

DEPARTMENT OF CHEMISTRY NEWSLETTER



Mark Jefferson Construction

The construction of the addition to the Mark Jefferson building is well underway (the above shot was taken March 3rd). The work, EMU's largest-ever single construction project, will include a three-story, 72,000-square-foot addition on the west side of the Mark Jefferson science building. When that's finished, the existing 180,000-square-foot structure will be completely renovated and updated.

The first phase, which is ongoing and will be completed this fall, will create an addition to the existing structure that will primarily contain instructional laboratories, faculty offices, and student interaction spaces. There will also be a spherical classroom/seminar room that will house a planetarium. The second and third phases will completely renovate the existing structure and include improvements to the mechanical and electrical systems, as well as the structure, roof, and site. Further, most of the existing interior walls will be demolished and there will be a very different floor plan on all of the upper floors of the existing building.

Between each phase, there will be a shuffling of offices and lab spaces to empty the spaces to be renovated. This will result in some labs and offices occupying temporary locations in the building for one or two years. So, if you come to visit us this fall you may

have to look around. By the end of fall, the chemistry faculty and department offices will have moved, most to the fifth floor of the addition. This fall, all of the instructional and research labs (except for the NMR) also will be moved out of the basement and second floor and into new locations (many temporary) in the addition.

The finished science complex will allow more interactive, technological classroom environments, interdisciplinary opportunities, and increased collaborative student work within classrooms, research labs, and dedicated study areas. It will also include environmentally friendly features including a rain garden to help with stormwater management and a green roof, which may also provide space for ecological education and experimentation.

The entire project is expected to be completed in 2012. For up to the minute progress on the project, you can visit the physical plant web-cam and update blog at

www.emich.edu/physplant/markjefferson.html

There is also a slideshow on the Chemistry Department's website which shows the time evolution of the construction. It is available at chemistry.emich.edu/special/construction/index.html

Burnt Bluff U.P. Expedition

Christina Phillips, BS General Biochemistry '09, and currently a Master's student in Chemistry, traveled with Dr. Armitage and a group of researchers to the Burnt Bluff rock art site in the Upper Peninsula in October 2009. The site is located on a sheer rock face on the Garden Peninsula, and is home to the only rock paintings in Michigan.

They were hoping to find paint on fragments from a collapsed section of the rock face where paintings were thought to have been; this would have provided the first ever radiocarbon date for the paintings.

Though no paint was recovered, it was an educational adventure: hiking two miles in rain on a rocky beach and climbing over large boulders to reach their destination are not common research experiences for chemistry students!



Welcome New Faculty!



Jeff Guthrie joined the Department of Chemistry in fall 2009 as an Assistant Professor in the area of environmental, bioanalytical chemistry. Jeff was raised in Kamloops, British Columbia and received his bachelor's degree from Thompson Rivers University. He completed his Ph.D. at Carleton University in Ottawa in aqueous environmental/analytical chemistry. After that, he went to the University of Alberta and did a postdoc in the area of bioanalytical chemistry, specifically in determining the mechanism of DNA damage from environmental agents. His second postdoc was at the Great Lakes Institute for Environmental Research at the University of Windsor where he began his current research.

Jeff's research involves developing aptamers, which are small synthetic nucleic acid fragments that have high affinity and selectivity for their targets, for the detection of environmental contaminants. Jeff's vision is to develop rapid and easy to use aptamer-based biosensors for the monitoring of environmental samples such as drinking water, surface water, and industrial wastewater for harmful levels of environmental contaminants. Biosensors may be developed using electrochemical or optical architectures that could potentially be miniaturized into handheld devices, and engineered for the simultaneous determination of multiple analytes.

Fulbright in Paris

Hedeel Evans was the only scientist from the United States awarded the Fulbright Scholarship to France in 2008-2009. Her research revealed that CAD (carbamoyl phosphate synthetase-aspartate transcarbamoylase-dihydroorotase) protein is located on the centrosome, an organelle that is involved in cell division. This process is highly deregulated in tumor cells and understanding how it works can eventually lead to the development of chemotherapeutic agents.

Hedeel needed to gain more experience in this field to help her understand why and how CAD is located there, and the Institut Curie in Paris was the perfect place to go. The institute has several floors housing researchers with expertise in different areas. There is a great microscopy center with several microscopes that allows for live cell imaging where proteins can be visualized in real-time. In addition, the seminars given at the institute provided her with some insight into new areas of research in several different subjects. She really enjoyed her time at the institute, she found everyone very helpful and superb.

