In the News:

- Scouting careers in engineering
  [http://www.udel.edu/udaily/2013/mar/scouts-engineering-032113.html](http://www.udel.edu/udaily/2013/mar/scouts-engineering-032113.html)
- Before They Were Scientists: A Letter To My Younger Self
  [http://www.huffingtonpost.com/science-club-for-girls/before-they-were-scientists_b_2877982.html](http://www.huffingtonpost.com/science-club-for-girls/before-they-were-scientists_b_2877982.html)
- Congratulations to Peter Beltramo, who was selected to lecture in the Milliken Graduate Symposium!

Future Department Events:

- Thesis Defense
  Jung Min Kiim
  Tuesday, March 26, 2013
  3:00pm in 102CLB
  Abstract is attached

- Department Seminar
  Matthew Tirrell, University of Chicago
  Friday, April 5, 2013
  10:00am in 102CLB
  "Protein Analogous Micelles: Versatile, Modular Nanoparticles"

Other Department Events:

- ELEG Distinguished Lecture Series
  T.L. Koch, University of Arizona
  April 24, 2013
  3:30pm at the Roselle Center for the Arts, Gore Recital Hall
  “Photonic Integrated Circuits: Past, Present, and Future”

- MSEG Seminar
  Dr. Yao Lin
  Wednesday, March 27, 2013
  10:00am in 219 Brown Lab
  “SUPRAMOLECULAR POLYMERIZATIONS: INCORPORATING COOPERATIVITY INTO MACROMOLECULE AND MACROMOLECULAR ASSEMBLIES”

Jobs/Recruiting:

Available positions can be found on the Chemical & Biomolecular Engineering opportunity website ([http://www.che.udel.edu/biz/OppIndex.html](http://www.che.udel.edu/biz/OppIndex.html)), so be sure to check it regularly.
EFFECT OF THE RANGE OF ATTRACTIONS ON THE RHEOLOGY, MICROSTRUCTURE, AND THERMODYNAMICS OF THERMOREVERSIBLE GELS WITH ADHESIVE HARD-SPHERES INTERACTIONS

Jung Min Kim

Dispersions of short-range attractions exhibit a rich spectrum of phase behavior including gelation in the intermediate concentrations regime upon changing the interparticle potential or the volume fraction. Studying such systems help understand both the static and flow properties of various complex fluids that are currently processed in industry. In this dissertation, the effect of range of attractions on the dynamic arrest is studied by probing the static structures with a goal to understand the underlying mechanism of the interparticle aggregation. The study is extended by investigating structural anisotropy under steady state and LAOS deformations.

The dispersions are characterized with TEM, DLS, SANS, gravimetric densitometry, TGA, and rheometry for single-particle properties and gel transition temperature. The gel transition temperatures are defined by observing tan δ over several orders of frequency from frequency sweep measurements. The mechanism by which interparticle attractions arises is studied via AFM with a systematic change of temperature and/or medium.

The static microstructures of the dispersions are measured via SANS and USANS as a function of volume fraction, temperature, and particle size. The Baxter parameters at the gel temperatures are extracted by fitting the solution of the Ornstein-Zernike equation with a Percus-Yevick closure to the resultant structure factors. The reliability of the scheme is validated by performing an independent study using a thermodynamically self-consistent closure and the extended law of
corresponding states. The discrepancy in the location of the gel line is further studied in terms of the gravitational Péclet number, which compares the time scales between Brownian diffusion and sedimentation.

Finally, the micromechanics of structural anisotropy under steady state and LAOS deformations is studied with rheo- and tOr-SANS and analyzed in the framework of an alignment factor. The obtained alignment factors are used to create the structure-Lissajous curves, which links the transient microstructure to bulk flow behavior. A comparison between the results from steady state rheology and LAOS rheology also demonstrates a fundamental difference in the transient microstructure. Combining the findings can aid in rational design of nanomaterials and complex fluids.