Soft Matter World Newsletter

August | 2011 | Issue 32

Dear Soft Matter colleagues,

Welcome to our August newsletter. This month we are proud to feature IHRS Biosoft, a leading soft matter research network, and highlight an exciting new paper from the Jožef Stephan Institute in Ljubljana by Uros Tkalec and his colleagues. We have recently changed our email provider to ensure our newsletter reaches all of our recipients. Read more about the new emails on page 3. Thank you for reading and have a phenomenal August.

IHRS Biosoft
Spearheading Soft Matter Science

The International Helmholtz Research School on Biophysics and Soft Matter is a vast interdisciplinary collaboration investigating fields encompassing physics, biology and chemistry. Based out of Jülich Research Centre, the core of BioSoft is composed of three universities and thirteen research groups. The larger Helmholtz Research Association spans fifteen scientific-technical and biological-medical research centers, placing BioSoft in one of the world's richest scientific networks.

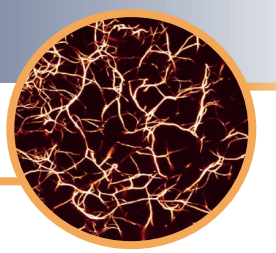
The groups that form BioSoft are extremely diverse. Those focusing on soft matter are:

- Professor Jan Dhont at the Soft Matter Institute at Jülich Research Centre, whose group aims to understand macroscopic, non- equilibrium phenomena in colloidal dispersions, polymer solutions and at interfaces on a microscopic basis as well as dynamics, microstructural order and phase behavior in suspensions and at interfaces in equilibrium.
- The theoretical soft-matter and biophysics group under the direction of professor Gerhard Gompper investigates membrane proteins, transport, polymers, membranes, hydrodynamic simulation, colloids and amphiphiles. We would also like to particularly thank this group and Dr. Thorsten Auth, IHRS Biosoft coordinator for their contributions to Soft Matter World.

International Helmholtz Research School on Biophysics and Soft Matter

Bridging the gap between disciplines makes soft matter science possible. Links throughout the group website connect to various departments in universities and research centers throughout Europe.

Read more about the groups and research opportunities at the BioSoft website.



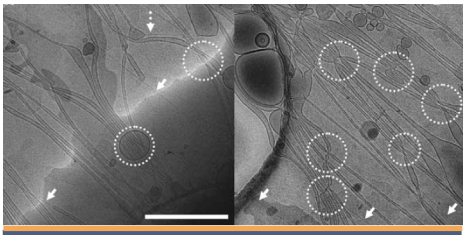
Block liposome and nanotube formation

A. Zidovska, K. Ewert, J. Quispe, B. Carragher, C. Potter and C. Safinya. Soft Matter. Royal Society of Chemistry. May, 2011. DOI: 10.1039/c1sm05481c

Block liposomes are a new class of liposomes characterized by linked shapes of vesicles and micelles. Researchers at UC Santa Barbara and the Scripps Research Institute demonstrate the spontaneous formation of these structures when polar lipids interact. The lipids DOPC or DOTAP were mixed with polar lipids MVL3, MVL5 or MVLBG2 and their resulting assemblies visualized with cryo- TEM.

Observing samples of block liposomes in-vitro yielded fascinating images of liposomes and their connecting nanostructures. Varying the ratio of polar to non-polar lipid, type of lipid and pH yielded variations in rigidity and ability to form nanostructures. Polar lipids capable of forming micelles are capable of forming long nanotubes. Solutions with different ratios of polar to nonpolar lipids formed nanorods (cylindrical micelles) of different rigidities. The more charged the lipid, the more rigid the nanotube.

These experiments showed nanotube formation can be explained by considering the physical interactions between the polar and nonpolar lipids. Rigidity, type and length of nanostructure is related to charge, concentration ratio and the composition of the lipids themselves. These findings will help to develop theory and understanding of lipid systems and is fundamental to the full understanding of the shape evolution of liposome systems.

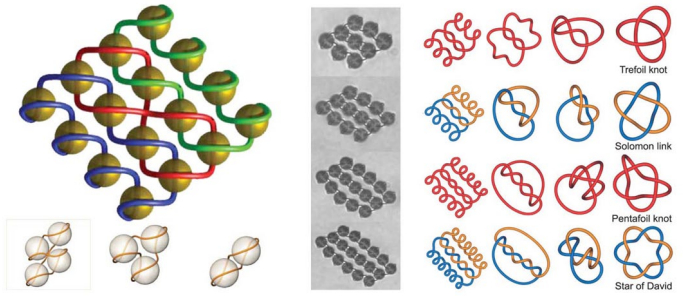


Cryo-TEM images of MVL5/DOPC BLs. Pronounced bundling can be observed. White dotted circles highlight areas where nanotubes cross or an entanglement of the nanotubes occurs at quite large length scales. White solid arrows point to nanorods. Scale bar, 500 nm.

