DEPARTMENT OF CHEMISTRY NEWSLETTER

DEPT & FACULTY NEWS

EMU Receives $2 M Grant to Institutionalize the Creative Science Inquiry Experience program

Original, unabridged article by Geoff Larcom, Executive Director of Media Relations.

Eastern Michigan University has received a federal grant of nearly $2 million to strengthen its efforts in educating its students in STEM disciplines, with a special emphasis on bringing women and minorities into those fields. The five year grant, awarded by the U.S. Department of Education's Title III Program, involves broadening and institutionalizing the *Creative Scientific Inquiry Experience*, a program developed by the University and funded by the National Science Foundation.

The CSIE program has demonstrated promise for increasing the graduation rates of students entering the STEM (science, technology, engineering and math) and STEM-related fields. It seeks to increase the number of STEM graduates through emphasis on customized academic support, academic service learning, career exploration and mentorship, and interdisciplinary, theme-based experiences.

"The CSIE program facilitates students' progression to upper-level courses with a deeper understanding of course content and with participation in community-based problem solving," said Nina Contis, a professor of chemistry at EMU who will serve as director of the Title III grant. "This grant will enable the University to significantly improve the success rate of students in STEM classes, particularly among underrepresented groups, through broadly implementing the CSIE program."

The grant builds upon EMU's ongoing effort to play a central role in fulfilling the State of Michigan's need for graduates in STEM fields. The number of STEM graduates from Eastern has risen 15 percent over the last five years. In addition, more students than ever are majoring in STEM disciplines at EMU. In the winter 2014 term, Eastern had 2,757 students majoring in declared STEM-related disciplines, making up about 15.5 percent of its undergraduate population.

The goals of the grant also include offering EMU faculty a wide range of professional development and stipend support to produce courses that spark further student success.

In addition to the federal funding, the project leverages an additional $250,000 from non-federal sources that will support the continued success of the project. By the end of year five, the CSIE program will be in full operation, to be sustained by a $440,000 endowment funded by a portion of the grant and matched by the University.

Cory Emal Receives a Patent for Development of Inhibitors of Cardiovascular Protein

Original, unabridged article written by Debra Johnson, Media Relations Administrator

EMU chemistry Professor Cory Emal, along with colleagues from the University of Michigan and the University of Maryland, received U.S. Patent 8,759,327 on June 29, 2014 for the design of molecules linked to controlling the buildup of plaque that leads to blood clots and blocked arteries in the circulatory system.

"The patent partially draws from the first couple of years of my long-standing collaboration with Daniel Lawrence's research group at the University of Michigan Medical School," said Emal. "Dr. Lawrence is one of the world's foremost experts in PAI-1 biology, and he was looking for a synthetic chemist to work with – I was in the right place at the right time, and we've had a very productive continuing collaboration over the past eight years."

Their work is focused on creating new molecules that disrupt a naturally occurring human protein called plasminogen activator inhibitor-1 (PAI-1). People with elevated levels of PAI-1 are at higher risk for stroke, and heart attack, due to PAI-1's ability to prevent the normal dissolution of blood clots. They are interested in designing novel compounds that block the ability of PAI-1 to contribute to these conditions.

Certain molecules called polyphenols found in green tea were the inspiration for the compounds contained in their patent. These molecules show a wide range of biological activity and

some of them show the ability to inhibit PAI-1, so this was a starting point for the design of their own compounds.

"We designed our compounds to act by binding tightly to PAI-1, preventing it from attacking other human proteins," said Emal. "Hopefully, the molecules contained within this patent will someday lead to a drug with the ability to treat patients with serious conditions, such as stroke."

Professor Mas Yamauchi Passes Away

Dr. Mas Yamauchi, 83, passed away on April 19, 2014. Dr. Yamauchi came to EMU in 1965 from a faculty position at the University of New Mexico. He earned the rank of full professor in 1971 and retired in 1996 after more than 30 years of teaching and conducting research in inorganic chemistry, and providing service to EMU's Chemistry department and programs. He was an avid gardener and a marathoner who ran well into his 60's.

