

# THE MIDLAND CHEMIST

A publication of the Midland Section of the American Chemical Society

May 2013, Vol. 50, No. 5

## Contents

MMI Announces 2013 TAVP Program and Visit Dates .....	1
2013 Turner Alfrey Visiting Professor Course – Elasticity and Fracture of Soft Materials, June 17-21 .....	2
Joint Technical Society Dinner Meeting, June 19 .....	4
Midland Section Councilor's Report on 245 <sup>th</sup> National ACS Meeting .....	4
Report on Mid-Michigan Technician Group First 2013 Dinner-n-Learn Event .....	6
Report on Mid-Michigan Technician Group Second 2013 Lunch-n-Learn Event .....	6
Upcoming Dates, Events, and Other Updates .....	6

## MMI Announces 2013 TAVP Program and Visit Dates

**Steve Keinath, Director and TAVP Program Coordinator**



The Michigan Molecular Institute (MMI) is pleased to announce that Professor Kenneth R. Shull from Northwestern University will be the 2013 Turner Alfrey Visiting Professor (TAVP). The full details for the 2013 TAVP course, *Elasticity and Fracture of Soft Materials* (pre-registration required no later than one week in advance, June 10<sup>th</sup>), and for the joint technical society dinner meeting, *The Role of Soft Materials Characterization in Art Conservation* (RSVP deadline one week in advance, June 12<sup>th</sup>), is available at <http://www.mmi.org/tavp2013.html>.

Professor Shull's Northwestern University website (<http://shullgroup.northwestern.edu>) will also give you a more thorough view of the breadth and depth of his current R&D activities and interests.

Professor Shull will be in residence at MMI from Monday, June 17, through Wednesday, June 26. The first week (June 17–21) will be the week in which he will give a series of five afternoon course lectures (3:00-6:00 PM, each day), plus make quick visits to MSU and SVSU, and participate in an opening reception at MMI, and a joint technical society dinner meeting (June 19, 6:30 PM). The second week (June 24–26) will be dedicated to full-day site visits to Dow, Dow Corning, and CMU. Please mark your calendars with the 2013 TAVP visit dates now, and sign up early for the course lectures and the dinner meeting.

**2013 Turner Alfrey Visiting Professor Course – Elasticity and Fracture of Soft Materials, June 17-21**  
**Steve Keinath, Director and TAVP Program Coordinator**

**Course 1040: ELASTICITY AND FRACTURE OF SOFT MATERIALS**

**Lecturer**

Professor Kenneth R. Shull, Professor of Materials Science and Engineering, Northwestern University, Evanston, IL 60208

**Location**

Lecture Hall, Michigan Molecular Institute, 1910 West St. Andrews Road, Midland, MI 48640

**Time**

Formal lectures: Monday-Friday, June 17–21, 2013, 3:00-6:00 PM

**Fee**

There is no fee for auditors if they belong to organizations that are financial sponsors of the Turner Alfrey Visiting Professor program: The Dow Chemical Company, Dow Corning Corporation, Central Michigan University, Michigan State University, Saginaw Valley State University, Mid-Michigan Section of the SPE, and Midland Section of the ACS. For all others, a course fee of \$400 will be required at registration. All participants, however, must pre-register.

**Registration**

Pre-registration is required no less than one week in advance with the Registrar by visiting <http://www.mmi.org/tavp2013.html>, e-mailing [registrar@mmi.org](mailto:registrar@mmi.org), or by calling (989) 832-5555.

**Course Description:**

Many application areas for “soft” polymeric materials require that their mechanical properties be appropriately tuned. Our definition of a “soft” material includes the following situations:

1. Materials which are soft enough so that adhesive forces result in substantial deformation of the material. This criterion is met for any polymeric material when the size scale is sufficiently small, as in a nanoindentation experiment to measure the elastic properties, for example. It is also met when the modulus of the material becomes small enough so that even macroscopic samples are deformed by relatively weak adhesive forces. Pressure sensitive adhesives (sticky tapes) are an example of this type of soft material.
2. Materials with fracture stresses that exceed their elastic modulus. Standard fracture mechanics concepts are no longer applicable in this regime. The materials design strategy for producing high toughness soft materials like artificial cartilage is fundamentally different than the design strategies for producing tough, rigid materials like metals and ceramics.
3. Materials with a substantial viscoelastic character. Energy dissipation mechanisms at the molecular level often dominate the behavior of soft materials. While some features of soft material behavior can be understood from a purely elastic analysis, other features, including rate dependent issues in fracture, require that viscoelastic effects be taken into account.

