# THE OCTAGON

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## *In This Issue:*



## *Meeting Announcement:*

### *785th LVACS Meeting:*
### *Muhlenberg College*

**Date: Wednesday, Feb 22nd**
**Reception:** 5:15 -6:00pm Hoffman House, N 23rd Street
**Dinner:** 6:00 pm
**Meeting:** 7:00 pm - 130 Trumbower lecture Hall
**Talk:** At the conclusion of the meeting 130Trumbower lecture Hall
**Menu:** Chicken breast with artichokes and rice, or Sesame beef with Asian vegetable stir fry, or vegetarian
**Cost:** $21 per member and guests ; $11 for students
**Contact:** Contact LuAnn Feist at 484-664-3266 or feist@muhlenberg.edu by noon Friday Feb 17th. Please give your name, affiliation, choice of entree and a phone number.
**Directions:** Directions and campus map on the web at: http://www.muhlenberg.edu/muhlinfo/directions.html

**Speaker:** Darrin J. Pochan
Department of Materials Science and Engineering and Delaware Biotechnology Institute, University of Delaware, 201 Dupont Hall, Newark, DE 19716
Dr. Pochan is an Associate Professor of Materials Science and Engineering, University of Delaware with a secondary appointment in the Department of Chemistry and Biochemistry. He also serves as Associate editor for North America, Soft Matter, Royal Society of Chemistry, Cambridge U.K. He received his Ph.D. in 1997 in Polymer Science and Engineering, University of Massachusetts, Amherst, Massachusetts under the direction of Prof. Sam Gido. He has received the
NSF Career award and DuPont Young Professor Grant. He has more than 30 peer reviewed publications and several patents.

**Talk: Construction of Nanostructures through Polypeptide Self-assembly**

**Abstract:** Bionanotechnology, the emerging field of using biomolecular and biotechnological tools for nanostructure or nanotecnology development, provides exceptional opportunity in the desing of new materials. Self-assembly of molecules into materials is an attractive materials construction strategy due to its simplicity in application. By considering peptidic or charged synthetic polymer molecules in the "bottom-up" materials self-assembly design process, one can take advantage of inherently biomolecular attributes; intramolecular folding events, secondary structure, and electrostatic interactions; in addition to more traditional self-assembling molecular attributes such as amphiphilicty, to define hierarchical material structure and consequent properties. Three molecular systems that utilize biomolecular attributes to define their self-assembly process will be discussed. 1) Diblock copolypeptides consisting of a hydrophilic, positively charged lysine block and a hydrophobic leucine (L) block were designed to self-assemble due to their amphiphilic nature. The defined helical secondary structure of the hydrophobic block forces these molecules to form a membraneous local nanostructure regardless of molecule length or assembly pathway. However, the hierarchical, microscale assembly process results in diverse materials ranging from rigid hydrogel, vesicle suspension, or hexagonal single crystal depending on the assembly pathway. The interplay of secondary structure and assembly pathway will be discussed. 2) Synthetic

triblock copolymers with charged corona blocks can be assembled in dilute solution containing multivalent organic counterions to produce biomimetic micelle structures such as toroids. These ring-like micelles are similar to the toroidal bundling of charged semiflexible biopolymers like DNA in the presence of multivalent counterions. Block copolymer micelle structure can be tuned between toroids, cylinders, and disks simply by using different concentrations or molecular volumes of organic counterion. 3) Design strategies based on small (less than 24 amino acids) beta-hairpin peptides will be discussed. Self-assembly of the peptides is predicated on an intramolecular folding event caused by desired solution properties. Importantly, the intramolecular folding event impart a molecular-level mechanism for environmental responsiveness at the material level (e.g. infinite change in viscosity of a solution to a gel with changes in pH, ionic strength, temperature).

Laser Scanning Confocal microscopy (LSCM), cryo transmission electron microscopy (cryoTEM), transmission electron microscopy (TEM), small and ultrasmall angle neutron scattering (SANS, USANS), and oscillatory rheology have all been used to characterize the nano-through-microstructure of the self-assembled systems.

### *LVACS to Showcase Undergraduate Chemistry Research*

Undergraduate Poster Session

Preceding the April LV-ACS meeting, 5:00-6:15 PM at Moravian College, Mid April

Entrants eligible for $250 Travel Award to support presentation of research at a national or regional ACS meeting

Tentative Abstract deadline:
Monday, April 3

Questions? Contact Carol Libby, cblibby@cs.moravian.edu

Details about participating in these events will be announced in the March Octagon and posted on the section website, **http://www.esu.edu/lvacs/** in mid-February.

