**Midland Section**

Serving the Michigan counties of Midland, Bay, Saginaw, Isabella, and Gratiot

65th Annual Fall Scientific Meeting

# Advancing Chemistry through Science Education

October 10, 2009
8:30 a.m. – 5:00 p.m.
Delta College
University Center, MI

## Agenda

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|---|---|
| 8:30 am – 1:00 pm | Registration [outside of G160] |
| 8:45 am – 9:00 am | Welcome [G160] |
| 9:00 am – 10:00 am | Keynote Address # 1: Glenn Ruskin – ACS Director, Office of Public Affairs [G160] |
| 10:00 am – 11:00 am | Keynote Address # 2: Mary Kirchhoff – ACS Director of Education [G160] |
| 11:00 am – 12:00 pm | Poster Session and Vendor Booths [outside of G160] |
| 12:00 pm – 1:00 pm | Lunch [Commons Food Court N005] |
| 1:00 pm – 4:00 pm | Symposium 1: “Every Dipole Has Its Moment”: Student Presentations []G160] |
| | Symposium 2: “Keep Your Ion the Ball”: Advancement in Science Education [N008] |
| | Symposium 3: Promoting Excellence in Science Education and Community Outreach [N007] |
| 4:00 pm – 5:00 pm | Awards Presentation & Other Acknowledgements [G160] |

**American Chemical Society – Midland Section**

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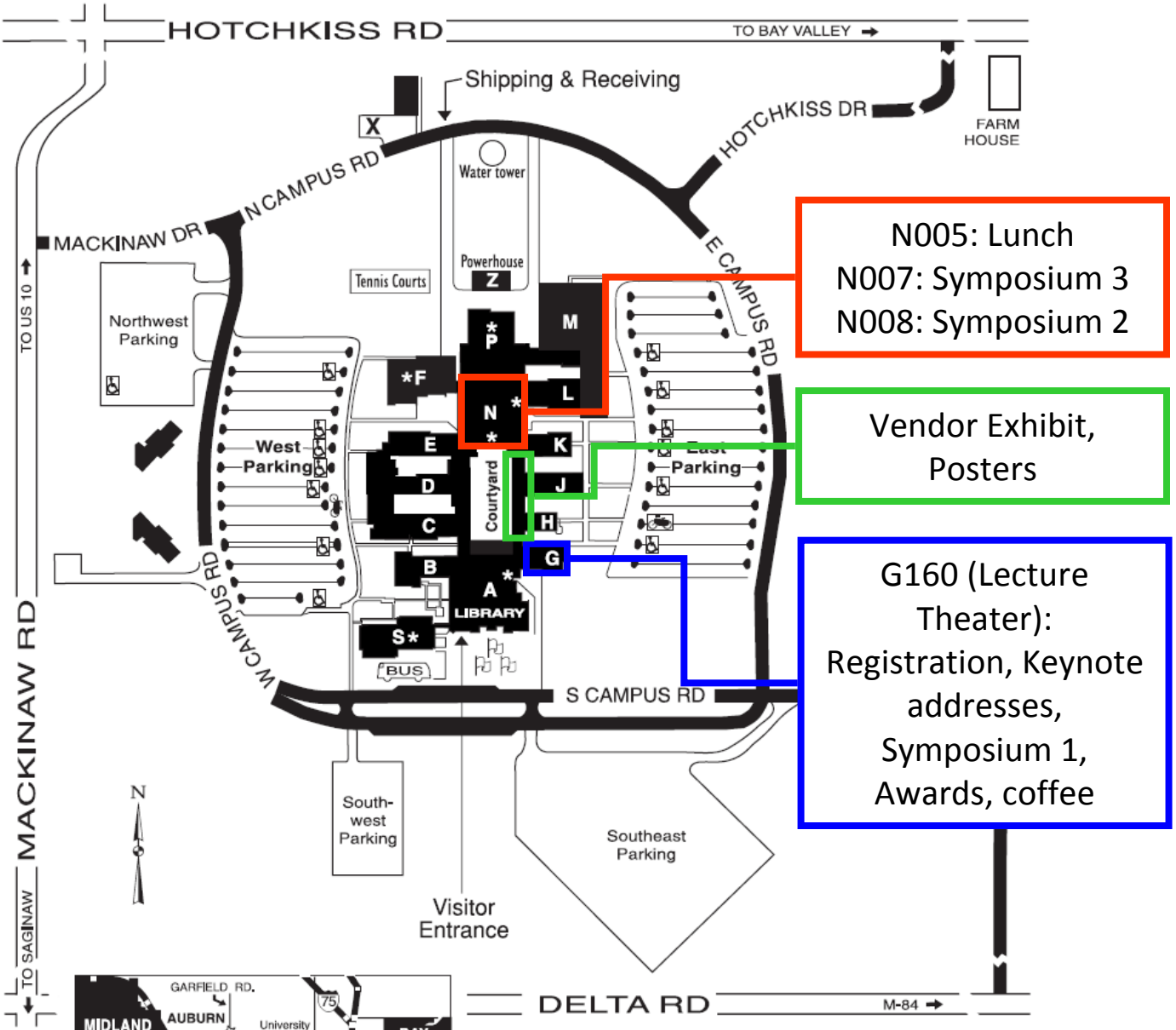


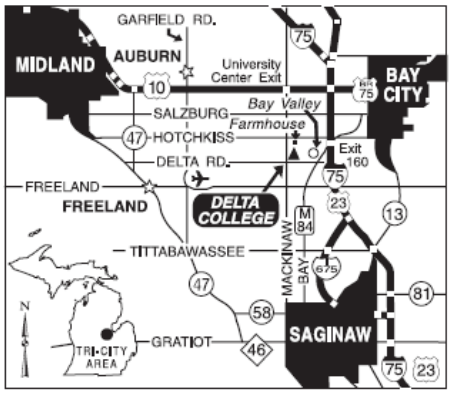


**From 1-75**
Take exit 160. Turn south onto M-84. Travel 1/4 mile to the second traffic light. Turn west onto Delta Road. Travel 1-1/4 miles. College is on the right.

**From US-10**
Exit south at Mackinaw Road exit onto Mackinaw Road. Travel south 2-1/4 miles, past the blinker light at Hotchkiss Road intersection. College entrance is on the left.

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## Welcome

### Welcome to the 65th Fall Scientific Meeting, hosted by the Midland Section of the American Chemical Society!

The Fall Scientific Meeting is the premier science and technology meeting for the Midland Section of the American Chemical Society. The meeting has been held, excepting one year, since 1945. It is organized by Section members and attended by scientists, college faculty, high school teachers, college students, and other people from a variety of organizations such as Central Michigan University, Saginaw Valley State University, Alma College, Delta College, Michigan Molecular Institute, The Dow Chemical Company, and Dow Corning.

The 65th Fall Scientific Meeting will be held at Delta College on October 10, 2009. The theme for this year’s meeting is “Advancing Chemistry through Science Education.” We are particularly excited about this year’s program because it brings together scientists, science educators, and students in a unique way, encouraging networking and providing a forum for new ideas. *Susan Rhodes and Matthew Gave, Co-chairs, Fall Scientific Meeting*

**Opening Remarks:** Angelo Cassar, Chair, Midland Section

## Keynote Speakers

Moderator: Matt Gave, Chair, Fall Scientific Meeting

### The Chemistry of Advocacy

Glenn S. Ruskin; Director of Office of Public Affairs, American Chemical Society

The ACS Congressional charter passed in 1937 and signed by President Franklin Delano Roosevelt, calls upon the ACS to "encourage in the broadest and most liberal manner the advancement of chemistry in all its branches; increase the diffusion of chemical knowledge, …promote scientific interest and inquiry, …foster public welfare and education, aiding the development of our nation's industries, and adding to the material prosperity and happiness of our people."

