

Special Elements in Excellence

Department of Chemistry Newsletter



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1st Collaborative Research Gathering

The first Collaborative Research gathering was Thursday, November 9, 2017 at 8:30 a.m. in room 3880 of the Chemistry Building. There were over 40 faculty and staff in attendance from Chemistry, Biological Sciences, Physics, Chemical & Paper Engineering, Office of Vice President for Research and Anthropology. The presenters each had two slides and six minutes to present their research projects, scientific instruments used and possible collaboration areas to the attendees. Many questions were asked, similarities were found and future research collaborations are in formation. A big thank you to all the presenters and attendees! We hope to make this an annual event.



From the Chair's Desk

Greetings,

Welcome to this edition of the Department of Chemistry's "Special Elements" newsletter, which encompasses many exciting initiatives on behalf of our faculty and students. It's hard to believe that two years have passed since I was chosen by the faculty and Dean Carla Koretsky of the college to be the interim chair of the Department of Chemistry.



Together, we have started and accomplished many positive initiatives. I am very humbled to report that I have been asked to serve another two years until June 2020 in the same role. I am so proud and excited to serve such a dynamic department. Please contact us or stop by so we may share that excitement with you.

We would like to thank everyone, both alumni and friends, who have recently contributed both time and money to the Chemistry Department. Your gifts, pledges, and endowments to the Chemistry Department have been a tremendous help in supporting many needs of the department and our students. Best wishes and we hope to see you soon,

Bill

FEATURE STORY

Dr. Gellert Mezei receives Emerging Scholar award, 2018 Excellence in Discovery award and has work published in *ChemComm*.

Emerging Scholar Award

Dr. Gellert Mezei

Dr. Mezei, a faculty member since 2007, has developed a novel class of compounds called “nanojars,” doing research that could potentially assist in purifying water.

Working with a 2014 National Science Foundation grant for \$284,833, Dr. Mezei’s team has shown that nanojars can reduce levels of arsenic and chromate from water to those acceptable to the Environmental Protection Agency.

He has had his work not only published in several peer-reviewed journals, but also featured on the cover of prestigious journals such as “Chemical Communications,” “Chemistry — A European Journal,” “Dalton Transactions” and “Green Chemistry.”

Dr. Mezei has been a mentor and supervisor for numerous graduate and undergraduate students and worked with the American Chemical Society’s Project SEED for economically disadvantaged high school students. He also has assisted with the Science Olympiad, organized activities for “Chemistry Day at the Museum” in Kalamazoo and participated in WMU student orientation and advising events. He has been an active member of the American Chemical Society since 2000.

A colleague in WMU’s chemistry department praised Dr. Mezei not only for his impact in the field, but “societal applications, such as water treatment

around nuclear wastes, new synthetic methodologies for pharmaceuticals and highly effective catalysts.” In addition, as a contributor the past eight years to Chemistry Day, he “was able to show the power of science to young children with his chemiluminescence and volcano demonstrations.” He has received numerous awards at WMU, including the 2012 Arts and Sciences Teaching and Research Award; 2012 and 2016 Discovery and Dissemination Awards; 2008, 2010 and 2017 Faculty Research and Creative Activities Awards; and a 2010 Impacting Communities by Advancing Chemistry Award.

He earned his bachelor’s and master’s degrees in chemistry from Babes-Bolyai University in Romania and a Ph.D. from the University of Puerto Rico.

Dr. Mezei’s work was recognized by fellow scientists around the globe who recommended him for the Emerging Scholar Award. His “creative approach to a stunning range of research problems has led to significant advancements in scientific knowledge as well as to practical

applications in different fields of chemistry...” said a professor of chemistry at another university who is a Nobel Laureate in chemistry.

The Emerging Scholar Award program was launched late in 2006 to acknowledge the accomplishments of WMU faculty members who are among the rising stars in U.S. higher education. It is designed to celebrate the contributions of faculty who are in the first decade of their careers at WMU and who, by virtue of their contributions to scholarship or creative activity, have achieved national recognition and demonstrated outstanding promise to achieve renown in their continuing work. The award goes to scholars nominated for consideration through a campuswide selection process and carries a \$2,000 cash prize.



Dr. Gellert Mezei received the 2018 Excellence in Discovery Award for his patent “Selective extraction of anions from solutions.”

