GREENUP CONFERENCE

On September 25, the Michigan Department of Environmental Quality hosted the first GreenUp Conference at the Fort Shelby Downtown Detroit Doubletree. This conference was designed to stimulate academic, industrial, and government partnerships to advance green chemistry in the state of Michigan. Over 120 attendees were present, including numerous leading experts from the state and national levels. Topics covered in the sessions focused on environmental concerns and implementing green chemistry practices into industrial applications, green chemistry curricula in higher education, and green chemistry and sustainability from a business and economic perspective. Registrants were encouraged to participate in breakout interactive sessions, allowing attendees to apply the topics to their unique field.

The morning session consisted of opening remarks from Steven Chester of MI DEQ, followed by an opening presentation by Amy Cannon, co-founder of Beyond Benign, a non-profit organization that specializes in K-12 curriculum, community outreach, and workforce training in green chemistry. Four 2-hour breakout sessions were held before lunch covering the topics of green chemistry curricula, green manufacturing innovations, the practice and requirements of green chemistry and engineering, and innovations in green catalysts. After lunch, ten more 1-hour sessions were available for attendees focusing on standards, regulation, and policy; green chemistry and energy; bio-based chemical engineering, and business practices.

The afternoon keynote speaker for the event was the “founding father” of the green chemistry movement, John Warner. John is a founder of the Warner Babcock Institute for Green Chemistry, the Center for Green Chemistry at University of Massachusetts-Lowell and Beyond Benign. He, and fellow green chemist Paul Anastas, recently received a Leadership in Science award from the Council of Scientific Society Presidents for their work in green chemistry.

Full conference proceedings may be found at www.michigan.gov/deqgreenchemistry.
Winners of the first annual Michigan Green Chemistry Governor's Award Program were honored on September 24 at a ceremony at the Detroit Institute of Arts. This award program was established by the Michigan Green Chemistry Roundtable in support of Governor Granholm’s Executive Directive to celebrate leaders in green chemistry across the state. The awards recognize work that utilizes green chemistry in industrial processes, or projects that support role for implementation of such technologies in education or research areas. Awards were given in five categories: business, academics, education, public sector, and student.

Business awards were given to PPG Industries Inc. and Dow AgroSciences. PPG was honored for their development of a liquid paint detackifier. The product, which serves as an alternative to petroleum-based products, is derived from waste from food production, such as lobster and shrimp shells. Dow AgroSciences received recognition for Spinetoram, an active ingredient in insecticides that has a low toxicity and short environmental persistence.

In the field of academics, Yinlun Huang of Wayne State University and Phillip Savage of the University of Michigan won awards for their research. Huang’s work involves research into hazardous substance source reduction in the electroplating industry, with the promise of profiting through the implementation of technology. Savage’s research resulted in the replacement of flammable organic solvents with water for the synthesis of terephthalic acid, eliminating a harmful pollutant.

Grand Valley State University’s Chemistry Department won an education award for the integration of green chemistry across the university’s science curriculum, initiating a green chemistry education network, and developing a green chemistry certification.

A public sector award was given to the Ecology Center of Ann Arbor for advocating green chemistry policy in Michigan. The Center has been continuously advancing green chemistry to support sustainable economic development in MI.

Nathan Craft, chemistry major at Grand Valley State University, was honored with a student award for his research in hydrogenation processes with potential uses for the synthesis of drugs and specialty chemicals.