This presentation will examine how ACS fulfills its Congressional charter through the advocacy efforts of members, governance and staff. At the core of ACS advocacy are the members of the Society – without them there would be no ACS positions or advocacy. The members decide through the ACS committee structure what the positions and priorities of the Society shall be and government relations staff in the ACS Office of Public Affairs, joined by members of the ACS Legislative Action Network and local section Government Affairs Committees and ACS governance, communicate those priority positions on Capitol Hill, with the Executive branch and other interested organizations.

The presentation will pull together all the various pieces of ACS advocacy to give participants an overall understanding of how ACS policies are created, communicated and advocated, and the presentation will explain how the ACS priorities fit into the larger legislative environment in Washington, DC.

***Biographical Sketch:*** *Ruskin joined the American Chemical Society (ACS) in May 2005 and currently serves as Director, Office of Public Affairs which houses the Society's Government Affairs and Communications programs. He leads the ACS efforts to promote sound public policies that advance science and the chemical enterprise with policy-makers as well as communication efforts designed to increase public awareness and appreciation of chemistry's critical role in addressing society's most pressing issues.*

*Ruskin has over 27 years senior management experience in both the public and private sector and has broad based experience in government affairs, public relations, corporate communications, media relations, litigation communications and environmental affairs. His private sector experience has largely focused on the chemical manufacturing sector, and he is well versed in the issues, challenges and complexities that face the industry. Earlier in his career he worked on Capitol Hill for a New Jersey Congressman and for a small New Jersey urban city where he was responsible for urban, economic, transportation and residential development.*

*Ruskin received his B.A. degree from Drew University and his Masters of Science in Administration from George Washington University. He is a member of the American Chemical Society, the American Public Health Association, the American League of Lobbyists and serves on the Board of Directors, Triangle Coalition for Science and Technology Education.*

### ACS: Serving Learners and Educators

Mary Kirchhoff; Director of Education, American Chemical Society

Education features prominently in the charter of the American Chemical Society, a charter that promotes the education of both citizens and professional chemists. Education equips professional chemists, as well as all members of society, to advance in the new millennium, developing 21st century solutions to complex problems. In fulfilling its Congressional Charter, the Society has created a number of long-standing, dynamic education programs. At the same time, ACS must be responsive in meeting the needs of the changing chemistry enterprise. This presentation will examine the challenges and opportunities facing science education today and will highlight the education resources of the American Chemical Society using the five goals of the Education Division strategic plan as a framework.

***Biographical Sketch:*** *Dr. Mary Kirchhoff is Director of the American Chemical Society Education Division, and previously spent three years as Assistant Director of the ACS Green Chemistry Institute. She received her Ph.D. in organic chemistry from the University of New Hampshire and joined the Chemistry Department at Trinity College in Washington, DC in 1992. Mary spent nine years at Trinity College, where she served as Chair of the Division of Natural Sciences and Mathematics. She became involved with green chemistry when she received an AAAS Environmental Fellowship to work with the U.S. EPA's green chemistry program. Mary is a co-author or co-editor on Designing Safer Polymers, Greener Approaches to Undergraduate Chemistry Experiments, and Going Green: Integrating Green Chemistry into the Curriculum. She is a Fellow of the American Association for the Advancement of Science.*

## Symposium # 1: "Every Dipole Has Its Moment": Student Presentations

Moderator: Brad Fahlman, Central Michigan University

This symposium consists of high school and/or college level presentations of 20 minutes. All areas of chemistry, chemistry-related, and science education topics were invited.

*Special Note: The best student presentation will be honored with the Thomas H. Lane Education Award, which consists of a plaque and $500 cash award. This award is sponsored by Dow Corning Corporation.*



### [1:00 p.m.] New Synthetic Strategies for the Generation of Regiospecifically Substituted Icosahedral Boranes


Ian M. Harrier, Kevin K. Klausmeyer, and Joel A. Dopke
*Alma College, Department of Chemistry, Alma, MI 48801*


The icosohedral boranes and carboranes have been studied in a wide range of contexts for a variety of applications. Some of these applications include polymers, non-coordinating anions, and therapeutic agents. As a result, the derivative chemistry of these species has been of growing interest. The new partially-brominated dodecaborates $B_{12}Br_{12-n}H_n^{2-}$ (n = 5, 6, 7) were synthesized with a variety of counterions in moderate to high yield using N-bromosuccinimide as the brominating agent under mild conditions. The subsequent reaction of the brominated salts with refluxing 30% hydrogen peroxide produced the corresponding hydroxylated species $B_{12}Br_{12-n}(OH)_n^{2-}$. Alternatively, acid-catalyzed hydroxylation followed by bromination provided $B_{12}Br_{12-m}(OH)_m^{2-}$ (m = 4,5). The icosahedral products were identified crystallographically (n = 7) and via elemental analysis, and by $^{11}B$ NMR and IR spectroscopy. The derivative chemistry of these anions and the prospects for the generation of other partially-substituted species with novel substitution geometries will be discussed.

### [1:20 p.m.] Water Quality: An Analysis of City Water in Bay City, Michigan


Erika Trigg
*Saginaw Arts & Sciences Academy, 200 Congress Ave., Saginaw, MI 48602*


The purpose of this study was to evaluate causes of the poor water quality in Bay City found during the previous year's study of water quality in the Saginaw Valley. What was determined to be poor water quality in Bay City may be due to the type of piping in the home from which water was sampled. Contaminants from the piping could have been released into water. Therefore, it was hypothesized that the specific home previously tested is the source of the conclusion that the water quality in Bay City is poor. Twelve houses, three from each of four different quadrants of the city, were tested for eleven contaminants. Contaminants tested for during this study included alkalinity, ammonia, total coliform/E. coli, carbon dioxide, chloride, dissolved oxygen, nitrites, pH, supersaturation, total dissolved solids and total hardness. All of the tests, except total coliform/E. coli, supersaturation and total dissolved solids, were conducted three times to ensure accuracy of the results. Following analysis of the data, it was concluded that the original hypothesis was incorrect. Although the quadrant that the house is located in had the highest values for several contaminants, the individual house did not have higher values than any of the other houses tested. Based upon the findings of this study, future research is planned related to the water quality in Bay City. It is recommended that additional testing be performed to determine the cause of the poor water quality of an individual home, be it the piping of the home or the pipes leading up to the home from the water treatment facility. Additional testing may also be performed to evaluate leaching that occurs with different types of pipes at different temperatures.

**[1:40 p.m.] Solid-Liquid-Solid (SLS) Growth of Silicon Nanowires**

Aleks Antic and B. D. Fahlman
*Department of Chemistry, Central Michigan University, Mt. Pleasant, MI 48859*

Nanowires are crystalline wires with characteristic diameters of less than 100 nm and comparatively long lengths. Silicon nanowire (SiNW) arrays are of particular interest for next-generation applications such as nanoelectronics, photovoltaics, and energy storage. The solid-liquid-solid (SLS) method is a simple "bottom-up" synthetic route that precludes the use of co-reactant gases or liquids. Surface-assembled gold nanoparticles catalyze the growth of crystalline SiNWs through simple thermal annealing of the substrate. The solubility of the silicon in the gold is temperature dependent; higher temperatures yield greater solubilities. As the metallic nanocatalyst becomes supersaturated, the dissolved substrate precipitates, leading to the nucleation and growth of the nanowire crystallites. This study found that samples prepared at a temperature of 1080 $^{o}$C under argon gas could yield fine structured silicon nanowires with diameters in the 20-60 nm range. Herein, we will discuss our synthetic procedure and resultant SiNW morphologies using HRTEM and FESEM analyses in association with energy-dispersive spectroscopy (EDS).