Dr. Mezei's Work Published in ChemComm



ChemComm (Chemical Communications) is renowned as the fastest publisher of articles providing information on new avenues of research, drawn from all the world's major areas of chemical research.

ChemComm publishes 100 issues per year, the first chemistry journal to do this, resulting in even faster times to publication and increased visibility.

The journal publishes a number of web themed issues on cutting edge areas of chemical research. From 2011, an Emerging Investigator issue is published on an annual basis.

Dr. Gellert Mezei recently had an article published in ChemComm: Discrete multimetallic complexes constitute a valuable class of functional materials with diverse applications, such as single-molecule magnets, molecular spintronics and quantum computing, molecular flasks for "ship-in-a-bottle" synthesis of unstable species, molecular recognition and catalysis. Therefore, the discovery of novel multinuclear complexes holds the promise of further advancements in those fields, and can lead to a variety of innovative applications.

Here we advance the concept of accessing novel discrete multimetallic complexes, not obtainable with a given bridging ligand (such as pyrazolate, 'pz'), by locking ligands together. Thus, we discovered a series of new multicopper complexes, including two Cu₄, one Cu₂₆, one Cu₂₈ and one Cu₃₀ complex, which are not obtainable with the simple pyrazolate (pz) ligand, but can be prepared in excellent yields by tethering pairs of 'pz' ligands with an ethylene tether (pzCH₂CH₂pz).

Unexpectedly, the new Cu₂₆, Cu₂₈ and Cu₃₀ complexes (nanojars) have total selectivity for the supramolecular incarceration of the carbonate vs. sulfate ion, which is not the case with the untethered 'pz' ligand. We have previously shown that 'pz' nanojars selectively extract ions with large hydration energies, such as carbonate and sulfate, from a mixture containing large excess of ions with small hydration energies (such as nitrate and perchlorate ions). For the first time, we show that the carbonate ion (CO₃²⁻), which has a hydration energy comparable to that of the sulfate ion (SO₄²⁻), can be selectively extracted from a mixture containing a large excess of sulfate, by using the novel nanojars based on the tethered pzCH₂CH₂pz ligand.

We anticipate that this paper will advance the field of selective anion binding and extraction, and will inspire the discovery of novel multimetallic complexes, hitherto inaccessible, with potential new properties and applications.

Associate Prof Andre Venter reports on his sabbatical at the University of Pierre and Marie Curie in Paris, France.



Parisian Adventures in Research

For the past six months I've had the opportunity to do research at L'Institut Parisien de Chimie Moléculaire, an institute at the Univeristé of Pierre et Marie Curie. This university was founded by Guillaume de Champeaux in 1109 and today has 31,000 students in the sciences. UPMC is ranked at the top in France and 9th in Europe by agencies such as the ARWU of Shanghai University.

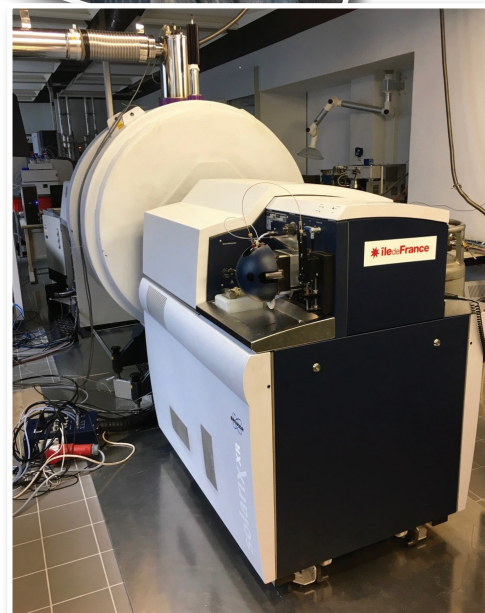
During my stay here I have had the joy of using state-of-the-art, ultra high resolution mass spectrometers such as the Thermo Orbitrap with a resolution of 100 000, and the Waters Synapt G2S with a resolution of 40 000. Our main project, however, uses the Bruker Solarix 7T Fourier Transform Ion Cyclotron Mass Spectrometer (FTICR), with a resolution up to 10 million! This very large and heavy instrument was moved soon before my arrival, due to several delays in a university infrastructure project. I affectionately call it the White Elephant, as a struggle ensued for several months to homogenize its magnetic field lines after the move, before it could be used again. (See the photo!)