Further information on the Michigan Green Chemistry Program is available on the DEQ Web site at: www.michigan.gov/deqgreenchemistry.
Green Chemistry will be highlighted this year at the Spring National American Chemical Society (ACS) Meeting held in San Francisco March 21-25, 2010. The theme of this year’s program is “Chemistry for a Sustainable World.” In the spirit of this theme, a symposium entitled Green Chemistry, Sustainability, and Education: Collaborative Projects and Interdisciplinary Outcomes is being organized by Dalila Kovacs of GVSU (kovacsd@gvsu.edu) and sponsored by the Division of Chemical Education. This event will focus on the need for green chemistry content in modern chemistry curricula, as potential strategies and methods for teaching green chemistry in the classroom and lab. The symposium description is given below:

It is an exciting time to be a chemist! The profession is, again, at the crossroad of the societal progress. The future generation of specialists has to able to meet the needs of the presents without compromising the future. Is the chemistry curriculum preparing them for these exciting asks? Are our students ready to enter in today’s job market open to many non-traditional and interdisciplinary careers?

Despite the very definition of green chemistry today as a new approach toward benign design of chemicals and process development, there is the general acceptance that green chemistry will become mainstream chemistry. This transitional period requires specific and flexible approaches: specific involves green introductory and advanced courses of green chemistry principles, practice, and case studies; flexible approaches involve adaptability to continuous building of knowledge, information dissemination, awareness of innovative projects, and adaptability to new challenges.

This symposium will feature a variety of successful mechanisms for teaching and learning green chemistry. Speakers form all areas of green chemistry, form research-focused to small liberal arts and community colleges, from industrial and governmental organizations to non-profit, are invited to discuss various aspects of their work to make learning green chemistry an active engagement with the world with focus on the distinctive requirements of undergraduate education, including multidisciplinary initiatives. In particular, the organizers will share the results of their effort toward building a Michigan Green Chemistry Education Network and toward integrating it into the worldwide network of educators interested in teaching green chemistry.

Another green chemistry related symposium entitled Sustainability: What, Why, and How will also be sponsored by the Division of Chemical Education. Early conference registration begins December 21, 2009 and standard registration is available from February 3 until March 25, 2010. More information about the Spring National ACS meeting may be found at http://portal.acs.org/portal/PublicWebSite/meetings/index.htm.
ANNUAL GREEN CHEMISTRY AND GREEN ENGINEERING CONFERENCE & GOOGLE CONTEST

The 14th Annual Green Chemistry & Engineering Conference returns to downtown Washington, DC on June 21-24, 2010. With the theme "Innovation and Application" and with Dr. John Warner as the chair, this conference is shaping up to be one you won’t want to miss!

Technical Programming: Please visit the conference website, where more details will be posted as they become available: http://acswebcontent.acs.org/gcande/

Google Map Contest for Free Conference Registration:

The University of Oregon in partnership with the ACS Green Chemistry Institute is sponsoring a contest to increase the number of people and organizations listed on the Green Chemistry Google Map. Each new person or organization that submits their information to the map will be eligible for a drawing to receive a free registration for the Green Chemistry & Engineering Conference, June 21-24, 2010.

The contest begins November 1, 2009 and runs until December 15, 2009. The main goal of the map is to raise the visibility of people working in the area of green chemistry from academia (educators and researcher), industry, government and non-governmental organizations. The map originated as a tool to provide educators with access to local contacts (education, industry, government and NGOs) that may be useful as they prepare educational activities for their students. In addition, local contacts can help to strengthen the green chemistry community and provide resources for regional projects and outreach activities.

Here is the link to the Google map that can be used to locate individuals interested in green chemistry education and research.

http://greenchem.uoregon.edu/Pages/MapDisplay.php

To enter the contest, select the "Instructions" link located at the top of the map page and add your information to the map. Please contact Julie Haack (jhaack@uoregon.edu) if you have any difficulty submitting your Google map information.
STUDENT-RUN BIODIESEL FACILITY TO BE LAUNCHED