Students remembered Dr. Yamauchi for his often humorous, but insightful, discussion of inorganic chemistry. Emeritus faculty Dr. Krish Rengan, who for two decades occupied an adjacent office, commented that Dr. Yamauchi's "enthusiasm about lab work and excitement to deal with and help students always amazed me . . . and they were contagious. I learned a lot from him."

Dr. Yamauchi received his bachelor's degree from the University of Hawaii and his M.S. and Ph.D. from the University of Michigan.

Biochemist Dr. Steven Backues Joins EMU Faculty

We are most fortunate to have Dr. Steven Backues join us this year. Dr. Backues received undergraduate degrees in Chemistry and Biochemistry from Gustavus Adolphus College in St. Peter, MN, where he first became interested in undergraduate science education.

Professor Backues received his PhD in Biochemistry from the University of Wisconsin, Madison, where he studied developmentally important membrane trafficking pathways in the model plant *Arabidopsis* under the mentorship of Dr. Sebastian Bednarek. For his postdoctoral training he continued working in membrane trafficking, but now using baker's yeast and focusing on the field of autophagy, a medically-important cellular stress response that delivers cytoplasmic cargo to the vacuole for degradation. This work was done under the mentorship of Dr. Dan Klionsky at the University of Michigan, with whom Dr. Backues also continued his training in teaching and mentoring undergraduates.

Dr. Backues provides instruction in biochemistry and general chemistry, and he is leading student research into the mechanisms of membrane trafficking in autophagy.

Travel is an everyday necessity for many people, making the environment of a passenger vehicle a place where Americans spend a significant amount of time. New cars have been found

Faculty Feature: EMU Professor Gavin Edwards Researches that "New Car Smell"

to emit volatile organic compounds (VOCs), often called "New Car Smell".

Although some find these odors enjoyable, "New Car Smell" could potentially have adverse health effects. Previous studies have indicated upwards of 150 VOCs present in new the ambient air within the cabins of new cars, including molecules like benzene, toluene and formaldehyde. While previous VOC models have been produced, there is still uncertainty in these models with respect to changing variables such as cabin temperature, and when the car doors or windows are opened/closed.

The development of an accurate and reliable model, capable of determining the concentration of different VOCs in a car cabin as a function of time, is the focus of a research project in the atmospheric chemistry research group, headed by Gavin Edwards. Dr. Edwards and his students are working on this project that involves a collaboration between EMU and the "Big Three" automakers in Detroit, as part of the United States Council for Automotive Research (USCAR) project.

Currently, Dr. Edwards' group is trying to model VOCs from chamber experiments done at the Ford Motor Company. They hope that their models can be shown to work in chambers and then be scaled to automobile level analysis. Preliminary testing of these models has shown promise. Varying time points for sample collection, and various parameters such as VOC starting concentration and chamber temperature have been shown to play important roles in emission rates. Further experimental comparisons, statistical analyses, and model sensitivity testing will need to be done in the future as the project and collaboration continues.

CHEM STAFF NEWS

Carolyn Jackson, Chemistry Senior Secretary, Retires

After more than 20 years as senior secretary in the Chemistry Department, Carolyn Jackson retired at the end of June. Carolyn is one the nicest people you could ever hope to meet and was a joy with which to work. Carolyn was exceptional at her job. She always made our department look good, and has a penchant for detail and organization that made the annual awards and alumni banquet the most highly praised celebration in the university. Her initiative and attention to detail keep things running so smoothly that it would be easy to take her for granted. However, we always appreciated her and everything she did for Chemistry and we wish her nothing but the best in her well-deserved retirement. Here are a few remembrances.

Carolyn Jackson on the far right, pictured with student office workers.

