range from flows in gels and pastes, to tissue mechanics and even animal movement. Some of the most recent publications and research projects include;

**Defect Transport in Crystals of Colloidal Peanuts:** Hollow, fluores-



▲ (left) Photograph of water drop. (center) Scanning Electron Microscope image of monodispersed hematite colloids. (right) Image of liquid crystal which was featured on March 2010 issue of Soft Matter

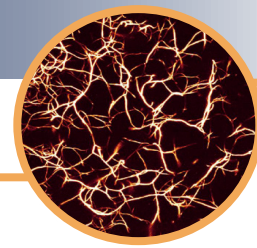
cent, peanut-shaped silica particles made up of spherical lobes are pipetted into sealed cells which accommodate a monolayer and are then observed using a confocal microscope. The particles form "Degenerate Crystals" – an ordered phase which is structurally reminiscent of close-packed spheres however display distinctly different dynamics.

**Novel Methods to measure shear Mechanical Properties of Human Articular Cartilage:** A large emphasis is placed on formulating methods which can increase

the accuracy of tissue deformation measurements. One of the methods involves photobleaching grid lines onto images of fluorescently-stained biological tissue using a high-intensity laser, and is referred to as grid-resolution automated tissue elastography (GRATE). Prof. Cohen's group is also responsible for creating a confocal microscopy stage known as a Tissue Deformation Imaging Stage (TDIS). The stage allows simultaneous imaging of the 3-D structure of a fluorescent material such as a colloidal suspension or biopolymer network while measuring the amount of force necessary to shear the material. The group collaborated with [Harrick Scientific](#) to develop a commercial version of the stage and is now available for purchase.

Prof. Cohen's research can be seen on the cover of quite a few scientific journals, and has even been mentioned in *Wired Magazine*.

You can read more about the group at the [website](#). There are a wide variety of resources including fascinating videos of their research.



## Academic community reaches out to displaced Japanese scientists

On March 11, 2011 a 9.0 magnitude earthquake struck northeastern Japan causing catastrophic damage. As of March 25th 10,000 have been confirmed dead and 17,000 remain missing.<sup>1</sup> The earthquake has crippled the infrastructure of Japan's top universities and research institutions. Among these is [Tohoku University](#) who furthermore, is a member of Soft Matter World's Global Network.

Some of the other research facilities that have been affected include the Japan Proton Accelerator Research Complex (J-PARC) and the Photon Factory synchrotron at The High-Energy Accelerator Research Organization in Tsukuba.<sup>2</sup>

Many universities throughout the worldwide academic community have responded by arranging for housing and temporary exchange programs for many of Japan's "refugee-scientists". The [Nippon Science Support Network](#) is a platform for coordinating immediate relief efforts via existing scientific networks between Germany and Japan. The organizers have established a database for dedicated funding resources, exchange schemes and open positions for visiting students and research fellows from Japan. Although the website is based out of Germany, positions and contributions are open to any country. Visit the [website](#) to upload



a potential accommodation for a fellow researcher.

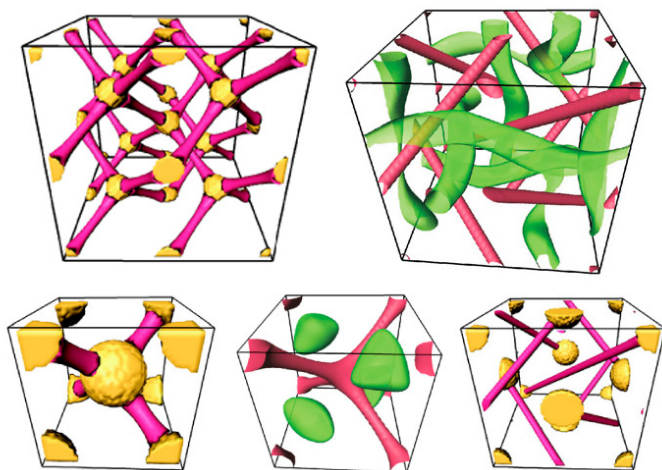
Other organizations in which you can make donations and contributions include;

