



NOVEMBER 2014
ISSUE #69

Dear Soft Matter Colleagues,

This month we have several things to share with the soft matter community. Firstly we would like to welcome Mike Facio to our team. Mike is a new UC Merced undergraduate writing intern and a biochemistry major. He will be working with us throughout the year on writing projects. We are also pleased to announce two workshops this year - ideal for graduate and postdoc students, a liquid crystal focused program in the UK this winter and a colloid school in Italy next summer.

A METHOD FOR BUILDING SELF-FOLDING MACHINES

Self-assembling mechanisms are incredibly beneficial as they create efficiencies in logistics, manufacturing and other applications. Recently, newer methods have improved these advantages by introducing a simple bimorph actuator to create a self-folding robot using a soft material found commonly in plastic cups. Felton and his team at Harvard University in collaboration with the Massachusetts Institute of Technology demonstrate this actuator, including a stretched form of the common polymer Polystyrene, through "origami robots." This medium

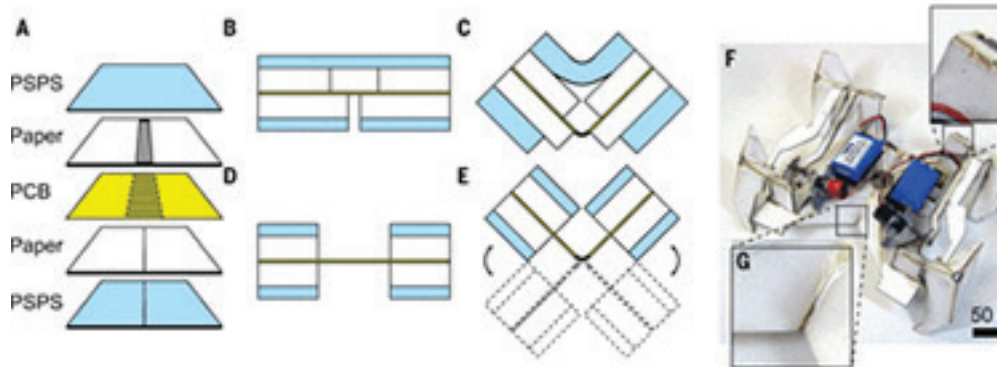
has shown potential as an effective soft material in shape memory composites that is malleable but yet sturdy enough to support itself and the robot. The actuator allows for a paper origami type folding mechanism that can be less bulky than typical mechanisms. These actuators simultaneously self-assemble the robot parts from a flat shape to a completely three-dimensional shape to produce the same effect as any self-assembling operation in a more energy efficient manner.

In order to perform the complex folds carried out by this robot, a shape memory composite was made out of two outer contractile layers of stretched Polystyrene (PSPS), two layers of paper substrate, and a polyimide bearing copper circuit (PBC). In essence, this

layering results in a bimorph actuator (Figure 1). When a current is passed through the PBC, it heats the contractile layer to approximately 100, exerting a tension on the substrate, causing a complex fold. In operation, the tension of one layer of the PSPS contracts, while the other expands, causing a bending displacement.

The group attempted to build three different robots. Out of the three, one had the capability to move about only using its folds for three dimensional transformation and movement. The results offer potential hinge and composite layering designs that can be manipulated and improved to suit the needs of a specific self-assembly process. Sam Felton and his team have demonstrated that the new technology can be applied in future remote autonomous assembly in logistics, for example, being able to transport a large number of flat products that would assemble themselves at arrival and manufacturing through inexpensive planar fabrication techniques.

The full article can be found [here](#) where you can also watch a video of the robot in action.



► Fig 1: A bimorph actuator formed by a combination of (A) two outer stretched polystyrene layers (PSPS), two inner paper substrate layers, and a polyimide bearing copper circuit (PBC). (B) The cuts in the paper and PSPS layers allow for simultaneous contraction and expansion of the fold shown in (C). The fold uses an active hinge designed to move freely and repeatedly (D,E). The examples are seen on the actual robot (F,G,H).

- Mike Facio

ENRICO FERMI SUMMER SCHOOL - SOFT MATTER SELF-ASSEMBLY

June 28-July 7, 2015 at the International School of Physics "Enrico Fermi" in Varenna, Italy

This summer the International School of Physics at Varenna, Italy will host a 10 day summer school on soft matter assembly. This summer school will focus on the latest topics in the physics of colloids through nine mini-courses and four seminars.