**[2:00 p.m.] Interaction of Lithium with Low-Dimensional Graphene**

Chananate Uthaisar and V. Barone
*Department of Physics, Central Michigan University, Mt. Pleasant, MI 48859*

We will discuss the rich variety of electronic and magnetic properties displayed by different types of graphene nanoribbons and their potential for energy storage applications. Unlike carbon nanotubes, these thin strips of graphene can be produced in a much more controllable manner and their electronic and magnetic properties strongly depend on the nature of the edges. Based in our first-principles calculations of the electronic properties of these materials, we will discuss their Li intake capacity and rationalize it in terms of their peculiar properties and morphology.

**[2:20 p.m.] NMR Studies on Ag(I) Complex with G2-PAMAM-OH Dendrimer**

[1]Zhiyuan Wang, [1]Charmane Thurmand, [1]CheHin Ho, [1]Minghui Chai
*[1]Department of Chemistry, Central Michigan University, Mt. Pleasant, MI 48859*

[2]Tracy Zhang, [2]Abhijit Sarkar and [2]Petar R. Dvornic
*[2]Michigan Molecular Institute, 1910 West St. Andrews Road, Midland, MI 48640-2696*

Ag(I) ions have been classic antimicrobial agents. Recent studies showed that Ag(I) PAMAM dendrimer complexes have better antimicrobial function than the simple Ag(I) inorganic salts like $AgNO_3$. However PAMAM dendrimers alone do not have any antimicrobial property at all. In this research, we use G2 PAMAM dendrimer to chelate with Ag(I) ions to form the complex in aqueous solution. NMR spectroscopy has been used to probe the interaction between the dendrimer and silver ions in order to understand the activity of the dendrimer silver complex. 1D NMR spectra of the complex systems at different molar ratios of Ag(I) and G2-PAMAM dendrimer show that the periphery amino groups of the dendrimer prefer to bind with silver ions first, the tertiary amino groups of the dendrimer can also bind with the silver ions. Multidimensional NMR techniques have also been used to characterize the structure of the complex and provide more resolution and correlation to assign the resonances in the 1D spectrum.

**[2:40 p.m.] Synthesis and Characterization of Pt(II) Complex with Salicylic Acid**

Ewa Gorski, and Minghui Chai
*Department of Chemistry, Central Michigan University, Mt. Pleasant, MI 48859*

In this research we have synthesized the complex of platinum (II) ions with salicylic acid. Recent studies showed that salicylate can reduce cisplatin toxicity on hearing and kidney function without compromising its oncolytic action. Therefore, using salicylic acid in cisplatin chemotherapy can potentially provide a safe and effective treatment for cancer. The newly synthesized complex has been characterized using NMR, IR, UV-Vis and MALDI-TOF-MS. In particular the MS spectrum shows platinum isotopic pattern with correct mass for the complex, which indicates the success of the coordination between Pt(II) ions and salicylic acid ligands.

**[3:00 p.m.] Structure, Properties and Reactivity of 2,4,5,5-Pentaphenyl-1,3,2-dioxaphospholane and Related Compounds**

Young_Jun Cho and Bob A. Howell
*Center for Applications in Polymer Science and*
*Department of Chemistry, Central Michigan University, Mt. Pleasant, MI 48859*

Certain five-membered dioxaheterocycles (hetero atoms may be P, Si, S, etc.) contain a strained carbon-carbon bond which may undergo hemolytic thermolysis at modest temperatures to generate a diradical capable of initiating vinyl

polymerization. If substituents contain flame-retarding moieties this represents a convenient method for imparting flame retardancy to a polymeric material. Of particular interest has been 2,4,4,5,5-pentaphenyl-1,3,2-dioxaphospholane. The thermal degradation of this and several related compounds has been studied using $^{13}C$ NMR spectroscopy. This may conveniently be done by monitoring the intensity of the signal for the benzylic carbon atom as a function of time and temperature. A simple transformation is the conversion of the cyclic compound to the linear polymer.

**[3:20 p.m.] Synthesis of Various Amino Ester Hydrochlorides using Triphosgene**

Candace Robinette, Steven Crain, and David Baker
*Science Division, Delta College, University Center, MI 48710*

Most organic chemistry synthetic strategies use thionyl chloride, phosgene and oxalyl chloride as ideal chlorinating agents. Our investigations focused on using triphosgene as an alternative chlorinating agent. Triphosgene has been used to prepare a variety of methyl, ethyl, and benzyl ester hydrochlorides of a variety of the amino acids phenylalanine, histidine and proline. The long term research goal is be able to convert the amino acids into isocyanates using a one pot approach. From this work, interesting experiments applicable to the organic chemistry curriculum have been developed.

**[3:40 p.m.] New Approaches to the Generation of Effective, Nontoxic Organoplatinum Antitumor Drugs**

P. Chhetri, A. Dumitrazcu, K. N. Stanton, and B. A. Howell
*Center for Applications in Polymer Science and*
*Department of Chemistry, Central Michigan University, Mt. Pleasant, MI 48859*

Organoplatinum antitumor agents are very effective, broad spectrum drugs used for the treatment of a variety of cancerous conditions. The two most prominent of these, Cisplatin [*cis*-diamminodichloroplatinum(II)] and Carboplatin [diammino(1,1-cyclobutanedicarboxylato)platinum(II)], are large scale commercial successes. A third, Oxaliplatin [((*trans*-1,2-diamminocyclohexane)oxalate)platinum(II)], is now commercially available. The administration of all these drugs is accompanied by severe side effects. For Cisplatin, the most debilitating of these is kidney damage and extreme nausea. Several approaches to generate drug-release formulations that might mitigate toxic side-effects have been explored. Now, platinum(IV) compounds which are more inert than platinum(II) compounds, and consequently less toxic, but which may be reduced to platinum(II) species within the cell are being evaluated for effectiveness in the treatment of cancer.

## Symposium # 2: "Keep Your Ion the Ball": Advancement in Science Education

Moderator: David Baker, Saginaw Valley State University

This symposium will consist of presentations by researchers active in the field of science education with the goal of providing information to local teachers, parents, and interested parties about activities promoting advancement in science education. Additionally, these talks will provide opportunities for teachers to have peer-to-peer discussions with each other and the speakers regarding activities to promote science education.

### Assessment and Instruction Aligned to Science Content Standards
*or*
### "Keeping an Ion the Learning Goal"

Cari Herrmann-Abell, AAAS Project 2061

Project 2061 is a long term effort by the American Association for the Advancement of Science (AAAS) to advance literacy in Science, Mathematics, and Technology. Our current work includes creating middle and early high school science assessment items that are precisely aligned with national content standards and developing resources to support the creation and use of these types of assessment items. Each item is developed using a procedure designed to evaluate an item's match to important science ideas and its overall effectiveness as an accurate measure of what students do and do not know about those ideas. During item development, feedback is obtained from students during pilot testing and from scientists and science education experts during a review of the items using a set of criteria to ensure content alignment and construct validity. After revisions are made based on the feedback, the items are field tested on a large national sample to determine the psychometric properties of the items. As part of our work in instruction, we are writing descriptions of scientific phenomena that can be used to illustrate or be explained by targeted ideas, identifying simulations and graphic representations that can clarify those ideas for students, and making suggestions for guiding students' thinking about the relationship between the phenomena, representations, and ideas.