I started working at EMU in the Registration Office in 1991. I started in my positon as senior secretary for the Chemistry Department in 1992, for a total of 23 years at EMU, 22 of them in the Chemistry Department. During my time in the Chemistry Department, I worked with five department heads, Drs. Judy Levy, Wade Tornquist, Maria Milletti, Ross Nord, and Steve Pernecky. I feel blessed that I had the opportunity to work with all five; I have great memories from my work time with each of them. The same is true of the faculty and staff I worked with. I am thankful for the friendships I developed and am glad I was able to be a part of the Chemistry Department family.

One of the things I enjoyed most about my job was working with the students. I especially liked working with the student employees in the Chemistry Office, and there were many, many wonderful students that I worked with over the years. There were times when I had the opportunity to help or encourage the students, and at times I felt like a second mom to some of them. It was rewarding to feel like I could contribute to their academic success in small ways. I felt like serving and helping the students who came to the office for assistance was one of the most important parts of my job. I also enjoyed getting to know many of the graduate assistants in the department. One year a group of our international graduate assistants invited my daughter and me to their apartment for dinner. I later invited them to my home for a traditional Thanksgiving dinner. I think it was a great learning experience for all of us. I have great memories of both occasions

Before coming to EMU, I worked for the University of Michigan Employees Union, AFSCME, Local 1583 for over twenty years. My work there played a role in helping establish the Union that represented the service and maintenance employees at the University of Michigan. The founding of the Union, the wages and benefits that the Union was able to negotiate made it possible for hundreds of employees to have better working conditions and to earn a decent wage that allowed them to take better care of themselves and their families. It means a lot to me to know that I was able to be part of the work that helped make life better for so many people. The Union continues to represent employees at the University of Michigan today.

Now that I have retired and have more free time, my focus is my family, my grandchildren. My husband and I have two children, a daughter and a son. We are also blessed with three grandsons, ages 7, 9, and 11. I can attest to the fact that you can never know how much you love a grandchild until you have one. We are eagerly looking forward to the birth of our first granddaughter. She should arrive April 5th, if not sooner; we couldn't be more excited!! As I have heard Professor Ron Scott say many times in the Chemistry Office in the past, "the sun is shining; the birds are singing."

Meet Tracey Grant, Chemistry's New Senior Secretary, and Tanya Johnson, New Science Complex Manager

Tracey Grant received her undergraduate degree in Secondary Education from Eastern Michigan University (Literature, Language, and Writing). Prior to joining Chemistry, Tracey was a member of Eastern's departments of Academic Success Partnerships and Teacher Education. Tracey enjoys volunteering within her community, assisting others in various academic pursuits, reading, and writing.

Dr. Tanya Johnson received her undergraduate degree in Biological Sciences from the University of Nebraska-Lincoln and her PhD in Molecular, Cellular and Developmental Biology from the University of Michigan, where she studied membrane trafficking pathways in pumpkins and the plant *Arabidopsis*. For her postdoctoral training at the University of Maryland in Dr. Maria Sandkvist's group, she researched the

bacterium *Vibrio cholerae*, the causative agent of the disease cholera. Dr. Johnson is excited to be starting at Eastern Michigan University and in her free time enjoys reading historical mysteries and doing DIY around her house, although days now spent attending to building maintenance issues may change that!

STUDENT & ALUMNI NEWS

EMU Alum Steven Fernandes is on Winning Team for 2014 Merck's Innovation Cup

This summer, Steve Fernandes was one of only 30 students selected (out of 700 applicants) to attend the 2014 Merck Sereno Innovation Cup in Darmstadt, Germany. While there, Steve's international five-member-team won the first place award for the business plan they develop entitled "Changing the way cancer is treated by cancer cell burst".

Steve is a recent MBA graduate of Johns Hopkins University and a 2007 graduate of EMU, where he received his MS under the direction of Dr. Deborah Heyl-Clegg. He is currently Laboratory Manager in the Department of Pharmacology and Molecular Sciences at the Johns Hopkins School of Medicine.