Hedeel's family accompanied her to France. Her husband, David, worked at the Pierre et Marie Curie institute in Paris; her daughter, Katie, attended high school at the Ecole Active Bilingue Jeannine Manuel (EABJM), a highly selective lycée (high school), and her other daughter, Christina, who is an art major and a senior at EMU attended l'academie-charpentier where she learned novel art methodology and learned special art techniques from different regions in France.

CABINEX

During the summer of 2009, the Chemistry Department's very own Gavin Edwards joined 58 fellow researchers from 15 other universities for a 6-week investigation to probe the link between forested areas and the chemistry of the air. Gavin was taking part in the Community Atmosphere-Biosphere Intensive Experiment

(C.A.B.IN.EX.) campaign, held at the University of Michigan Biological Station (UMBS) in Pellston Michigan, about 25 miles south of the Mackinaw Bridge. Gavin's research is centered on the understanding the links between the biosphere and the atmosphere. There is increasing evidence that many basic atmospheric chemistry processes are impacted if the air is in close proximity to forest canopies as forests are large sources of biological volatile organic compounds (BVOC). Emission of these BVOC's, coupled with anthropogenic pollution, often drives the formation of "secondary" pollutants such as smog, ground level ozone and aerosol haze. Complicating the story, many forests in this area of Northern Michigan are recovering after the large-scale cutting and burning that culminated at the start of the 20th century whilst also experiencing environmental stresses due to global climate change.

UMBS is an ideal location to study these forests and their changing environment. The C.A.B.IN.EX. project was centered at the site of a 30-meter tower built in 1997 specifically

for the investigation of biosphere-atmosphere interactions. It was on top of this tower where Gavin and his fellow investigators set up equipment to monitor air chemistry during the campaign that ran from July until mid August.

Despite excellent locations to monitor the air chemistry, living conditions during the campaign were a little Spartan. The researchers were housed at the main UMBS camp some 3 miles from the tower, mainly in wooden cabins that date back to the camp's founding in 1909. The cabins typically have no heat other than a space for a wood fire; community bathrooms located several yards away, no televisions, no cell phone signals and no streetlights. Despite this, researchers frequently keep coming back. Gavin has completed three summers of research there, first as a postdoc and now as an EMU faculty member. The data collected by Gavin and his fellow researchers participating in the C.A.B.IN.EX. campaign is currently being analyzed and the results will be presented at a special session of the American Geophysical Union, scheduled to be held in San Francisco in December 2010.