**Bio:** Cari Herrmann Abell joined AAAS Project 2061 as a Research Associate in 2005 and her work in the last four years has focused on research and development in assessment, specifically in topics involving physical science. She came to Project 2061 from the University of Colorado at Boulder, where she was a postdoctoral research associate in the Department of Mechanical Engineering and the Department of Chemistry and Biochemistry. Her previous experience includes serving as a graduate research assistant and teaching assistant in the Department of Chemistry at the University of North Carolina at Chapel Hill. Herrmann-Abell holds a Ph.D. in physical chemistry and materials science from the University of North Carolina at Chapel Hill, and a B.S. in chemistry and mathematics from Muhlenberg College.

### Creative Science for the Classroom

Bernadette Harkness[1], Brian Aldrich,[2] and David Baker[1]
[1]Science Division, Delta College, University Center, MI, 48710,
[2]Heritage High School, Saginaw MI

This will be a discussion of potential hands-on activities that will explore current applications of chemistry in technology. Applications will include biodiesel, solar energy, fuel cells, wind energy, exploring the nanoworld and providing experiences with nanotechnology. New approaches to using small-scale experiments and equipment to address issues of sustainability and pollution prevention in the laboratory will be presented.

There will be an additional discussion of visualization in chemical education. Storyboard and animation exercises can be used to increase student understanding of macroscopic concepts. These exercises or "atomic comics" compel students to incorporate the particulate view of matter with important concepts in chemistry. Chemsense animation software has been used by students and will be demonstrated to illustrate examples of student-generated work.

**Bio:** Bernadette Harkness joined Delta College in 2002. She came to Delta College from Dow Corning in Asia, where she was a science research technologist with anti-foaming agents. Her previous experience includes serving as a post-doctoral researcher at the University of Tokyo and a graduate research assistant and teaching assistant in the Department of Chemistry at McGill University. Bernadette Harkness holds a Ph.D. in inorganic chemistry from McGill University, Montreal, Canada and a B.S. in chemistry from the University of British Columbia, Canada.

**Bio:** David Baker joined Delta College in 1996. He came to Delta College from a position at Pennsylvania State University: The Behrend College, Erie PA. His experience includes serving as a post-doctoral researcher in the College of Pharmacy at The Ohio State University and a graduate research assistantship in Chemistry at Leicester University, UK. David Baker holds a Ph.D. in organic chemistry from Leicester University, an M.S from the University of Toledo and a B.Sc. (Hons) in chemistry from Leicester University.

**Researching Inquiry-Based General Chemistry Labs and Online Learning at Central Michigan University**

Janice Hall Tomasik
Department of Chemistry, Central Michigan University, Mt. Pleasant, MI 48859

This presentation will describe new lab experiments developed at Central Michigan University. The labs incorporate authentic research-based experiences that highlight CMU faculty research. It is hoped this design allows students to learn important concepts in a more relevant and familiar context. The goals of this project are to 1) study the best methods for development and implementation, and 2) study the effects of this research-based approach for teaching chemistry. The topics discussed will include the development of the new labs, a pilot test with two students, and the survey created to assess impacts on student learning.

This presentation will also discuss the learning environment of an online continuing education course for teachers scheduled to begin at CMU in the summer of 2010. The results of a survey given to participants a year after completing the course reveal information about the online learning environment.

**Bio:** Janice Hall Tomasik joined Central Michigan University in July 2008. She came to CMU after receiving her Ph.D. in chemistry from the University of Wisconsin-Madison. She received her B.S. in chemistry at the University of Illinois at Urbana-Champaign. She has completed research in both inorganic chemistry and chemical education. She has studied zirconium catalysts for polymerizing alkenes and created an online course about nanoscience for teachers. She has taught general chemistry and teaching methods courses for preservice teachers and has held teaching assistantships in general and inorganic chemistry.

## Symposium # 3: Promoting Excellence in Science Education and Community Outreach

Moderator: Kevin Wier, Dow Corning Corporation

This symposium will provide an opportunity for interactions between teachers and local industry personnel to promote science education by providing tools to attendees to share with students at school or children at home. Also, this symposium will provide an opportunity for students to network with local industry personnel and discuss possible career paths.

### Chemistry and the Food Scientist

Julie Lorenz and Jeff Paxhia, Kellogg Company, Battle Creek, Michigan

The food production and manufacturing industry is arguably the largest in the world. This industry employs scientists of diverse backgrounds to contribute to the development of abundant, safe, nutritious, high quality products to feed a growing world population. Many scientifically inclined students are unaware of the opportunities for technical careers in the food industry. Typical food science and technology careers include culinologist, product development scientist, food technologist, food process engineer, quality assurance scientist, food chemist, sensory scientist, and nutrition scientist. Demand for professionals trained in the science of food production and manufacture is expected to be strong into the future. In this talk we will highlight the science behind the food we eat and opportunities for chemists within the food industry.

**Bio:** Dr. Julie Lorenz joined the Kellogg Company in 2006 after previous work experience in the chemical and pharmaceutical industries. She is currently Senior Director in Advanced Innovation for the Research, Quality and Technology organization. She was Director of the Food Chemistry group at Kellogg's before joining the Advanced Innovation team. She received her BA in Chemistry from Wittenberg University and PhD in Physical Chemistry from the University of Wisconsin - Madison. Prior to joining Kellogg she was employed at Rohm and Haas and Pfizer. She has been a member of the American Chemical Society since 1991.

**Bio:** Jeff Paxhia joined the Kellogg Company in November of 1997. He is currently employed as a Principal Scientist in Advanced Innovation for the Research, Quality and Technology Department. He has worked in food R&D for over 23 years, with prior tenure at Sara Lee and PepsiCo. He leads the New Technologist Pipeline Program which is supported by Kellogg's Research, Quality and Technology Department. The objective of the program is to inspire students to pursuer careers in the areas of Science, Technology and Engineering which are important to the future of Kellogg Company. The program incorporates key platforms of Academic Events, Student Outreach and Student Mentorship to achieve its goals. He is assisted by some of the more than 400 scientists and engineers employed at Kellogg's in their global technical organization. He received his BS degree in Food Science from Purdue University and his MS degree in Food Technology from Iowa State University. He is a member of the Institute of Food Technologists.

### Pyrotechnics - What You Should Know About Fireworks

Jim Malek, Wolverine Fireworks

This presentation will cover fireworks information in general, with emphasis on the chemistry involved.

**Bio:** Jim Malek is a retiree of Dow Corning Corporation, having worked in Research, Technical Service & Development, and Technical Information Services for over 30 years. After retirement he became involved with Wolverine Fireworks and the Polish Pyros, assisting in over 50 professional fireworks displays, including the Bay City Fireworks Festival and the displays for the Great Lakes Loons at Dow Diamond. His special display has been the Riverdays Grand Finale Fireworks held each year at Chippewassee Park in Midland.

### A Day in the Life of a Forensics Scientist

Elaine Dougherty, Bridgeport Forensics Laboratory

This presentation will include information on the daily operations of a forensic laboratory, the education and qualifications required to become a forensic scientist, and the use of chemistry in solving crimes. Topics covered include latent print analysis, firearms analysis, biological materials analysis, crime scene investigation, and controlled substances analysis. In addition, several short demonstrations will be shown, including some suitable for the classroom.

**Bio:** Elaine received her BS in biochemistry from Michigan Tech and taught high school chemistry, AP chemistry, and physics for five years. She attended graduate school in Forensic Chemistry at MSU and accepted a job offer before graduation. She has been working at the Michigan State Police Bridgeport Forensic Laboratory in the Controlled Substances Unit for 5 ½ years.

# Awards

Moderator: Brad Fahlman, Central Michigan University
Tom Lane, President, ACS

### Thomas H. Lane Science Education Award

Dow Corning Corporation is sponsoring an annual American Chemical Society Midland Section award in honor of Dr. Thomas H. Lane. Dr. Lane, former senior scientist and director of global science and technology outreach at Dow Corning and current ACS President, has always emphasized the need for education and science literacy. He believes that ACS must ensure that all people, particularly students, understand the "transforming powers of chemistry."