Some travel bursaries will be available and the organizers hope to attract graduate student and postdoctoral participants from around the world.

To learn more about the school and to apply, visit the website of the International School of Physics "Enrico Fermi" at http://www.sif.it/attivita/scuola_fermi

You can also learn more about the school <https://sites.google.com/site/softmatterselfassemblyvarenna/>

Confirmed instructors for their five-lecture minicourses and topics will be:

- 1. Colloids with directional bonding (David Pine, NYU)
- 2. Pathways to self-organization (Christoph Dellago, Vienna)
- 3. Particles at interfaces (Kathleen Stebe, Upenn)
- 4. Self-assembly hydrodynamics (Julia Yeomans, Oxford)
- 5. Driven self-assembly (Peter Schurtenberger, Lund)
- 6. Polymer structure and dynamics (Michael Rubinstein, N. Carolina)
- 7. Liquid-crystal colloid dispersions (Randall Kamien, Upenn)
- 8. DNA-based self-assembly (Oleg Gang, Brookhaven)
- 9. Self-organizing nanosystems (Willem Kegels, Utrecht)
- Varenna, June 28 - July 7 2015



In addition to the minicourses students will also be able to attend specialized seminars from several speakers. For further enquiries you can email the organizers at softmatterselfassembly@gmail.com

LIQUID CRYSTAL WINTER WORKSHOP

Hull University, UK Jan 5-7th 2014

This year's BLCS Winter Workshop will again be held at The University of Hull (Department of Chemistry) in the UK. The program will cover three days (Jan 5th-7th) and will include both a general introduction to liquid crystals plus a wide range of 'Liquid Crystal' topics and substantial practical sessions.



An EPSRC grant means that the Workshop is free of charge for all research students registered with a UK university, otherwise the cost is £140- for academics and £240-for industrialists, great value for money.

The research field of Liquid Crystals is very much interdisciplinary, and involves Chemistry, Physics, Mathematics, Biology, Computation, Engineering, and even Art and Fashion! The Workshop reflects this interdisciplinary nature, and is particularly designed to introduce the many important scientific aspects of liquid crystals to new entrants, including students, research fellows and staff. The Workshop will include tuition by experts of international repute. Some of the time will be devoted to giving a 'hands-on' experience of the various techniques involved in the design, synthesis and characterisation of liquid crystals. Course notes are also provided.

Accommodation and meals are included in the cost of the Workshop.

Follow this link for a pdf with more details on how to apply and full program details including a list of the tutorial classes and registration form.

You can also contact Prof Mike Hird at Hull University for more details - M.Hird@hull.ac.uk





GSOFT - CALL OR NOMINEES - EARLY CAREER PRIZE

The American Physical Society Topical Group on Soft Matter (GSOFT) is delighted to announce a new Early Career Award for Soft Matter Research. This Unit Award aims to recognize outstanding and sustained contributions by a young researcher to the field of Soft Matter during his or her initial period of full time employment (12 years after the PhD, allowing for breaks). The award provides \$5000 and the cost of travel to the March meeting of the APS (March 2-6, 2015), and is generously sponsored by Solvay.

More information and nomination details can be found at <http://www.aps.org/units/gsoft/awards/early-career.cfm>

The nomination deadline this year is 1 December 2014, to enable the award winner to give an Invited Talk at the APS March Meeting 2015.

APS is diverse global organization and so nominations of underrepresented groups and scientists from outside the United States are especially encouraged.

FACULTY POSITIONS

Is your school hiring in soft matter? Target hundreds of potential applicants by sending your job advertisement to us and we will post it for free!

submissions to the editor at editor@softmatterworld.org

2015 CALENDAR COMPETITION - CALL FOR IMAGES

This year's calendar competition is underway! Each year we take submissions for our amazing softmatter calendar, where "soft matter meets art". We are looking for images that represent the beauty of soft matter - you can visit the gallery at SoftMatterWorld for some inspiration and see winning images from the past two years.

If you think you have an exciting image to share with the community, send it in to us at editor@softmatterworld.org

Images should be high quality (300dpi) and of a suitable size to use in the calendar - send your submissions in by Nov 30th at the latest.



THANKS FOR READING

LINDA HIRST AND THE SOFTMATTERWORLD TEAM