Alumni Feature: Dr. Tom Horvath Reflects Upon His Education and Career in Chemistry

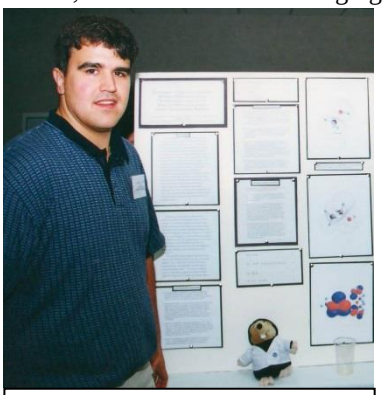
For the last few years, we have featured alumni stories about their EMU experiences and where their training has taken them. This year we feature Dr. Tom Harvath, who graduated with a Professional Chemistry degree 15 years ago.

I started my academic career at EMU in 1996 as an undergraduate student in the College of Technology. My intent was to continue my studies in CAD drafting after successfully completing my Associates of Applied Science degree in Mechanical Design Technologies at Ivy Tech State College in Bloomington, IN. While completing general education requirements, I attended the first term in the introductory chemistry sequence (CHEM 121 & 122) that was taught by the late Professor Donald Phillips. I was quickly captivated by the subject material comprised in the curriculum, and thoroughly enjoyed the observation-based inquiry implicit in laboratory experimentation. My decision to switch my major area of study to chemistry was driven by a newfound interest in studying chemical and physical phenomena, and a relentless recruiting campaign by Professor Phillips.

As an undergraduate student in the chemistry department, I was able to perform physical chemistry research in the following areas: Random Sequential Adsorption of molecules onto surfaces (Prof. Ross Nord); investigations in fluorescence and Raman spectroscopy (Prof. Tim Brewer); and modeling of the energies of interaction between gas-phase analytes and stationary phase materials commonly used in GC columns (Profs Heather Holmes and Maria Milletti). I was also able to take advantage of the chemistry department's internship program to secure a two-year (paid) internship in bioanalytical chemistry within the Pharmacokinetics, Dynamics, and Drug Metabolism (PDM) department at Pfizer's Global R & D facility in Ann Arbor. In this role, I developed Liquid Chromatography-Mass Spectrometry/Mass Spectrometry (LC-MS/MS) methods, and performed assessments of new technology that were pertinent the bioanalytical scientists that worked in the PDM department.

After graduating in the summer of 2000, I went on to earn my M.S. and Ph.D. degrees in Physical Chemistry from the University of Michigan under the tutelage of Professor Raoul Kopelman, where I studied nanotechnology. After completing my Ph.D., I accepted a post-doctoral research position in the laboratory of Donald Mock, MD., Ph.D. at the University of Arkansas for Medical Sciences in Little Rock, where I developed blood and urine based LC-MS/MS assays to assess tissue-level biotin status of humans under various clinical circumstances (e.g. pregnancy, smoking status). This body of work culminated in eight peer-reviewed publications over a two-year time period!

After completing my post-doc, I accepted a position as a Senior Research Scientist in the Methods Development group within the Bioanalytical Services division of Worldwide Clinical Trials located in Austin, Texas. In this challenging role, I developed and validated quantitative LC-MS/MS assays for the determi-nation of pharma-ceuticals and their metabolites in biological fluids in accordance with highly regulated Food and Drug Administration (FDA) and European Medicines Agency (EMEA) guidances. These experiences lead me to The University of Texas MD Anderson Cancer Center in Houston, TX, where I am currently working as a Research Scientist in the Proteomics and Metabolomics Core Facility within the Bioinformatics and Computational Biology Department. My role in this position is to develop quantitative LC-MS/MS methods for the targeted analysis of endogenous metabolites in biological fluids and incubated cancer cell lines that are included in the National Cancer Institute (NCI-60) panel.



Tom Horvath presenting research results at the Undergraduate Symposium

When I pause to reflect on my career, I consider the time shared with faculty and fellow students in the chemistry department as some of the fondest and most influential of my life. The theoretical and practical training provided by the Chemistry Department faculty was paramount to achieving success in both my academic and industrial pursuits.