STUDENT AWARDS, 2009

The Peet-Mayor Endowed Chemistry Award

ACS Huron Valley Section Undergraduate Award

American Institute of Chemists Award

Collins' Endowed Scholarship in Chemistry

Maurice Decoster Endowed Chemistry Scholarship

Sandra J Lobbetael Chemistry Endowed Scholarship

Elva Mae Nicholson Organic Chemistry Endowed Scholarship

John Sullivan Endowed Scholarship

Hypercube Scholar Award

Biochemistry Achievement Award

Toxicology Achievement Award

Wiley Inorganic Chemistry Award



James P. Grinias

Vanessa R. Porter

Andrew J. Livingston

Michelle A. Altenburg

Melissa L. Cordes

Patrick M. Spoutz

Umar Syed

Ian M. Pendleton

Heesung Jin

Hillary E. Walters

Louis A. Lello

Vanessa R. Porter

Brooke D. Raven

James P. Grinias

Wiley Organic Achievement Award

POLYED Outstanding Achievement in Organic Chemistry Award

John J. Contario Analytical Chemistry Award

ACS Division of Analytical Chemistry Award

CRC Press Freshman Chemistry Achievement Award

Perry S. Brundage Scholarships

Donald B. Phillips Memorial Endowed Scholarship

Huron Valley Publishing Scholarships

Honors Undergraduate Fellowships

Honors Senior Thesis Awards

Symposium Undergraduate Scholarships

Symposium Undergraduate Research Fellows

ACS Huron Valley Section Outstanding Graduate Student Award

The Ronald M. Scott Memorial Scholarship

EMU Chemistry Department Teaching Assistant Award

EMU Chemistry Department Research Award

University Fellowships in Chemistry

Graduate Research Fair Fellow

Student Employee Appreciation Awards

Brooke D. Raven

Vanessa R. Porter

William P. Malcolm

Andrew J. Idzior

Ian M. Pendleton

Brian J. Rissman

Travis M. Smith

Lairen B. Ford

James P. Grinias

Patrick M. Spoutz

Seo Jin Oh

Vanessa R. Porter

Brooke D. Raven

Patrick M. Spoutz

Andrew J. Livingston

Brooke D. Raven

James P. Grinias

Jennifer J. Vogel

James P. Grinias

Ian M. Pendleton

Nadine C. El-Ayache

Srujana Katukuri

Charles J. Harrison

Srikanth R. Konda

Srujana Katukuri

Srikanth R. Konda

Durgaprasad Peddi

Roshini S. Fernando

Heidi M. Krukemyer

Jennifer VanderKlipp



GRADUATE RESEARCH FAIR, March 2009

Renee Beardslee, Professor Heedel Evans, sponsor. “An Investigation of g-Tubulin, a Centrosome Protein, using Expression in E. Coli”

Reza Eizadkhah, Professor Maria C. Milletti, sponsor. “Structural and Electronic Characteristics of Human Islet Amyloid Polypeptide (hIAPP) Leading to Aggregate ”

Nadine El-Ayache, Professor Cory Emal, sponsor. “Design and Synthesis of Aryl Sulfonamides as Inhibitors of Plasminogen Activator Inhibitor-1”

Roshini Fernando, Professor Hedeel Evans, sponsor. "Probing the Mechanism of Activation of Dihydroorotase by Aspartate Transcarbamoylase in Aquifex Aeolicus"

Charles Harrison, Professor Steven Pernecky, sponsor. "GC-MS Characterization of Fatty Acids and their Derivatives in Cecal Material"

Anitha D. Jayaprakash, Professor Deborah Heyl-Clegg, sponsor. "Synthesis and Analysis of hIAPP 1-19 Region, a Peptide Involved in Membrane Disruption"

Srikanth Reddy Konda, Professor Deborah Heyl-Clegg, sponsor. "Role of Aromatic Pi-stacking on Aggregation of Human Islet Amyloid Polypeptide"

Ranadheer Reddy Pesaru, Professor Deborah Heyl-Clegg, sponsor. "Synthesis and Analysis of Insulin-Based Inhibitors of Human Islet Amyloid Polypeptides"

Rohini Sidhu, Professor Steven Pernecky, sponsor "Triphenylphosphine Promotes Production of 12-HETE during COX-1 Dependent Metabolism of Arachidonic Acid"

UNDERGRADUATE SYMPOSIUM, March 2009

Caitlyn G. Buchhop, sponsor Timothy Friebe. "Oxazolone Anions: A New Acyl Anion Equivalent"

Daejin Choi, sponsor Maria Milletti. "A Comparison of Activation Energies for the Rate Determining Step of the Epoxidation of Four Polyunsaturated Fatty Acids in the COX Active Site."

Melissa L. Cordes, sponsor Hedeel Evans. "Expression and Purification of γ -Tubulin, an Important Component of the Centrosome"

Tiffany D. Crosby and **Steven E. Kamberov**, sponsor Steven Pernecky. "Isolation and Analysis of Cyanobacterial DNA"

James P. Grinias, sponsor Heather Holmes. "Going Beyond the Lab: Turning Research Experience into Teaching Opportunities for Undergraduate Students"

James P. Grinias and **Louis Lello**, sponsor Ruth Ann Armitage. "Determination of Lead in Paint by Atomic Absorption Spectroscopy"

Kristi L. Henricks and **Karen L. Sanders** sponsor Cory Emal. "Design, Synthesis and Evaluation of Polyphenolic Inhibitors of Plasminogen Activator Inhibitor-1"

Andrew J. Livingston, sponsor Maria Milletti. "A density Functional Study of the Relative Stability of Intermediates in a McMurry Coupling Reaction"

Geneve M. Maxwell and **William P. Malcolm**, sponsor Ruth Ann Armitage. "Qualitative GC-MS Analysis of Proteins and Amino Acids in Rock Painting Binders"

Paul R. North, sponsor Cory Emal. "Conformational Effects of Polycyclic Inhibitors of Plasminogen Activator Inhibitor-1"

Seo Jin Oh, sponsor Cory Emal. "Isolation and Identification of Bioactive Agents from Green Tea"

Joshua M. Osborne, sponsor Deborah Heyl-Clegg. "Disruption of β -islet Cell Mimics by

Selected Sequences of Human Islet Amyloid Polypeptide”

Gauri H. Pawar, Gonzalo Gonzalez, and Zachary B. Baker, sponsors Steven Pernecky, Martin Brown and Steve Francoeur. "Ford Lake: A Potential Producer of Toxins?"