A student focused interdisciplinary program is being launched at GVSU. Biodiesel, a fuel produced from the transesterification of vegetable oils or animal fats, provides similar fuel economy as petroleum-based diesel. In addition, biodiesel emissions are significantly lower than that of petroleum-based biodiesel. The GVSU small scale production facility will be run by students and supply biodiesel to the Western Michigan community. This facility will foster the opportunity for students to engage in research following a Green Chemistry approach. The biodiesel facility will require students to consider processing, quality control, management, networking, and the environmental impact of processing as they engage the project. Bart Bartels (bartelba@gvsu.edu) from the Sustainable Community Development Initiative is the project manager and is working closely with Steven Leeser (leesers@gvsu.edu) & David Cox (coxd@gvsu.edu) of Facilities and Ethan McCann (mccanet@gvsu.edu) of Campus Dining to establish a supply of waste vegetable oil in which to propel this project forward. Melissa Baker-Boosamra (bakerbom@gvsu.edu) from the Liberal Studies Department is working closely with two students from her department on a service project based on the waste oil conversion in to biodiesel. Jim Seufert (seufertj@gvsu.edu) oversees laboratory safety under the College of Liberal Arts and Sciences, and Dalila Kovacs (kovacsd@gvsu.edu) and Kristina Mack (mackkr@gvsu.edu) are the Chemistry Department contacts for the project.

COMPACT FLUORESCENTs AND GREEN CHEMISTRY IN THE NEWS

Compact fluorescent bulbs, and their use as “green” alternatives to standard incandescent bulbs, were recently featured in the local West Michigan news. In November, Jim Krikke of GVSU was interviewed by WXMI, Fox-17 News regarding the benefits of using compact fluorescent lights (CFLs) in our homes, including the energy savings involved by switching to CFLs. They also investigated the fact that a small amount of mercury is used in the bulbs (4mg maximum per bulb, although some newer bulbs have it down to about half that). After demonstrating the shattering of an incandescent light versus a CFL, Jim visually demonstrated how little 4 mg of mercury actually is. Finally, the proper disposal and cleanup of the CFL’s was discussed. The segment also highlights the green chemistry program at GVSU and its goals. A link to the story is below:

http://www.fox17online.com/videobeta/watch/?watch=d3f87da2-b2aa-45ef-8904-8664905dbaa4&src=front
Listed here are numerous professionals in MI who are actively involved in green chemistry and/or green engineering in an industrial, academic, or regulatory setting. A brief summary of their areas of expertise and activity is also given. Please contact these individuals if you would like more information regarding their projects or wish to collaborate. A world-wide map listing of green chemistry experts may be also found online at the address below:
http://greenchem.uoregon.edu/Pages/MapDisplay.php

Jennifer Aurandt (jaurandt@kettering.edu) and Montserrat Rabago-Smith (mrabagos@kettering.edu) - Kettering University:
Jennifer and Montserrat have been actively developing green chemistry curricula at Kettering University, including a green industrial chemistry course aimed at engineering majors and another with an industrial ecology focus:

**Green Industrial Organic Chemistry Course for Engineers:**
Promoting environmentally responsible engineers and scientists necessitates the integration of green chemistry into the undergraduate engineering curriculum. In response to this need, Kettering has developed a pollution prevention (P2), Green Chemistry, and Green Engineering course designed for undergraduate engineering students that have taken general chemistry. Instead of the option of adding an additional course to a packed curriculum, they have modified a course that is required of all Mechanical and Industrial Engineering students at Kettering University - Chem 145: Industrial Organic Chemistry. The course would be a lab/lecture hybrid course entitled: “Green Industrial Organic Chemistry”. This course would meet all of the learning objectives for the traditional organic chemistry course for engineers while using the 12 principles of Green Chemistry and Green Engineering as the spine of the course. The pedagogy includes the engagement of students in interactive dialog, internet research on the web, networking opportunities with industry, government, and academic professionals that are knowledgeable and well experienced in the field of P2, the twelve principles of Green Chemistry and the principles of Green Engineering. In addition, laboratory exercises will be conducted in order to facilitate the learning of organic chemistry. The students’ understanding of the learning objectives of organic chemistry will be assessed and compared to other sections taught without the incorporation of the green principles. Students’ understanding of the green chemistry will also be assessed through both formative and summative assessment tools. The class will be assessed through peer review by the chemistry and engineering faculty. Development of this course is supported by Michigan Pollution Prevention Retired Engineers Technical Assistance Program (RETAP) Internship Program, administered by the Department of Environmental Quality, Environmental Science and Services Division.