STUDENT AWARDS, 2014

UNDERGRADUATE

Amanda Dewyer, The Peet-Mayor Endowed Chemistry Award

Brianne Moe, ACS Huron Valley Section Undergraduate Award

Sr. Isaac Marie Breckler, Grace Simmons Gregory Scholarship

Sylvia Torres, Maurice Decoster Endowed Chemistry Scholarship

Philip Ewing, Mordechai Sadowsky, Collins' Endowed Scholarships in Chemistry

Jamie Reder, Sandra J. Lobbestael Chemistry Endowed Scholarship

RaKeenja Fluellen, Elva Mae Nicholson Organic Chemistry Endowed Scholarship

Philip Elugbemi, John Sullivan Endowed Scholarship

Jason Miller, James G. and LeAnn K. Emal Scholarship in Chemistry

Jaymes Dempsey, CRC Press Chemistry Achievement Award

Johnathon Napier, Hypercube Scholar Award

Martin Solano, Yeji Park, Biochemistry Achievement Award

Calvin Day, ACS Division of Analytical Chemistry Award

Yuan Ross, ACS Organic Chemistry Division Award

Jaymes Dempsey, Samantha Malley, Brianna Sohl, Perry S. Brundage Scholarships

Jacquelyn Lesko, Donald B. Phillips Memorial Endowed Scholarship

GRADUATE

Sarah Burke, David A. Berry Excellence in Organic/Biochemistry Endowed Scholarship

Michael Martin, Martin and Antoinette Gorsky Endowed Scholarship

Megan Connolly, EMU Chemistry Department Teaching Assistant Award

Danielle St. Germaine, Darshani Weerakoon, EMU Chemistry Department Research Award

Evert Njomen, ACS Huron Valley Section EMU Outstanding Graduate Student Award

Reshmi Gopagani, Ronald M. Scott Memorial Endowed Scholarship

UNDERGRADUATE SYMPOSIUM, March 2015

Ahmed Nidal Abuzoor and Bridget T. Kennedy - Professor Steven Backues, faculty mentor. "Random Mutagenesis of Autophagy Related Protein 9 (Atg9)"

Zeinab Alsheemary – Professors Deborah Heyl-Clegg and Hedeel Evans, faculty mentors. "Regulation of Protein Interactions by the Alzheimer's Survival Peptide Humanin"

Caitlin Baumer – Professor Maria Milletti, faculty mentor. "Computational Study of the Interaction Between PAI-1 and One of Its Inhibitors"

Sean Blackburn – Professor Ingo Janser, faculty mentor**.** "Inhibition Activity of Ethacrynic Acid Analogues on Biologically Important Enzymes"

Mariah Brito – Professor Jeff Guthrie, faculty mentor. "Selection of Aptamers for Small [illegible] Capillary Electrophoresis"

Cristina Bugescu – Professor James D. Hoeschele, faculty mentor. "Synthesis of Mixed-Amine Analogs of the Asymmetric Platinum(IV) Complex, fac-$[Pt(NH_3)_2Cl_3NO_2]$(CPA-7)"

Andrew Durden - Professor Maria Milletti, faculty mentor. "Exploring the Effect of an Electron-Withdrawing Substituent in an aza-Cope—Mannich Reaction"

Philip Elukunle Elugbemi – Professor Cory Emal, faculty mentor. "Design, Synthesis, and Evaluation of Small-Molecule Inhibitors of Plasminogen Activator Inhibitor-1"

Philip Ewing – Professor Donald Snyder, faculty mentor.
"A Study of the Relationship Between Impedance Behavior and Alcohol Structure or Concentration"

Rakeenja S. Fluellen – Professor Cory Emal, faculty mentor. "Development of a Structure-Activity Relationship of Inhibitors of Plasminogen Activator Inhibitor-1"