This course is designed to provide the background needed to work effectively with a variety of soft materials, and to design, conduct, and interpret experiments aimed at probing soft material behavior. The course is inherently interdisciplinary, and includes both the relevant background in pure mechanics and of structure/property relationships in different soft materials. A variety of material examples will be discussed throughout the course to illustrate key concepts.

### **Lecture Topics Outline:**

#### **Deformation and Adhesive Contact of Soft Materials**

Hertzian (non-adhesive contact) of elastic solids

Adhesive contact: The JKR theory of adhesion

Geometric connections, contact splitting, etc.

Examples: Nanoindentation, biomimetics (Gecko adhesion), pressure sensitive adhesives

#### **Fracture Mechanics of Soft Materials**

Stress fields in the linear elastic limit

Nonlinear fracture mechanics and the use of strain energy functions

Fracture of elastomers and gels

Examples: Super-tough polymer gels

#### **Two-Dimensional Elasticity**

Laplace pressure equation and the relationship between membrane tension and pressure

Equilibrium shapes of liquid interfaces

The role of elasticity

Examples: Membrane inflation, membrane contact experiments

#### **Materials Characterization with Quartz Crystal Resonators**

Wave propagation in solids

Acoustic resonators and the coupling of mechanical and electrical information

Theory of the quartz crystal microbalance

High frequency characterization of materials across the complete viscoelastic spectrum

Examples: Cure monitoring of rigid coatings, quartz resonators as contact sensors

**Joint Technical Society Dinner Meeting, June 19**  
**Steve Keinath, Director and TAVP Program Coordinator**

**The Role of Soft Materials Characterization in Art Conservation**

Professor Kenneth R. Shull, Professor of Materials Science and Engineering, Northwestern University, Evanston, IL 60208

**Abstract**

Art conservators face challenges that are conceptually similar to those faced by scientists and engineers tasked with preserving an aging and decaying infrastructure. In both cases models to assess the current physical state of an object at microscopic length scales are needed, as is a model for projecting behavior into the future. Art conservators face two additional challenges, however. The first of these is the magnitude of the time scales that are involved—often involving centuries. The second challenge is the difficulty in obtaining reliable experimental data. In developing treatment protocols to restore or clean very old paintings, model systems are generally needed that accurately mimic the properties of coatings that have been aged for long periods of time. This talk will focus on the role that modern materials science techniques are playing in this effort.

**Date**

Wednesday, June 19, 2013

**Time**

Social 6:30 p.m. • Dinner 7:00 p.m. • Program 8:00 p.m.

**Location**

NADA Center, Northwood University, 4000 Whiting Drive, Midland, MI 48640, Phone: (989) 837-4277

**Cost**

\$25 for SPE and ACS members (or members of other professional societies such as AIChE, ASM, etc.) and guests, \$15 for students. Note: Mid-Michigan SPE will charge individuals who make reservations and do not attend the meeting.

**Reservations**

Reservations can be made via phone, fax, or e-mail to Molly Warren-Haycock at MMI. Reservations must be received no later than Wednesday, June 12, 2013. Phone: (989) 832-5555, ext. 554, Fax: (989) 832-5560, or E-mail: [warren-haycock@mmi.org](mailto:warren-haycock@mmi.org)

**Midland Section Councilor's Report on 245<sup>th</sup> National ACS Meeting**

**Bob Howell, Councilor**

The 245<sup>th</sup> National Meeting of the American Chemical Society was held in New Orleans during the second week of April. The formal meeting started on Sunday, April 7<sup>th</sup>. Committee meetings started on Thursday, April 4<sup>th</sup>. Both Midland Section ACS councilors, Bob Howell and Wendy Flory, were busy during the meeting. Bob Howell continues to serve as a member of the Committee on Professional Training (CPT), the Committee on Nomenclature, Terminology and Symbols (NTS) and the Polymer Education Committee (PolyED). CPT met from Thursday evening through Sunday. Major activities were review of school reports (all ACS-certified chemistry programs must submit a substantial [voluminous] report every five years to demonstrate their

compliance with CPT guidelines), meeting with representatives of programs seeking certification, and a Sunday luncheon meeting with representatives wishing to provide feedback on guideline revisions.