This premier award will be presented to a student demonstrating academic excellence through their participation in the Midland Section ACS Fall Scientific Meeting for a category selected each year by the FSM committee. This year's award description is as follows:

### Best Student Presentation

The student giving the best presentation at the Fall Scientific Meeting, Symposium # 1: Student Presentations - "Every Dipole has its Moment" will receive a plaque and a $500 cash award. The best presentation will be selected by committee, and students at all academic levels will be considered.

### Best Student Poster Award

Dow Corning Corporation is sponsoring a $200 cash award for the best student poster.

### Science Education Promotion Award

Meeting attendees can submit suggestions for ways to locally promote science education. The best idea will be selected by the local ACS board and FSM committee members. A $50 cash award will be provided, sponsored by Dow Corning Corporation.

### Outstanding Achievement and Promotion of the Chemical Sciences

Each year the Midland Section honors an individual residing within the Section's geographical area who has demonstrated outstanding achievement and promotion of the chemical sciences. This award recognizes dedication and service to the chemical profession. *Note: This award will not be presented this year.*

### Outstanding Service to the American Chemical Society

The Section sponsors an annual award to a member to recognize outstanding service to the Midland Section of the ACS. This award recognizes achievement in the promotion of the goals of ACS. *Note: This award will not be presented this year.*

### Outstanding Chemical Technician

The Section presents an annual Outstanding Chemical Technician Award to an individual who has demonstrated an extremely high degree of professionalism as a chemical technician.

### Members of ACS for 50 Years or More

An award is presented to each member who has reached 50, 60, or 70 years membership.

## Meeting Sponsors and Exhibitors

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# Poster Abstracts



### 1. Apatite Crystallization in Microfluidic Chip Probed by Raman Spectroscopy


Brandon Whitman and Mary Tecklenburg

*Central Michigan University, Mount Pleasant, Michigan*


Microfluidic chips are universally regarded as an essential tool for micro-scale observation of fluid dynamics. A microfluidic chip provides an extremely small area for a reaction to take place. This is important for reactions that require expensive materials, or materials that are safer to use in small quantities. Microfluidic chips have recently been used for crystallization studies of proteins and inorganic minerals such as calcite. Our goal is to apply the method to crystallization of apatite, a calcium phosphate mineral, which comprises the inorganic phase of bone. The mineralization of apatite on a collagen template may be protein controlled. In order to study and analyze crystallization in the presence of hard to obtain reagents such as proteins we have initiated crystallization kinetics studies in a microfluidic chip.

This application used a microfluidic chip for observing apatite as it crystallized from a mixture of calcium and phosphate. The microfluidic chip was mounted in a microscope with a Raman spectrometer. The set-up allowed for both optical assessment along with vibrational spectra of developing crystals. Using the microfluidic chip in this way allows for precise measurements concerning the kinetics in the crystallization of apatite.

### 2. Modeling Bone Mineralization: Raman analysis of Amorphous Calcium Phosphate to Apatite


Dan Zhou, Brandon Whitman, and Mary Tecklenburg

*Central Michigan University, Mount Pleasant, MI*


Bone is a mineral reservoir for calcium and phosphorous and it is primarily composed of an organic matrix, the protein collagen, and nanocrystals of apatite-like mineral. Mineralization of bone involves a process in which crystals of calcium phosphate are produced by bone-forming cells and deposit within the bone fibrous matrix. If the process of deposit is not regulated, it can lead too little or too much mineral deposit in bone matrix which can threaten bone health. By modeling bone mineralization in our study, the in vitro conversion of amorphous calcium phosphate (ACP) to hydroxyapatite (HA, $Ca_{10}(PO_4)_6(OH)_2$) will be investigated. An improved understanding of the mechanism of calcium phosphate mineralization in bone could furnish new principles for the development of preventive and therapeutic measures to improve bone quality and prevent fractures from bone diseases.

The structural features of the transformation from amorphous (precursor) calcium phosphate (ACP) to octacalcium phosphate (OCP) and then to apatite (AP) was investigated by Raman Spectroscopy and Ion Chromatography, which mimics the chemical conversion occurring in the in vivo production of mineral crystallites in bone. ACP was prepared by direct precipitation of solutions of calcium and phosphate salts. Kinetics of amorphous calcium phosphate to OCP to apatite hydrolysis was monitored by Raman spectroscopy to identify the variation of mineral maturity in the mineral structure. Ion chromatography was used to determine apatite ion composition and phosphate and calcium content of small samples of synthetic apatite.

### 3. Modeling Bone Mineralization: Raman Analysis of Octacalcium Phosphate to Apatite

Ryan Paul, Brandon Whitman, and Mary Tecklenburg
*Central Michigan University, Mt. Pleasant, MI*

Bone mineralization involves the transformation of soft tissue to hard tissue, with the inorganic component of bone developing into a material similar to hydroxyapatite. This inorganic component starts as amorphous calcium phosphate and may go through several intermediate forms, including octacalcium phosphate (OCP), before maturing to apatite. Octacalcium phosphate ($Ca_8(HPO_4)_2(PO_4)_4 \cdot 5H_2O$) is similar in structure to hydroxyapatite ($Ca_{10}(PO_4)_6(OH)_2$). In the unit cell of OCP, a water layer separates two apatitic layers of similar structure and composition to the hydroxyapatite unit cell. Additionally, the nanocrystals in bone have a plate-like morphology that is more similar to OCP than highly-crystalline hydroxyapatite. OCP has been suggested as a precursor to biological apatites, as an OCP-like intermediate has been detected recently in mineralizing murine calvarial tissue before developing into apatite.

Octacalcium phosphate samples were allowed to hydrolyze in solutions kept at 37°C and 7.4 pH. The rate and mechanism of the aqueous transformation of OCP to apatite were investigated by periodically removing the OCP samples and analyzing with Raman spectroscopy and powder X-ray diffraction. The hydrolysis of OCP to apatite is evident by the decrease in $HPO_4^{2-}$ peaks relative to $PO_4^{3-}$ peaks in the Raman spectra at 880, 912, 967, 1000, and 1010 wavenumbers. This transformation, which was also evident by a decrease in the 4.8 degree peak in the XRD over time, was determined to proceed slowly for the first several hours and then more quickly over the next 3-5 days. Support from the National Institutes of Health grant #AR047969-05A2 is appreciated.

### 4. NMR studies on the insoluble drug encapsulation inside a self-assembled adipic acid G4-PAMAM dendrimer system in aqueous solution

Lindsay Cronin, Che-Hin Ho, Zhiyuan Wang, and Minghui Chai
*Department of Chemistry, Central Michigan University, Mt. Pleasant, MI 48859*

In this research we first use adipic acid to self-assemble on the surface of a G4-PAMAM dendrimer via electrostatic attraction between the positive ammonium group from the dendrimer and negative carboxylate group from the diacid molecule. This interesting self-assembled system is very water-soluble which can be used to encapsulate insoluble drugs such as salicylic acid and ibuprofen to enhance their solubility in aqueous solution. Multidimensional NMR techniques have been used to characterize the system and to probe the location of the drug molecule inside the dendrimer. Diffusion NMR and proton $T_1$ relaxation measurements have also been used to investigate the interaction between the drug molecule and the dendrimer-acid self-assembled system.