- [Japanese Red Cross](#)
- [International Medical Corps](#)
- [Unicef](#)
- [Save the Children](#)

1. Ryall, Julian. (2011, March 25). Japan Earthquake: death toll passes 10,000. *The Telegraph*. Retrieved from <http://www.telegraph.co.uk>  
2. Ichiko, Fuyuno. (2011, March 21). *Nature* 471, 420 (2011). Retrieved from <http://www.nature.com> | doi:10.1038/471420a

## Three-dimensional colloidal crystals in LC blue phases

Miha Ravnik, Gareth P. Alexander, Julia M. Yeomans, and Slobodan Zumer. *PNAS Early Edition*. doi: 10.1073/pnas.1015831108



▲ Models of Blue phase colloids created with a mean field Landau de Gennes approach. (left) Three dimensional blue phase colloidal crystal in its most energetically favorable state. (right) A local free energy density profile of a blue phase colloidal crystal.

The major limitation of self-assembly approaches to building 3D photonic materials is the difficulty of scaling the materials up from the nanoscale to the device dimensions. This is largely due the fact that these approaches typically rely on the manipulation of particles by van der Waals or screened electrostatic forces and the manipulation proceeds either under ultra high vacuum conditions or in water dispersions.

The authors report on a new method to achieve self assembled photonic materials based on colloidal particles in a liquid crystal (LC) matrix.

They show, by means of computer modeling, that colloidal particles can self-assemble into stable, 3D, periodic structures in blue phase LCs. More specifically, Specifically, face-centered cubic colloidal crystals form in type-I blue phases, whereas body-centered crystals form in type-II blue phases. Moreover, the colloidal particles substantially increase the thermal stability range of the blue phases, for a factor of two and more.

To read more visit the article at the [PNAS website](#).



## 6th International Liquid Crystal Elastomer Conference

The 6th International Liquid Crystal Elastomer Conference which will be held, 5th-7th September 2011 at the Rectorate of the New University of Lisbon, in Lisbon, Portugal.

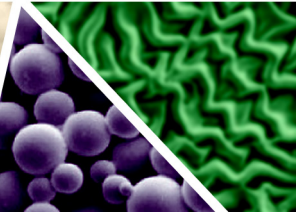
Following the tradition of the previous meetings the conference will bring together physicists, chemists, and engineers active in the field of liquid crystal elastomers. Experimental, theoretical, and-technical issues will be discussed through

talks (invited and contributed) as well as poster presentations.

Presentations will be delivered under the following main topics;

- Biomaterials
- Nanomaterials
- New Materials
- Response and Applications
- Response & Characterization
- Theory and Modeling

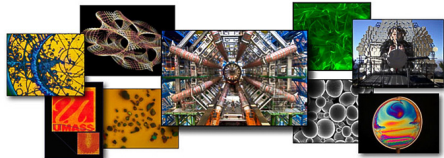
To read more visit the [website](#).



▲ The ILCEC will take place in Lisbon, Portugal this September.



UMASS Summer School  
Soft Solids and  
Complex Fluids 2011



The Annual UMass Amherst Summer School, Soft Solids and Complex Fluids, is being held from Sunday May 29th, to Thursday June 2th, 2011.

## UMass Summer School: Soft Solids and Complex Fluids 2011

The School is aimed at graduate students in soft matter who are early in their career in a research group. The lecturers will anticipate that participants have a standard background in graduate classical and quantum mechanics, electromagnetism, statistical mechanics and the associated mathematical methods.

The courses offered are as fol-

lows;

- Microfluidics - [Todd Squires](#)
- Intermolecular forces - [Adrian Parsegian](#)
- Active Matter - [Cristina Marchetti](#)
- Elasticity - [Benoit Roman](#)

To register visit the [webpage](#).

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Linda S. Hirst and Adam Ossowski

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