Ian M. Pendleton, sponsor Harriet Lindsay. "Microwave-Assisted Aza-Cope Rearrangement – Mannich Cyclization of Conformationally Mobile Amine Alcohols: Challenges in the Stereoselective Synthesis of Acylpyrrolidines"

Christina M. Phillips and Deidre T. Hardemon, sponsor Ruth Ann Armitage. "Testing Pre-Treatment Methods for Nondestructive Radiocarbon Dating of Textiles"

Vanessa R. Porter, sponsor Gregg Wilmes. "Observation of Black Copolymer Self-Assembly in Solution by NMR Relaxation"

Brooke D. Raven, sponsor Harriet Lindsay. "Synthesis of the Bicyclic Core of Indolizidine and Pyrrolizidine Alkanoids"

Patrick M. Spoutz sponsor Maria Milletti. "Conformational Analysis of Polyphenolic Inhibitors of PAI-1"

Catlin J. Van De Car, sponsor Ruth Ann Armitage. "Detection of DDT in the Environment: Water Analysis Using Solid-Phase Extraction and Gas Chromatography-Mass Spectrometry"

Louis Lello, sponsor, Maria Milletti, "A Comparison of Two Pathways for Pyrrolidine Epimerization"



Bobby Marthambadi: Advisor: Gavin Edwards "Observations and Modeling of Free Radical Concentrations Above the Pacific Ocean"

Vanessa Rae Porter Advisor: Gregg Wilmes, Ph.D. "Observations of Block Copolymer Self-Assembly in Solution by NMR Relaxation"

Geneve Maxwell and Will Malcolm, Advisor. Ruth Ann Armitage "Qualitative and Quantitative Analyses of Proteinaceous Binders in Rock Paintings"

Deidre Hardemon and Christina Phillips, Advisor. Ruth Ann Armitage "Determining the Efficacy of an Alternative Cleaning Method for Radiocarbon Dating Archaeological Textiles"

Christina L. Dean, Advisor. Ruth Ann Armitage "Soil Analysis for Comparison of Archaeological Samples"

Caitlin Van De Car, Advisor. Ruth Ann Armitage "Detection of DDT in the Environment: Water Analyses Using Solid-Phase Extraction and Gas Chromatography-Mass Spectrometry"

Jim Grinias and Louis Lello, Advisor. Ruth Ann Armitage "Determination of Lead in Paint by Atomic Absorption Spectroscopy"

FACULTY ACTIVITIES

GRANTS AND AWARDS

Ruth Ann Armitage: \$207,275 Major Research Instrumentation (MRI) grant for the acquisition of a High-Resolution Time-of-Flight Mass Spectrometer for Research and Education -This award is funded under the American Recovery and Reinvestment Act of 2009 (Public Law 111-5).

With this award the Department of Chemistry will acquire a high-resolution time-of-flight (TOF) mass spectrometer with direct analysis in real time (DART) and electrospray ionization (ESI) sources. The instrument will be used to support teaching and research activities across the department, including:

- 1) method development for rapid, non-destructive characterization of organic cultural heritage materials and works of art (Ruth Ann Armitage)
- 2) isolation, identification, and synthesis of biologically relevant molecules such as polyphenols (Cory Emal)
- 3) atmospheric chemistry of biogenic, volatile organic compounds (Gavin Edwards)
- 4) development of microwave-assisted reaction methodology (Harriet Lindsay)
- 5) advanced materials such as porous co-polymers from ionic liquids (John Texter)
- 6) identification of end-groups in self-assembling block copolymeric materials (Gregg Wilmes)
- 7) signal transduction pathways in the regulation of normal and cancer cell growth and proliferation (Hedeel Evans)
- 8) determination of microbial metabolites in rat cecal fluid and in vitro co-cultures (Steve Pernecky)
- 9) insulin-based inhibitors of human islet amyloid polypeptide (Debbie Heyl-Clegg)

Tim Brewer, Larry Kolopajlo, and Jose Vites: \$7500 eFellows grant for instructional equipment

Harriet Lindsay and Maria Milletti: \$3000 eFellows grant for instructional software

Jeff W. Guthrie: \$5,000 Provost's New Faculty Award

John Nelson: Received a Fellowship in Sustainability through the Faculty Development Center. He's working with faculty members from across campus in designing course materials related to Sustainability. John will be piloting materials on Green Chemistry in a section of CHEM 115 in the coming semesters.

CONGRATULATIONS!

Tim Friebe: on promotion to full professor.

Hedeel I. Guy Evans: on receiving tenure.