However, one should not complain about a sojourn in Paris with a baguette under the arm and croissant crumbs on the chin. While we waited for the FTICR to come back on line, I collaborated with researchers at the Centre de Reserche sur la Preservation.

This center is a research unit devoted to the conservation of cultural heritage. Together we made progress in identifying secondary metabolites of fungi believed to be involved in the foxing (or discoloration) of documents from antiquity.

With the FTICR now back in action, we have recently obtained enticing evidence that ions of proteins in their native and globular state leave highly charged droplets via a different mechanism than if those same proteins were denatured and lost their tertiary structure. This finding will be valuable in designing analytical strategies to better study intact proteins by mass spectrometry. Using our approach, we have already stumbled upon a solvent system where proteins can become supercharged during ionization without disrupting protein-cofactor associations.

With research, as with adventure, perhaps Tim Cahill says it best, "An adventure is never an adventure when it happens. An adventure is simply physical and emotional discomfort recollected in tranquility." As my time here in Paris fast runs out, I'm looking forward to returning to my laboratory at WMU where students are making progress on our National Science Foundation sponsored projects.



2017 Spring Award Recipients

CRC Press Freshman Chemistry Achievement Award

Makayla Long

Jensen Chemistry Scholarship

Austin Salome

American Chemical Society Analytical Award

Paige Poindexter

American Chemical Society Physical Chemistry Award

Paige Poindexter

American Chemical Society Inorganic Chemistry Award

Christian Hartman

American Chemical Society Organic Chemistry Award

Randy Homic

Adli Kana'an Award

Christian Hartman

Merck Index Award

Joel Eisenberg

William McCracken Award

Christian Hartman

American Institute of Chemistry Award

Gregory Johnson

Colonel Charles E. Bayliss Scholarship

Marwa Saad

Paige Poindexter

Megan Callaghan

Rena Mroczek

Dr. Susan Burns Memorial Scholarship Graduate

Niluka Dissanayake

Department of Chemistry Endowed Undergraduate Award

Joseph Warner

Department of Chemistry Endowed Graduate Award

Jaliya Samarakoon

Mohammad Hossein Yassaman Endowment for Chemistry Scholarship

Basil Ahmed

Lester Boyce Maile Endowed Scholarship

Gregory Johnson

Dustin Mattison

Brendan Stewart

Christopher Taylor

Lillian H. Meyer Undergraduate Scholarship

Amanda Croft

Lillian H. Meyer Graduate Scholarship

Tara Maser

MPI Undergraduate Research Award

Susan Ardon

Marc W. Perkovic Memorial True and Quasi Scholarship

Mia Jawor

Kasan Yuan

Frederick W. Stanley Jr. Memorial Scholarship Undergraduate

Taylor Grace

Andrew Vanek

Dr. Nagler Endowed Graduate Scholarship

Hazim Al-Zubaidi

Dr. Berndt Endowed Graduate Scholarship

Sarut Jianrattanasawat

Dr. Hashem and SuzAnne Akhavan-Tafti Chemistry Scholarship

Elahe Honarvar

Graduate College Research and Creative Scholar Award

Basil Ahmed

Hazim Al-Zubaidi

Fadwa Hamad

Graduate College Teaching Effectiveness Award

Fadwa Hamad

Tara Maser

Graduate College Student Research Grant

Sarut Jianrattanasawat

Graduate College Travel Grant

Kelley Current

Jaliya Samarakoon

College of Arts and Sciences Undergraduate Research and Creative Activities Award

Emily Hanners

Mia Jawor

Paige Poindexter

OVPR Undergraduate Research Excellence Award

Christian Hartman

Jacob Kirkendall

ACS Kalamazoo Outstanding College Chemistry Student Award

Jacob Kirkendall

Presidential Scholar Award

Jacob Kirkendall



James Kiddle, Recipient of the Local Section Outreach Volunteer of the Year Award

In an effort to recognize the immeasurable outreach efforts made by local section volunteers, the Committee of Community Activities (CCA) has established the Local Section Outreach Volunteer of the Year award program. Each local section has an opportunity to recognize one individual annually for demonstrating extraordinary outreach volunteer service within the section. Volunteers are only eligible to be recognized once every five years.



In 2018, ACS recognized 52 awardees in recognition of their exemplary outreach efforts, ACS provides each participating local section with a certificate and gift to present to the awardee during a local section meeting or another event. The program and some awardees will also be

recognized in an issue of Chemical & Engineering News (C&EN) later this year.