### 5. Probing drug release of dendrimer encapsulated systems on molecular sieves

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*[2]Dow Corning Corporation, Midland, MI 48686*

In this work G4 amine-terminated PAMAM dendrimer with an ethylene diamine (EDA) core was utilized to encapsulate salicylic acid molecules, which could enhance the solubility of the drug in water significantly. Furthermore molecular sieves were employed to adsorb the drug and drug-dendrimer systems for a preliminary formulation study on drug-dendrimer system. Then the release of salicylic acid in aqueous solution was probed using kinetic NMR and UV-Vis techniques. Multidimensional NMR techniques have been used to characterize the systems for NMR resonance assignments. The results from NMR studies indicated that there are two kinds of salicylic acid molecules exist in both systems (drug molecules on molecular sieves with and without the PAMAM dendrimer). Diffusion NMR has also been performed to gauge drug dynamics in the systems quantitatively.

### 6. Probing the effect of core-size of PAMAM dendrimers on the encapsulation of drugs

David Andras Galinac and Minghui Chai
*Department of Chemistry, Central Michigan University, Mt. Pleasant, MI 48859*

In this work G4 amine-terminated PAMAM dendrimers with different size cores including EDA (ethylenediamine), DAB (diaminobutane), DAH (diaminohexane), and DADD (diaminododecane) was utilized to encapsulate non-steroidal anti-inflammatory drugs (NSAIDs) such as salicylic acid, ibuprofen and indomethacin in order to enhance the solubility of these drugs in water. Multidimensional NMR techniques have been used to characterize the structures of the drug-dendrimer complexes systems. $^{1}H$ diffusion NMR and $T_1$ relaxation measurements have also been performed to gauge the efficiency for drug encapsulation of the different core-size PAMAM dendrimers.

### 7. Synthesis and characterization of glucosyl salicylic acid

Jarrett Rowlett and Minghui Chai
*Department of Chemistry, Central Michigan University, Mt. Pleasant, MI 48859*

Commonly used non-steroidal anti-inflammatory drugs (NSAIDs) such as salicylic acid, ibuprofen and indomethacin are sparingly soluble in water, which leads to a large dosage used in the clinic treatment. This research uses glycosylation to react glucose with salicylic acid forming water soluble glycan in order to enhance the solubility of salicylic acid in water. NMR, ESI-MS and IR techniques have been used to characterize the structure of glucosyl salicylic acid. The synthesized glycan form of salicylic acid can dissolve in water more than 100 times in comparison with the original drug.

### 8. Synthesis and characterization of galacosyl salicylic acid

Daniel MacHue and Minghui Chai
*Department of Chemistry, Central Michigan University, Mt. Pleasant, MI 48859*

Salicylic acid has been used as an anti-inflammatory drug for easing aches and pains and reducing fevers. However its low solubility in water (~ 2 mg/mL) results in a large dosage for medication. This research uses glycosylation to react galactcose with salicylic acid forming water soluble glycan in order to enhance the solubility of salicylic acid in water. NMR, ESI-MS and IR techniques have been used to characterize the structure of galacosyl salicylic acid. The synthesized glycan form of salicylic acid can dissolve in water up to 100 times in comparison with the original drug.

### 9. Investigation on CdS quantum dots stabilized by various thio-capping agents

Rajith Madushanka, Adam Jankovich, and Minghui Chai
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In this study five thio-capping agents are used to synthesize different CdS quantum dots (QDs). Most of the synthesized CdS quantum dots are water soluble. Various NMR techniques including 2D-NMR, $^{1}H$ diffusion NMR, and $T_1$ measurements have been used to study the capping agent interactions with the CdS nano-clusters. UV-Vis spectrum shows a distinct wavelength for the maximum absorbance of each kind of CdS QDs. In comparison with the IR spectra of the capping agents alone, the disappearance of thio-functionality in the IR spectra of the CdS QDs clearly indicates that the thio-capping agents interact or react with CdS nano clusters tightly. AFM have also been used to probe the sizes of these CdS quantum dots.

### 10. Synthesis of Various Amino Ester Hydrochlorides using Triphosgene

Candace Robinette, Steven Crain, and David Baker
*Science Division, Delta College, University Center, MI, 48710*

Most organic chemistry synthetic strategies use thionyl chloride, phosgene and oxalyl chloride as ideal chlorinating agents. Our investigations focused on using triphosgene as an alternative chlorinating agent. Triphosgene has been used to prepare a variety of methyl, ethyl, and benzyl ester hydrochlorides of a variety of the amino acids phenylalanine, histidine and proline. Interesting experiments applicable to the organic chemistry curriculum have been developed; these experimental procedures will be described.

### 11. Sustainability Approaches in the Organic Laboratory.

David Baker
*Delta College, University Center, MI 48710*

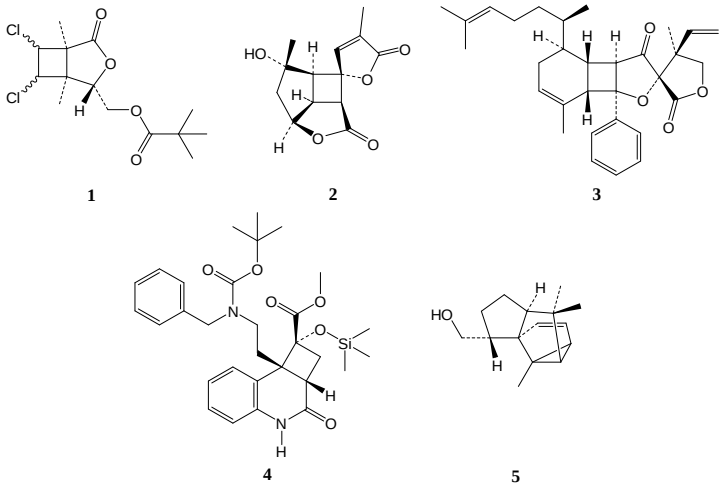
Today most organic chemistry courses use microscale glassware and equipment. The advantages of microscale equipment in reducing the amounts of chemicals used, improving laboratory safety, reducing costs and reducing waste produced are significant. Recently an evaluation of the sustainability of these courses pertaining to the consumption of

other resources was initiated. The results of our assessment have lead to some surprising observations and have initiated some new techniques and approaches. These experimental developments and their results will be presented.

### 12. Review of Recent Total Syntheses of Nonracemic Natural Products That Include Key Photocycloaddition Steps

Wendell L. Dilling
*Department of Chemistry, Central Michigan University, Mt. Pleasant, MI*

This poster reviews several recent publications where photocycloaddition reactions of nonracemic unsaturated compounds served as key steps in the total syntheses of natural products. The photocycloaddition reactions involved the following types of compounds that resulted in nonracemic cycloadducts, 1-5: an α,β-unsaturated γ-lactone, a 5-alkylidene-2(5H)-furanone, an ω-pentenyl-1,3-cyclohexadiene, a quinolone, and an ω-pentenylbenzene. The final nonracemic natural products prepared by the synthetic sequences were (–)-merrilactone A (Inoue, et al), (+)-tetracyclic core of bielschowskysin (Sulikowski, et al), (–)-biyouyanagin A (Nicolaou, et al), (+)-meloscine (Bach, et al), and (–)-penifulvin A (Gaich, Mulzer).




### 13. ACS Presidents from the Midland Section

Wendell L. Dilling
*Department of Chemistry, Central Michigan University, Mt. Pleasant, MI*

Two men from the Midland Section have been elected to the American Chemical Society presidency. Dr. Edgar C. Britton served as president in 1952, and Dr. Thomas H. Lane is serving in 2009. At the time of his election, Britton was director of the organic research laboratory and vice chairman of the executive research committee at The Dow Chemical Company. Lane is director, global science and technology outreach, and a research scientist at Dow Corning Corporation. Both men received part of their college education in Indiana and Michigan. Britton studied at Wabash College and received B.A. and Ph.D. degrees from the University of Michigan. Lane received B.S. and M.S. degrees from Purdue University and Central Michigan University, respectively. Britton's emphases during his presidential year were expanding original research in order to lay the foundation for future chemical businesses, establishing a balance between original and developmental research, maintaining and expanding ACS publications and Chemical Abstracts, and utilizing military reservists to support a large active military and an industrial and agricultural program for the US. Lane's emphases during his presidential year are keeping education and science literacy at the forefront of our thinking and pivotal in our actions, keeping an open mind, hearing all voices, and practicing tolerance and acceptance as ACS continues to reach out, building new and productive relationships that support the ACS strategic plan, and developing outcome-based metrics to guide ACS.