Christopher Lloyd Friebe – Professor Harriet Lindsay, faculty mentor. "Comparing the Outcomes of the Aza-Cope—Mannich Reaction of Two Chemically Similar Reactants"

Nicholas Greene – Professor Larry Kolopajlo, faculty mentor. "A Free Periodic Table App for Teaching High School Chemistry"
Brittany M. Jewell – Professor Maria Milletti, faculty mentor. "Examining the Strength of Interactions Between PAI-1 and a Polyphenolic Inhibitor"

Diamond Jones – Professor Maria Milletti, faculty mentor. "Computational Analysis of the Stereoselective Synthesis of Substituted Pyrrolidines"

Zubin Khan – Professor Amy Flanagan Johnson, faculty mentor. "Exploring Different Methodologies to Teaching Chemistry to Non-Science Majors"

Ahmed J. Oudeif – Professor Harriet Lindsay, faculty mentor. "Efficient Production of an Acyl Pyrrolidine via Aza-Cope Rearrangement—Mannich Cyclization"

Yeji Abigail Park, Yllka Vladaj and Jennifer Garvey - Professor Deborah Heyl-Clegg, faculty mentor. "Modification to Cysteine-Deleted Tachyplesin (CDT) to Increase Antimicrobial Activity"

Jamie M. Reder – Professor Harriet Lindsay, faculty mentor. "The Effects of Additional Reactant Substituents on the Formation of Acyl Pyrrolidines"
Toya Alexis Rodriguez and Remell Sophia Thomas Professor Jose Vites, faculty mentor. "Investigation of Water Quality at EMU"

Mordechai Goode Sadowsky – Professor Maria Milletti, faculty mentor. "Computational Study of PAI-1 and a Potential Inhibitor"

Chelsea Marie Swanson – Professor Ingo Janser, faculty mentor. "Chalcone Derivatives, Containg the Michael System, as Stable Radical Scavengers (Antioxidants)"

Andre Tackett, Alexa Salsbury and Brianna Sohl Non-presenting, co-author: Hosam Issa – Professor Heather Holmes, faculty mentor. "Integration Sites of Feline Leukemia Virus"

Alyssa Winkler – Professor Maria Milletti, faculty mentor. "Effects of a Bulky Substituent on the Stereoselectivity of a Reaction Leading to Acylpyrrolidines"

Brandie Yambrosic – Professor Harriet Lindsay, faculty mentor. "3-D Control in the Formation of Simple Acyl Pyrrolidines using the Aza-Cope—Mannich Reaction"

GRADUATE RESEARCH FAIR, NOVEMBER 2015

Nouf Alyami – Professor Hedeel Evans, sponsor. "Using Peptides to examine the communication between two enzymes in pyrimidine biosynthesis.

Shane Canaday – Professor Gavin Edwards, sponsor. "Modeling of Volatile Organic Compounds Emission from Materials Used in Passenger Vehicle Interiors"

Divya Ganti and Hala Almutawa – Examining the Interface of Pyrimidine Pathway Enzymes using Synthetic Peptides".

Samanthi Herath Gedara – Dr. Hedeel Evans, sponsor. "Exploring the Interaction of Humanin and its Analogs with IGFBP-3 and Regulation of Apoptosis in Alzheimer's Disease"

Reshmi Bhavana Gopagani – Dr. Ingo Janser. "Synthesis and Kinetic Investigation of Differently Substituted Chalcones"

Naga Pooja Kanneganti – Dr. Deborah Heyl-Clegg, sponsor. "Structure-Activity Relationships of Linear Derivatives of Tachyplesin Containing Fluorophenylalanine"

Michael John Martin – Dr. Jeff Guthrie, sponsor. "Selection of Aptamers using Quantum Dot-Assisted Capillary Electrophoresis"

Ailing Zhou and Samanthi Herath Gedara – Dr. Larry Kolopajlo, sponsor. "A Free Periodic Table App for Teaching High School Chemistry"