**Green Chemistry in an Industrial Ecology Course:**
The National Academy of Engineering released the Grand Challenges facing engineering in the next century. Environmental sustainability is related to at least 5 of the fourteen challenges. To
address these challenges, a multi disciplinary team of six faculty members from engineering, business, and chemistry developed a course entitled, “Environmentally Conscious Design and Manufacturing”. In this course there are six distinct modules agreed upon as necessary to meet the environmental challenge of re-designing common products sustainably. The course is based upon the Ford Partnership for Advanced Studies (PAS) pedagogy which emphasizes active learning through “hands-on activities”. The original six modules include (1) Historical Social and Ethical Perspectives, (2) Life Cycle Analysis, (3) Material Selection, (4) Process Design, (5) End of Life Options, and (6) Environmentally Responsible Management. In addition to these original modules Green Chemistry was added as a seventh module to add an important lab component to the course. Each module was designed to become a stand alone module able to be disseminated and used in any course.

In the Green Chemistry module students synthesized biodiesel and analyzed the products through chemical analysis and using it as fuel in a jet engine. The 12 principles of Green Chemistry were presented as foundational knowledge for comparing the life cycle of petroleum-based diesel to vegetable-based biodiesel. Students’ learning was assessed quantitatively for each module along with qualitative comments using the Strengths, Improvements, and Insights (SII) format. From feedback gathered in the first course offering, the Green Chemistry module was enhanced to include the use of the student-made biodiesel in a laboratory jet engine housed in the Mechanical Engineering Department. In addition to the student assessment, the role of Green Chemistry in this course was assessed by an outside advisory team composed of engineers from industry and other educational institutions.

Future Plans:
Teaching: Jennifer seeks to design the lab associated with Industrial Organic Chemistry to be less polluting and used to apply the principle of Green chemistry. In the future she would also like to teach a mechanistic toxicology class to undergraduates at Kettering.
Research: Jennifer also hopes to use the principles of Green chemistry in her research with the conversion of the wastewater treatment plant into a biofuel facility. The project is in the beginning phases.

Clinton Boyd (cboyd@sustainableresearchgroup.com) – Sustainable Research Group:
Clinton and SRG develop chemical assessment tools for human health and ecosystem impacts of chemicals over entire life cycles of materials and products. They offer services and assistance in the areas of green research, marketing, and real estate development.

Tracey Easthope (tracey@ecocenter.org) – Ecology Center:
Tracey is currently the Environmental Health director for the Ecology Center, a nonprofit organization in Ann Arbor that works at the local, state, and national levels for clean communities, a healthy environmental, and sustainability. This is accomplished through grassroots organizing, advocacy, education, and demonstration projects.
Clifford Harris (charris@albion.edu) - Albion College:
Clifford is active in research using ionic liquids as reusable green solvents for novel oxidation reactions. He also teaches both organic chemistry and advanced synthesis courses at Albion College.

James Jackson (jackson@chemistry.msu.edu) - Michigan State University:
James is active teaching organic chemistry with a green chemistry component, as well as implementing a first-year green chemistry seminar course at MSU. His research is centrally focused on green processing and other areas of green chemistry.

Jim Krikke (krikkeji@gvsu.edu) - Grand Valley State University:
Jim has recently taught the new CHM 180 course: Pollution Prevention, Green Chemistry, and Green Engineering at GVSU last winter semester. Students explored the primary sources of pollution and how green chemistry and green engineering may be used to limit these sources via pollution prevention schemes. Research projects, presentations, and debates on various environmental topics were used to allow students to personally reflect on these issues. External speakers from various environmental backgrounds were invited to relate their expertise. In addition, several off-campus trips to industrial and municipal facilities were used to highlight both waste treatment and prevention techniques.