A major failing of the current CPT guidelines is the lack of a requirement for any treatment of polymeric materials in B.S. chemistry programs. This situation exists despite the fact that 50-70% of all chemists work in a polymer or polymer-related area and that the standard of living that we all enjoy today would not be possible without these materials. An item of concern to NTS is the redefinition of the kilogram. The new definition will be based on an exact determination of Planck's constant. It will impact the value of Avogadro's number slightly (one part in  $10^8$ ) and carbon-12 will no longer have a mass of exactly 12.0000... g/mol, but for chemists who rarely weigh things beyond four decimal places, it will have no impact at all. A major focus of the PolyEd meeting was the revision of the CPT guidelines. As noted above, current CPT guidelines do not address the inclusion of any aspect of polymer science in the chemistry curriculum. This is a deficiency that needs to be addressed in a significant way. Most people trained in chemistry, whether taking a job after obtaining their B.S. degree or after receiving a graduate education, work in a polymer or polymer-related area. As noted in the report of the ACS presidential (Shakkashiri) commission on training in the chemical sciences, it is necessary for all programs to generate functional graduates.

By most measures, the New Orleans meeting was a huge success with 15,596 total registrants (8,105 regular attendees and 5,793 students) and 11,232 papers presented. The number of students attending national meetings continues to increase. This is largely due to the efforts of the Division of Chemical Education in providing student programming.

Several actions were taken at the Council meeting on Wednesday. G. Bryan Balazs and Charles E. Kolb, Jr. were selected as candidates for president-elect. Candidates for Director of District II (in which the Midland Section resides) will be George M. Bodner and Alan A. Hazari. The new director for District II will be selected next fall by a vote of the Councilors from that district. Candidates for Director-at-Large are Susan B. Butts (Midland Section), Thomas H. Dunning, Jr. (East Central Illinois Section), Dorothy J. Phillips (Northeastern Section) and Kathleen M. Shultz (Central New Mexico Section).

A petition to amend the by-laws to permit the Committee on Nominations and Elections to select two candidates for President-Elect was soundly defeated (85:15). This would have altered the current practice of the committee in selecting four nominees from which two candidates are determined by a vote of the Council. Petitions to approve a revision of the Academic Professional Guidelines and charter by-laws for new international chemical sciences chapters were approved with no dissent. A new formula for the distribution of funding to local sections was approved. This formula will allocate a base allotment of \$4,790 plus a per member allotment [\$6.20 (0-2000 members) plus \$4.10 (> 2000 members)] to each section. The annual allocation to the Midland Section will be minimally impacted by this change. Member dues were set at \$154.00 for 2014. ACS dues remain among the lowest for scientific societies. A new Romanian International Chemical Sciences Chapter to encompass the territory of Romania was approved.

Despite some setbacks, the National ACS finances remain strong. Total revenue for 2012 was \$490.7 million [\$6.1 million (1.3%) favorable to the approved budget]. Net revenue from operations was \$20.2 million (\$4.3 million favorable to the approved budget). This reflects strong performances by ACS Publications and Chemical Abstracts Service. Unrestricted net assets suffered a \$1.4 million decline (this after a significant decline in 2011) and now stand at \$100.6 million. The decline reflects the settlement of the Leadscope case and a charge for unfunded retirement liabilities (the retirement funding scheme has been altered such that these types of liabilities will decline in the future). Attorney fees for the Leadscope litigation have not yet been determined. Much of the cost will be covered by insurance but some portion will have to be borne by the Society.