### 14. Novel, Durable, Rapid-Cure, Advanced Nonskid Deck Covering Material

Peter Carver, Lowel Thomas, Robert Nowak
*Michigan Molecular Institute, Midland, MI*

Nonskid coatings onboard naval ships are essential. The coatings need to be resistant to oil, chemicals, fire and moisture, while still being durable and aesthetically pleasing. Most nonskid deck coverings to date are based on multilayered systems of epoxy resins, polyurethanes or acrylics. These often require at least two components and thorough mixing before application. The drying times of the multiple layers drive up costs, not just in materials but also

the time involved. A new binding polymer system is proposed here that should allow for a single layer, single component application onto steel decking that should successfully meet all the present requirements of naval deck coverings. It should be thinner, lighter, cost less, cure faster yet be more durable in the rigors of a naval environment.

### 15. Plastics Recycling

S.E. Keinath, L.S. Thomas, and A. Merrington
*Michigan Molecular Institute, Midland, MI*

The percentage of plastic waste in MSW increased from less than one percent in 1960 to 12.1% in 2007. It is perhaps this increase in the quantity discarded that has made plastics an obvious target for environmentalists and plastic recycling a publicly desired alternative to disposal in landfills. The quantity of plastics recycled annually has increased steadily since records have been kept. Nevertheless, the rate of recycling is not keeping up with the rate at which virgin plastics are being produced.

The plastics recycling industry initially focused on the primary recycling of single types of plastics that, in turn, generate the greatest financial returns. Plastics may require greater processing to be recycled than glass and metal materials. Mixed plastics typically have poor mechanical properties resulting from poor interfacial adhesion. Recycling single resin plastics from post-industrial or post-consumer sources utilizes standard processing equipment for the most part. Plastics are melted, extruded, pelletized and then formed into a final product. Additives may be added that compensate for prior use, additional processing caused thermal histories or new product needs, but the use of these additives is minimized to control the overall cost of the recycled plastic and thereby increase the overall profitability of the process.

This poster will outline some of the routes companies have developed to successfully recycle plastics.

### 16. Liquid Crystalline and Light Emission Properties of Polyesters Bearing Oligophenylene Groups

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[1]*Saginaw Valley State University, Saginaw, MI*
[2]*Centro de Investigación en Química Aplicada, Saltillo, Coah., México*
[3]*The University of Akron, Akron, OH*

Oligo and poly(p-phenylenes) are interesting materials because they can develop both liquid crystalline (LC) and light emission (LE) properties. Normally, the observed LC properties of these highly anisotropic molecules are of the nematic and smectic types, depending on the molecular structure and substituents. The light emission is in general situated in the blue region of the electromagnetic spectrum (380-420 nm) and it is produced when molecules are excited electrically or by UV-irradiation. The light emission can be modulated by introducing electron-donating or electron-attracting groups onto the phenylene rings. The combination of LC and LE properties is interesting because a polarized light emission can be obtained from films deposited onto a pre-aligned substrate. In this work, two polymers bearing terphenyl and quinquephenyl groups with and without cyano groups were synthesized and characterized by POM, DSC, UV-vis absorption / emission spectroscopy.

DSC: the polyester with pentamer groups showed a transition at high temperatures that lead to a LC behavior. The polyester with trimers did not developed LC properties because the lateral chains perturb the interaction of these trimers. POM: the polymer bearing a pentaphenyl without cyano groups showed a mesomorphic behavior at high temperatures (240-250°C). This polymer had a schlieren texture which indicated a nematic type of mesophase. UV-absorption: the trimer without CN groups 268 nm1, with one CN group 310 nm (TCN) and with two CN groups 331 nm (PE-trimer). The pentamer without CN groups 332 nm (PE-pentamer) which was due to longer conjugation. UV-emission: both polymers showed a light emission around 400-410 nm.

The electron-attracting cyano group shifts the absorption maxima towards higher wave lengths. A liquid crystalline behavior was observed only for the PE-pentamer. These polyesters are potential materials for applications in light polarized OLEDS and related devices.

### 17. Behavior of Poly(ether) Fluids Under Thermal Stress

B. A. Howell and Mahmoud Alomari
*Center for Applications in Polymer Science and*
*Department of Chemistry, Central Michigan University, Mt. Pleasant, MI 48859-0001*

Poly(ether)s generated by copolymerization of ethylene and propylene oxide find a wide range of industrial applications. Some of these are used as hydraulic fluids. In this application they must display good thermal and mechanical stability. The thermal stability of these fluids is being investigated by both dynamic and isothermal thermogravimetry, by mass spectrometry and by pyrolysis. These materials display good long term thermal stability in

the absence of air. For example, at 180°C in nitrogen the mass loss is less than 5% at 15hr, about 15% at 33 hr and only 25% at 45 hr. Significant failure occurs only at longer times. Pyrolytic decomposition leads to the formation of a variety of small molecule products.

### 18. Optical Switching Materials for Space Environments

Salma Rahman,[1] George W. Rayfield,[2] Edward W. Taylor,[3] and Abhijit Sarkar[1]
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Optical power limiters (OPL) are nonlinear materials that limit the amount of energy transmitted by exhibiting a drop in transmittance as the energy of incident laser pulses increases above a certain threshold value. They have potential for protecting optical sensors or other optical devices from laser-pulse damage. The interest in OPL for use in the space environment is due to the increasingly large number of space based missions and applications that require laser protection. Temperature and space radiation-induced effects in optical and electronic materials are well known and can cause disruption in OPL functions or in the worst case failure of the sensor. Therefore, materials that can withstand the space environment, has been an area of much exploration in recent years. Some of the best-performing optical limiters are materials containing chromophores that work via reverse saturable absorption, multiphoton absorption or nonlinear scattering mechanism; however, such materials are difficult to prepare and have problems with stability. In this presentation, a new polymeric OPL material based on multi-chromophore/mechanistic approach is described. The origin of the OPL properties in these materials and preliminary results of ionizing radiation effect on the OPL properties for the films are discussed.

### 19. Density functional theory study of Li mediated hydrogen storage in carbon nanostructures.

Prabath Wanaguru,Veronica Barone, and Juan E. Peralta.
*Central Michigan University, Mt. Pleasant, MI*

Storage mechanisms of hydrogen molecules became the most critical factor for hydrogen-based energy technologies. Storing hydrogen molecules in a phase between chemisorbed and physisorbed levels are crucial to operate this technology at ambient temperature and pressure. Here we present results based on first-principles density functional theory calculations on the hydrogen storage potential of carbon compounds such us C60 and graphene nanoribbons. We specifically look into the potential of carbon nanomaterials doped with lithium atoms to bind hydrogen molecules. In these calculations we look for the maximum number of lithium atoms that can be adsorbed into the carbon structure and their stability, most favorable position for the lithium atoms, charge acquired by the lithium atoms, and the binding energy of hydrogen molecules in these Li-doped systems.