Dalila Kovacs (kovacsd@gvsu.edu) - Grand Valley State University:
Dalila’s research has focused on using heterogeneous catalytic processes as alternative green pathways from biomass-based resources. Her group studies competing pathways from sugar polyols to polymer building blocks, cyclic polyols as transfer hydrogenation donors on metal catalysts, and cellulose conversion. The latter project involves the investigation of yet another possible route to convert cellulose directly to ethanol, sorbitol, and mixed alcohols, avoiding the glucose stage and utilizing metal catalysts, easy to be separated and reuse in repeated catalytic cycles. Dalila has also been active developing courses at GVSU that center on the core principles of green chemistry & engineering. These include:

CHM 180: Pollution Prevention, Green Chemistry & Green Engineering. This special topics class addresses green chemistry and green engineering and is geared toward the freshman level.

CHM 311: Green Chemistry and Industrial Processes. Focuses on green chemistry principles and their industrial applications, global perspectives on green chemistry performed in industrial settings with no negative environmental consequences, and increased benefits to humans and the earth.

She has also worked on developing the Introduction to Environmental Studies and Sustainability course, part of the new Environmental studies minor at GVSU and is proposing a Green chemistry certification program to be offered at GVSU, currently under the university curricular revision. For more information, visit http://148.61.114.203/greenchem/index.html.
Robert Lehmann (lehmannr@michigan.gov) - Saginaw Valley State University:
Robert teaches the Environmental Chemistry I class at SVSU. This focuses on the natural chemistry and biochemistry of air, soil, and water, but it also includes the fate and effects of pollutants that enter the environment. A Green Chemistry course is currently also being taught at SVSU. An advanced class of five senior chemistry majors at SVSU is applying their environmental chemistry knowledge to real-world situations. Recent projects have included field work in making a map of water flow within the university and searching for potential pollutant sources. Another project investigated the green design and materials for a new medical sciences building. Their next project will involve site design and pollution prevention for a fictional, but typical, small factory; along with this project will come the chance to earn a state industrial storm water certification for future employment.

Megan Loll (meiglazar@umich.edu) - University of Michigan:
At the University of Michigan, the Office of Campus Sustainability in partnership with Hazardous Materials Management is working to implement green chemistry techniques on campus in both our teaching and research laboratories. We are working on developing a Green Chemistry Recognition program that assesses individual laboratories practices and makes recommendations. When we work with laboratories, we look at their waste streams, type of equipment, recycling practices, purchasing habits, energy efficiency, and more.

Doug Mandrick (jmandrick@portageps.org) - Portage High School:
Doug is currently working to convert high school level chemistry labs to be entirely green. He has recently done research with Dalila Kovacs at GVSU. In the past year he has attended a Beyond Benign session in Colorado to learn green techniques for high school courses.

Simona Marincean (simonam@umd.umich.edu) - University of Michigan Dearborn:
Simona teaches organic chemistry at U of M Dearborn, and will be teaching a green chemistry course in the near future. She is also active in experimental work in carbohydrates and corresponding polyols hydrogenolysis.

Dennis Miller (millerd@egr.msu.edu) - Michigan State University:
At MSU, Dennis heads research on several green chemistry related projects. These include the hydrogenolysis of carbohydrate feedstocks into various polyols, hydrogenation of organic acids into their corresponding alcohols, the development of advanced biofuels, and separation schemes for purifying products from renewable resource feedstocks.
Partha Nandi (nandipar@msu.edu) - Michigan State University:
Partha is currently working on design and applications of heterogeneous porous materials that have alkali-metals and their alloys. These new class of reagent/materials have found a wide range of applications in pharmaceutical, chemical, environmental remediation (e.g., freon destructions, PCB removal, diesel desulfurization) and material research (vinyl norbornene isomerization, preparation of initiators for polymerization). He is finishing up his PhD degree at Michigan State University and will be headed for a post-doctoral research in the area of heterogeneous catalysis.