### *2005-2006 Tentative Meeting Schedule*

March 30 - Albright College
April - Moravian (Student Poster session)
May - DeSales (H.S. Teacher's night)

### *LVACS Officers - 2006:*

**Chair:** T. Michelle Jones-Wilson
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**Chair Elect:** Paul Bouis
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**Councilor:** Pamela D. Kistler
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**Alternate-Councilor**s: Roger Egolf & T. Michelle Jones-Wilson (see above)

**Octagon Editor & Webmaster:**
T. Michelle Jones-Wilson (see above)

## *This Month in Chemical History - Part 1*

By Harold Goldwhite, California State Univ., Los Angeles
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Prepared for SCALACS, the Journal of the Southern California, Orange County, and San Gorgonio Sections of the American Chemical Society

In my (apparently insatiable) search for early chemistry texts I recently acquired "The Elements of Medical Chemistry" by John Ayrton Paris M.D., F.R.S., F.L.S., Fellow of the Royal College of Physicians of London. This leather-bound volume, published in New York in 1825, has a quotation from Joseph Priestley on its title page: "The objects of Science are so multiplied that it is high time to subdivide them. Thus the numerous branches of an overgrown family in the Patriarchal ages found it necessary to separate; and the convenience of the whole, and the strength and increase of each branch, were promoted by the separation." This I take to be the author's apologia for a narrowly focused work on Medical Chemistry, and he claims that his is the first work in English to be devoted to those aspects of chemistry most useful to the medical practitioner.

In classic fashion, and in place of the usual preface, we are given a 16 page dialogue "Between the Author [A] and a Practitioner [P] who is about to direct the Medical Studies of his Son." A few quotations will give the flavor of this exchange. "A: …I feel no small degree of diffidence in offering advice to a practitioner who has been nearly thirty years in the active exercise of the profession. P: …The truth is that for the last twenty years I have been so absorbed in medical practice, that I have neither found leisure nor inclination to inquire into the improvements of medical education…" "A: …I am by no means satisfied that our system of teaching has been improved. …among our Metropolitan lecturers, may be ranked some of the first philosophers of the age, but there are many competitors , some of whom…have introduced a system of "grinding" or "cramming" .. which allures pupils, from the assistance it affords them in passing an examination…" How little things have changed in 180 years!

The text is devoted to those aspects of chemistry that the author, in his many years of lecturing to medical students, has found to be most applicable to the practice of medicine. It covers in some 460 pages of small print, a wide range of topics including some, such as Gravitation and Cohesion, that would seem to be out of place in a modern course. But the author links these unlikely chemical topics to real chemical problems. Gravitation is really about weights and measures and includes a brief discussion of the difference between weight and mass. Under Cohesion the author treats of phenomena that depend on the state of subdivision of materials including pulverization, trituration, despumation (look it up!), and filtration.

I find very interesting the sections on chemical affinity, elective affinity, and the rather new "Daltonian doctrine, or atomic theory" which had only been announced about a decade earlier. Chemical affinity was a subject of great interest to eighteenth century chemists such as Torbern Bergman and Claude-Louis Berthollet. Bergman's affinity tables held the same place in many lecture halls of his period as periodic tables do today. Here is a simple experiment that Dr. Paris suggests: "Mix together equal weights of magnesia [MgO] and quicklime [CaO], in fine powder, and add diluted nitric acid. After some hours it will be found that a considerable amount of the lime has been dissolved, but that the whole of the magnesia has remained untouched. Hence it is clear that nitric acid has a stronger attraction for lime, than for magnesia." I could not have predicted easily, from my general knowledge of chemistry, the result of that experiment. For muriatic acid [HCl] the order of decreasing affinities of bases is "Baryta, Potass, Soda, Lime, Ammonia, Magnesia." In fact the general subject of displacement reactions, as we would call them, seems to be of great importance to the medical chemist of the early nineteenth century, and Dr. Paris links the subject to the detection of poisons and proposes a kit for such tests.

Dr. Paris is quite up-to-date. He cites Berthollet on "the first distinct views of the relations of the force of affinity to quantity", views that were a forerunner of the Law of Mass Action which would be announced forty years later. He also cites the rebuttal of Berthollet's views by Sir. H. Davy, but has to admit that "excess in quantity of matter will compensate for deficiency of affinity" in some cases.

The text is illustrated by many wood engravings. For instance there is a clear depiction of the famous experiment of Galvani, in the chapter on electricity, in which a dissected pair of frog's legs are attached to separate plates of zinc and silver. When the plates are connected by a wire, the legs twitch. This experiment, celebrated at the end of the eighteenth century, led Volta early in the nineteenth, to develop the electric battery and initiate the field of electrochemistry.

I plan to return to further discussion of this book in my next column. *(See the March issue of the Octagon)*