If you have any comments, concerns, or questions, your local section councilors would like to hear from you. Contact Bob Howell at [bob.a.howell@cmich.edu](mailto:bob.a.howell@cmich.edu), or Wendy Flory at [wcflorey@dow.com](mailto:wcflorey@dow.com).

### **Report on Mid-Michigan Technician Group First 2013 Dinner-n-Learn Event**

*Jason Suhr, MMTG Chair*

The Mid-Michigan Technician Group (MMTG) held its first 2013 Dinner-n-Learn event on April 4<sup>th</sup>. Representatives from the Hantz Group sponsored a financial planning seminar at China Palace in Midland with a dinner buffet and drinks included. Ten MMTG members/spouses attended the event.

The presentation topics included tax planning, the impact investing has on your taxes, and 2012 taxes vs. 2013 taxes. The members of the Hantz Group were very pleased, both with the number of response cards filled out with favorable comments (100%), and with the number of MMTG members taking advantage of their offer of a free financial/tax planning consultation following the seminar. Some of the responses from MMTG members included “maybe hiring someone to do my taxes isn’t such a bad idea”, and “hopefully they can fix the mess my stupid tax guy made the last two years”.

This seminar with the Hantz Group may turn into an annual event for MMTG. If the Hantz Group is willing to hold another dinner meeting next year during tax season, MMTG would like to invite members of the local Midland Section ACS and the Younger Chemist Committee to attend. Stay tuned!

### **Report on Mid-Michigan Technician Group Second 2013 Lunch-n-Learn Event**

*Jason Suhr, MMTG Chair*

The Mid-Michigan Technician Group (MMTG) held its second Lunch-n-Learn event of 2013 on April 23<sup>rd</sup>, titled *Preventing Road Rage: Anger Management for Drivers*. The material covered how to avoid offending other drivers, managing your own anger, and disengaging from angry encounters. We listened to some personal encounters from real drivers and also to some personal anecdotes from these same people who have reformed themselves by practicing anger management techniques geared toward preventing road rage. MMTG members also contributed to the conversation by telling about their own personal encounters with road rage and/or unsafe driving practices.

More educational videos pertaining to safe driving can be found on the AAA Foundation for Traffic Safety website at [www.aaafoundation.org/videos](http://www.aaafoundation.org/videos).

### **Upcoming Dates, Events, and Other Updates**

- June 3 (7:00-9:00 PM) – ACS Board meeting, MCFTA Board Room (in person), or via conference call at phone number: 866-299-7945, participant code: 9837036#.
- June 17–21 (3:00-6:00 PM, each day) – 2013 TAVP course lectures, *Elasticity and Fracture of Soft Materials*, featuring Prof. Kenneth R. Shull of Northwestern University, MMI Lecture Hall, Midland. For more information and to pre-register for the course, see <http://www.mmi.org/tavp2013.html>. **Pre-registration is required by June 10<sup>th</sup>**. Contact Steve Keinath ([keinath@mmi.org](mailto:keinath@mmi.org)) for questions.

- June 19 (6:30-9:00 PM) – TAVP joint technical society dinner meeting, NADA Center, Northwood University. Prof. Kenneth R. Shull will give an interesting presentation on *The Role of Soft Materials Characterization in Art Conservation*. **RSVP deadline is June 12<sup>th</sup>** to Molly Warren-Haycock ([warren-haycock@mmi.org](mailto:warren-haycock@mmi.org)). Contact Steve Keinath ([keinath@mmi.org](mailto:keinath@mmi.org)) for any other questions.
- August 5 (7:00-9:00 PM) – ACS Board meeting, MCFTA Board Room (in person), or via conference call at phone number: 866-299-7945, participant code: 9837036#.
- August 26 (7:00-9:00 PM) – ACS Board meeting, MCFTA Board Room (in person), or via conference call at phone number: 866-299-7945, participant code: 9837036#.
- September 8–12 (Sunday-Thursday), 246<sup>th</sup> ACS National Meeting & Exposition, Indianapolis, IN. For more information, see [ACS Fall National Meeting](#).
- October 7 (7:00-9:00 PM) – ACS Board meeting, MCFTA Board Room (in person), or via conference call at phone number: 866-299-7945, participant code: 9837036#.