To read more visit RSC Publishing.

Reconfigurable Knots and Links in Chiral Nematic Colloids

U Tkalec,M. Ravnik, S. Copar, S. Zumer and I. Muševic. Science. AAAS Publishing. July 1, 2011. DOI: 10.1126/science.1205705



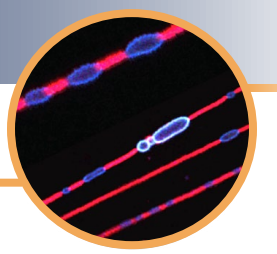
A series of alternating torus knots and links on 3 × q particle arrays are knitted by the laser-induced defect fusion. The defect lines are schematically redrawn by using a program for representing knots to show the relaxation mapping from the initial planar projection to the final knot diagram.

In the nucleus, DNA is knotted. Control of DNA entanglement is key for replication, transcription and recombination. Researchers from Oxford and Ljubljana investigate laser tweezers as a means to manipulate and control the size and shape of knots in a chiral nematic liquid crystal (NLC) colloid. The technique enables the arbitrary induction of topological features as small as twenty microns.

Silica spheres, 4.72 μm in diameter are introduced into pentylcyanobiphenyl [5CB] NLC. The liquid crystal conforms to the sphere, twisting and forming a ring. Such defects, or knotting, in nematic liquid crystals are necessary for stabilizing the phase. By artificially inducing a defect and manipulating the defect with light, knitting micron sized knots is possible. Aligning several spheres and fusing the defect rings together forms a twisted micro-mesh that can be manipulated into knots by knitting the spheres and fusing or breaking rings. Micro-knots can be tied, untied and retied by virtue of laser tweezers. Tailoring knots to order is proved possible through computer modeling of polynomial invariants, tangle specification and array size.

This soft matter system provides insight into the behavior of tangled macromolecules, such as DNA, skyrmion lattices in chiral magnets, confined blue phases, and entangled vortices in superconductors.

To read more visit ScienceMag.org to see the article and additional editorial features in Science and Scientific American.



Soft Matter World Contacts Update

Soft Matter World will no longer be using the editor.softmatterworld@gmail.com email. We have updated our email services and will now be using the following emails:

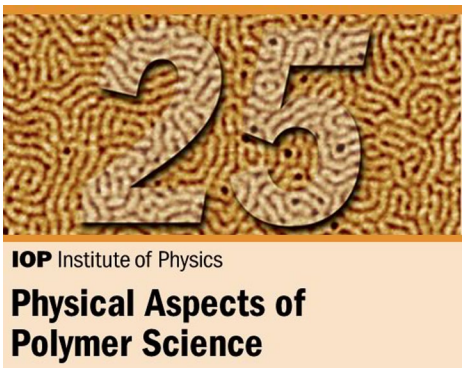
- editor@softmatterworld.org
- webmaster@softmatterworld.org

New email accounts

editor@softmatterworld.org
webmaster@softmatterworld.org

IOP Polymer Physics Presents: Physical Aspects of Polymer Science

Physical Aspects of Polymer Science is organized by the Institute of Physics (IOP), Polymer Physics Group (LINK) and will be held on the 12-14 of September at the University of Surrey. This is the 25th biennial meeting of the IOP Polymer Physics Group. The scope of the meeting covers all physical aspects of polymers. The program will include the Founders' lecture, the Best Student Paper Prize Lecture, and the APS DPoly Exchange Lecture.



A highlight of the meeting will be a lecture by the winner of the PPG Founders' Prize, Professor Tom McLeish (University of Durham). Complementing the program of contributed lectures, there will be presentations from four invited speakers.

The American Physical Society (APS) Division of Polymer Physics (DPOLY) has awarded an exchange lectureship to Dr Bradley Olsen of the Massachusetts Institute of Technology (MIT), and so he will be also contributing to the program.

Student presentations, both oral and poster, will make an important and valued contribution to the meeting. A prize will be presented at the meeting for the best student publication, and the prize winner will present a lecture.

The early registration deadline is August 12th. The fees for the meeting will be kept low because of generous sponsorship from several sponsors.

To read more or register visit the conference website.

We hope you enjoy browsing softmatterworld.org and come back soon

Linda S. Hirst, Adam Ossowski and Dmitri Medvedko

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