Steven Pernecky: on being selected as EMU's nominee for the Fourth Annual Michigan Distinguished Professor of the Year Recognition Award.

PUBLICATIONS

EMU Student co-authors are underlined.

Mark Lukowski, Kathryn Jacobs, Powen Hsueh, Harriet A. Lindsay and M.C. Milletti
“Thermodynamic and kinetic factors in the aza-Cope rearrangement of a series of iminium cations” *Tetrahedron* **2009**, *65*, 10311-10316.

Mark Lukowski, Dae Jin Choi, and M.C. Milletti “Substrate Binding and Kinetic Aspects of the Peroxidation Reaction of Four Polyunsaturated Fatty Acids in the COX Active Site of PGHS-1” *Lett. Drug Des. Discov.*, **2010**, *7*, 88-97.

D. M. Snyder, P. Vadgama, “Impedance Resonance: a novel technique for signal acquisition from interdigitated electrodes (IDE) in sensor applications.” *IEEE Sensors J.*, **2009** *9*(2), 143-145

D. Fraser and R. A. Armitage , “Clinical Test Strips for Rapid Identification of Binder Materials in Rock Paintings” *Proceedings of the 37th International Symposium on Archaeometry*. In press, **2010**.

A. J. Livingston, E. Robinson, and R. A. Armitage , “THM-GC-MS Analysis of Rock Paintings from Casa de Las Golondrinas, Guatemala: Implications for Radiocarbon Dating” *Int. J. Mass Spec.*, **2009**, *284*, 142-151.

Deborah L. Heyl , Joshua M. Osborne, Sarika Pamarthy, Shyamprasad Samiseti, Andrew W. Gray, Anitha Jayaprakash, Srikanth Konda, Dorothy J. Brown, Samuel R. Miller, Reza Eizadkhah, Maria C. Milletti, “*Liposome Damage and Modeling of Fragments of Human Islet Amyloid Polypeptide (IAPP) Support a Two-Step Model of Membrane Destruction*”, **2010** *Int. J. Pept. Res. Ther.*, in press.

Deborah L. Heyl, Ranadheer Reddy Pesaru, and Durgaprasad Peddi , “Development of Insulin-Based Inhibitors of Human Islet Amyloid Polypeptide” **2009**, In *Breaking Away: Proceedings of the 21st American Peptide Symposium*, Michal Lebl, ed., 158-159.

Joshua M. Osborne, Daniel J. Clegg and Deborah L. Heyl , “Cell Membrane Damage by the Type 2 Diabetes Associated Peptide Amylin in the Presence of Insulin” **2009**, In *Breaking Away: Proceedings of the 21st American Peptide Symposium*, Michal Lebl, ed., 171-172.

Deborah L. Heyl, Srikanth Reddy Konda, and Anitha D. Jayaprakash, “Synthesis and Analysis of Analogs of hIAPP (1-19), a Peptide Involved in Membrane Disruption” **2009**, In *Breaking Away: Proceedings of the 21st American Peptide Symposium*, Michal Lebl, ed., 173-174.

Sathiah Thennarasu, Anmin Tan, Rajesh Penumatcha, Charles E. Shelburne, Deborah L. Heyl and Ayyalusamy Ramamoorthy, “Antimicrobial and Membrane Disrupting Activities of a Peptide Derived from the Human Cathelicidin Antimicrobial Peptide LL-37”, *Biophysical Journal*, **2010**, *98*, 248-257.

N.C. El-Ayache, S.H. Li, M. Warnock, D.A. Lawrence, C.D. Emal, “Novel bis-arylsulfonamides and aryl sulfonimides as inactivators of plasminogen activator inhibitor-1 (PAI-1)”, **2010**, *Bioorganic & Medicinal Chemistry Letters*, *20* (3), 966-970.

J.M. Cale, S.H. Li, M. Warnock, E.J. Su, P.R. North, K.L. Sanders, M.M. Puscau, C.D. Emal, and D.A. Lawrence, “Characterization of a Novel Class of Polyphenolic Inhibitors of Plasminogen Activator Inhibitor-1”, *Journal of Biological Chemistry*, **2010**, jbc.M109.067967.

C.A. Van Huis, A.Casimiro-Garcia, Christopher F. Bigge, ..., and J.J. Edmunds, “Exploration of 4,4-disubstituted pyrrolidine-1,2-dicarboxamides as potent, orally active Factor Xa inhibitors with extended duration of action”, *Bioorganic & Medicinal Chemistry*, **2009**, *17*(6), 2501-2511.