Min Qi (qim@gvsu.edu) - Grand Valley State University:
Min plans to visit National Institute of Biological Science in Beijing in Aug. 2009. There, she will teach a short course on supercritical fluid extraction and supercritical fluid chromatography and their green applications. The class will be taught at the graduate level and consists of lecture and group discussion. While there, she will also meet faculty members in the institute to discuss future joint research opportunities.

Sudhakar Reddy (redv@bf.umich.edu) - University of Michigan:
The University of Michigan, through Occupational Safety & Environmental Health (OSEH), is promoting Green Chemistry among the teaching and research entities across the campus. They are closely working with the faculty to ‘green’ the experiments in the teaching labs while working on the syllabus to introduce Green Chemistry at undergraduate and graduate level courses. They are also working to advise research groups on pollution prevention, waste minimization, safer methods and substitution of chemicals with ‘greener’ alternatives.

Phillip Savage (psavage@umich.edu) – University of Michigan:
Phillip teaches chemical engineering courses at the U of M, and is active in various aspects of green chemistry research. His areas of interest include sustainable energy, green chemistry, synthesis in high-temperature water, supercritical fluids, and renewable energy.

David Shonnard (drshonna@mtu.edu) - Michigan Technological University:
David’s current work is based on a research initiative across the entire value chain of transportation biofuels from forest resources; forest function genomics, sustainable forest management, conversion of biomass to biofuels, fundamental combustion and emissions measurements in modified engines, and integrated sustainability assessments. Specific green chemistry projects include:
A. Chemical kinetic studies of sugars produced from forest biomass by acid catalyzed hydrolysis
B. Enzyme engineering - directed evolution studies for improving wild-type fungal cellulases
C. Fermentation - metabolic engineering and adaptation of biofuels-producing microorganisms.
D. Ionic liquids - design of novel reactive ionic liquids for biomass hydrolysis and pretreatment
E. Catalysis - design of nano-scale catalysts for conversion of pyrolysis bio-oil to hydrocarbon biofuel
F. Separative reactor design - integration of membrane separations with catalysis for biofuels recovery.
G. Durable biopolymers for automotive applications - co-polymerization of conventional biopolymer materials with residuals from fermentation for efficient mass utilization.
H. Life cycle assessment - carbon footprint analysis of biofuels and other bioproducts from forest resources.

CURRENT COLLABORATION REQUESTS

Listed here are the current collaborator requests for projects involving green chemistry. If you wish to contribute to any of these projects, please contact the project organizer(s) listed below:

Jennifer Aurandt (jaurandt@kettering.edu) - Kettering University:
Jennifer is seeking a group that is interested in developing a mechanistic toxicology or similar course for chemistry major undergraduates. She would also like to work with them in developing an upper division course and seeking funding for distributing materials to other universities for toxicology courses.

Jennifer Grivins (jgrivins@erpsk12.org) - Eaton Rapids High School:
Jennifer hopes to initiate a community, industry, and K-12 initiative for the city of Eaton Rapids. She is currently seeking contacts in these areas who are interested in contributing to this network as well as grant postings and funding support.

Megan Loll (meglazar@umich.edu) - University of Michigan:
Megan and the Office of Campus Sustainability are seeking laboratories interested in obtaining Green Chemistry Recognition as well as faculty interested in incorporating green chemistry into their curriculum.

NEWSLETTER SUBMISSIONS

If you wish to have your work in green chemistry included in an upcoming edition of the MI Green Chemistry Education Newsletter, please submit a short summary to MIGreenChem@gmail.com. All members of the green chemistry community are encouraged to submit news items, regardless of the scale or scope (including research, education, or other areas). Photos of your class, group, or project are welcome. Also, if you are looking for colleagues to collaborate with on future projects at your school or institution, please submit these requests as well.