### 20. Using glycerin from biodiesel production as a co-fuel in a heating furnace: Emissions and efficiency

Cassie J. Patterson[1], Iwan Setiawan[1], Christopher H. Schilling[2], and David S. Karpovich[1].
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[2]*Department of Mechanical Engineering, Saginaw Valley State University, 7400 Bay Road, University Center, 48710*

Triglycerides from soybean and other seed oils react with methanol in a transesterification process to yield methyl esters (biodiesel) and glycerin. The crude glycerin byproduct is considered waste since it would have to endure an expensive purification process before use in the chemical industry. As biodiesel production increases, there will be a corresponding increase in disposal of crude glycerin. In this study, we demonstrate the use of glycerin as a co-fuel in an oil-type furnace. Since incomplete combustion of glycerin is known to produce the carcinogen acrolein, the efficiency of the burning process must be carefully monitored and adjusted. This entails the analysis of the furnace exhaust for acrolein and other aldehyde emissions by first derivitizing with 2,4-dinitrophenylhydrazine (DNPH) then measuring using HPLC. This project is funded by the Michigan Soybean Promotion Board.

### 21. Approaching an Inquiry Curriculum: The Development of an Research-Based Experiment for General Chemistry

Katelyn Carter, Janice Hall Tomasik, Mitchell Heethuis, Arpita Mohanty, Sylvia Diaz, and David Squires
*Central Michigan University, Mount Pleasant, MI*

There is a movement in the world of science education to better train students in critical thinking. Current “cookbook” type experiments which spell out the methods and procedures for the experiment do not stretch the students’ mind. Experiments which are inquiry based, where the students have to develop part of the experimental procedure themselves, are shown to boost students’ critical thinking skills. An experiment has been developed based on the research of CMU’s professor, Dr. Anja Mueller. In this experiment students are presented with a real-world problem that a faculty in their own department is currently working to solve. Students are asked to compare the effectiveness

of cadmium ion removal from wastewater via activated carbon, sand, and Dr. Mueller's imprinted polymer. The students find that the imprinted polymer is the most effective, all the while being exposed to a variety of new concepts such as polymers, flame AA, column chromatography, ion exchange, and the idea of cost effectiveness. An initial version of the lab was given to two general chemistry student volunteers. The students were surveyed and their comments were used to modify the lab for a larger pilot study this fall.

### 22. Chemistry Club members x [kids] = moles of fun at SVSU

Rafe MacKenzie, Christopher M. Alvey, Margot M. London, Annette H. Pretzer, Anthony J. Lucio, Cassie J. Patterson, and David S. Karpovich
*Department of Chemistry, Saginaw Valley State University, University Center, MI*

Community involvement is a top priority for the Chemistry Club of SVSU, and this past year we focused more on one of the most fundamental and critical aspects of community: its youth. The club has enjoyed organizing demonstrations at special events, especially those that encourage young students and future chemists to get involved with practical chemistry-related activities. As part of SciFest, held at Delta College in 2009, we emphasized the involvement of chemistry in making athletic equipment by using our own innovative polymer crafts. The Science and Mathematics Extravaganza for Kids (SMEK), held each year at SVSU, gives kids the opportunity to choose their own area of interest within the sciences and allows them to perform hands-on experiments in those areas. Overall, we feel that by providing these science related activities to kids, we can help them enjoy science and encourage them to pursue scientific careers.

### 23. Mid-Michigan Technician Group in 2009

Gerard Nowaczyk, MMTG 2009 Chair, Dow Corning Corporation, Midland, MI 48686 and Dana Fuerst, MMTG 2009 Immediate Past Chair, The Dow Chemical Company, Midland, MI 48674

*The Mid-Michigan Technician Group (MMTG) strives to provide Chemical Technicians with opportunities to develop and expand their professional skills.*

MMTG had an outstanding year in 2009! Membership levels have been rather steady in this unsteady economy. Despite the poor economic outlook and many technicians being the first to be laid off in their departments MMTG gained 21 new members. MMTG kicked off the year with a very large lunchtime talk by the current President of ACS, Dr. Tom Lane. This event was co hosted by the ACS Division of Chemical Technicians and included technicians from Dow Chemical and Dow Corning that were not members of MMTG. A lunchtime event specifically geared for the students from Delta Colleges Chemical Technology curriculum support by a grant from ACS's preparing the Chemical Technology Workforce for 2015 and beyond was very well attended and received by all in attendance. Noted speakers were Patricia Moore of Dow Corning Corporation and Curt Theriault of Dow Chemical, they described their choice in career ladders as technicians. A vendor seminar luncheon by Buchi Corporation was held. A history of and chemistry of beer event was held at the local TriCity Brewery with tremendous success. A premier speaker from the local Toastmasters presented on the basics of "How to Give a Technical Talk, a lunch-n-learn session. And the 2008 Member Appreciation/Meet the 2009 Board Year End Lunch.

MMTG was also very active in public outreach programs, with members participating in National Chemistry Week, Sci-Fest 2009, Fall Scientific Day, and many chemistry demonstrations at local fairs and schools. Two members also participated in the Career Pathways held at Delta College, where hundreds of local high school students were allowed to find more information on their careers of interest. Members again participated in the Salvation Army's Adopt-A-Family program. By collaborating with Corporate Sponsored Technician Groups and members' co-workers, enough money was raised to adopt not only one but three families instead! MMTG also collected $500 to provide backs for local area school in need of backpacks for the new school year.

### 24. Chemistry in the Nontraditional Classroom

Victoria Behe,[1] Nancy Vossen,[2] Bob Moyer[3]
*[1]Carrollton Omni Adult, Alternative, and Early College High School Affiliation*
*[2]Windover High School*
*[3]Bay Arenac Community High School*

In association with the American Chemical Society and area foundations, three area alternative high schools (Omni Adult and Alternative High School, Windover High School, and Bay Arenac Community High School) are adapting the state-mandated chemistry curriculum for alternative learners. Now in our first year after the pilot program, these at-risk students are learning chemistry just like their traditional counterparts. The poster presentation will show how chemistry teachers from the involved schools have collaborated and developed curriculum that will be beneficial for all chemistry teachers throughout the state of Michigan.

**25. Synthesis of Hyperbranched Polymers for Use in Composites and a Surface Coating in a Prosthetic Heart Valve**

K. Strong, A. Mueller
*Central Michigan University Chemistry Department*

Adhesives which are able to bind to different materials and strengthen the composition of materials can serve a variety of applications. When patients undergo prosthetic heart valve replacement they must take blood anticoagulation medications that can have potentially dangerous side effects. Blood coagulation will occur on artificial surfaces when they are placed in the bloodstream which contains blood proteins and platelets which cause a cascade effect of coagulation that can lead to a large blood clot on the artificial valve. A polymer coating composed of different polymers that is able to stick and adhere to the surface of an artificial valve but can still retain anticoagulation properties can present a solution to the potentially harmful effects of blood anticoagulation medications. Likewise, a polymer coating that is able to adhere to individual molecules within a composite material can help strengthen the durability of the material. Such a polymer coating will be hyperbranched because the many branches on the polymer will increase adhesion to the pyrolitic carbon on the surface of the heart valve and increase anticoagulation on the outer surface of the polymer coating. In a composite the many branches of a hyperbranched polymer will allow it to adhere to several molecules within the composite and allow for greater adhesion as well as a greater overall composite strength and durability. Resorcinol, hydroquinone, and catechol were three monomers that were subjected to enzymatic polymerization by HRP. HRP is known to synthesize aromatic polymers via a radical mechanism. In our case oxygen is a part of the mechanism, instead of hydrogen peroxide, to regenerate the enzyme. Hydroquinone and catechol yielded linear polymers and resorcinol yielded a hyperbranched polymer. Results for the synthesis of these polymers will be presented as well as some properties that can be used in a variety of applications.