Dr. James Kiddle, associate professor of chemistry at Western Michigan University, has been a key, active, and long-term member of the Kalamazoo Local Section. Dr. Kiddle's contributions to the local section include development, promotion and administration of the section's competitive and well-respected chemistry examination program for local area high school students.

In addition, he also manages the section's efforts to recognize local high school chemistry teachers, and organizes the section's annual Awards Program. Dr. Kiddle shows directly through his actions the positive outreach impact that an ACS Local Section, specifically Kalamazoo, can make on STEM promotion and development.

2017 Ignition Grant to James Kiddle

The American Chemical Society Green Chemistry Institute has awarded James Kiddle, Associate Professor of Chemistry, one of only two 2017 Ignition Grant's from the Pharmaceutical Roundtable, to develop an environmentally friendly Wittig reaction for the formation of carbon-carbon double bonds. The ACS GCI Pharmaceutical Roundtable is a partnership between the ACS Green Chemistry Institute and 15 pharmaceutical corporations. The mission of the roundtable is to support innovative ideas providing sustainable solutions to chemistry and engineering problems relevant to the pharmaceutical industry.

Honeywell Donation

Honeywell's chemical division had several chemicals that were perfectly good, but had something slightly wrong with the labels. They contacted the Stockroom manager, Brianna Galli, who sent out emails to the faculty and staff to see what people wanted, and we came up with a list and sent it back to Honeywell. They packed it all up and sent it to us, and most of the chemicals are in that photo. Some are being used for the undergraduate labs, and the rest were distributed to the faculty's research labs.

Left to right in the photo are Brianna Galli, Hem Kothari, Greg Johnson, and Pete Stuurwold.



Published Research on Gold Cluster Nanomolecules from Dr. Ramakrishna Guda's group

Dr. Guda's group along with his collaborators have successfully shown that the energy gap law that was originally developed to describe the excited state relaxation dynamics of organic and organometallic molecules can be used to predict the exciton dynamics in gold clusters. Although the exceptions to the law do exist, they are attributed to the symmetry of the clusters. Also, Dr. Guda's group was a part of an international collaborative project that elucidated the structure of highly luminescent gold clusters protected by Bovine Serum Albumin. Dr. Guda's group has shown with their luminescence measurements that the rigidity offered by the protein is the reason

for enhanced luminescence. In a recent collaborative work, Dr. Guda has shown with ultrafast transient measurements that Au₂₇₉ cluster is the smallest cluster that is plasmonic and shows metallic behavior.

Kwak, K.; Thanthirige, V.D.; Pyo, K.; Lee, D.; Ramakrishna, G. Energy gap Law for Exciton Relaxation Dynamics in Gold Cluster Molecules *J. Phys. Chem. Lett.* 2017, 8, 4898-4905.

Chevrier, D. M.; Thanthirige, V.D.; Luo, Z.; Driscoll, S.; Cho, P.; MacDonald, M. A.; Yao, Q.; Guda, R.; Xie, J.; Johnson, E. R.; Chatt, A.; Zheng, N.; Zhang, P. Structure and

Formation of Highly Luminescent Protein-stabilized Gold Clusters *Chem. Sci.*, 2018, 9, 2782-2790.

Sakthivel, N. A.; Stener, M.; Sementa, L.; Fortunelli, A.; Ramakrishna, G.; Dass, A. Au₂₇₉(SR)₈₄: The Smallest Gold Thiolate Nanocrystal That Is Metallic and the Birth of Plasmon *J. Phys. Chem. Lett.*, 2018, 9, 1295-1300.

Ethical Chemical Practice Students Visit Kalsec, Inc.

Dr. James Guzinski (far left) and the students of Chem 5070, Ethical Chemical Practice, toured the production facilities at Kalsec, Inc. on March 28. This class project was designed to compare safety procedures on an industrial scale with the familiar lab safety lessons that are always part of chemistry lab courses. Although safety equipment such as those used for fire prevention are the same in



principle, practice is very different. Rather than installing fire extinguishers, fire suppression is built into the building design. Even light switches are sealed to prevent the possibility of sparks that could be ignition sources. The class examined solvent storage, stills, extractors, hydrogenators, and other equipment working on a scale three to six orders of magnitude larger than that used in the lab.

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For me, the most interesting part was the fact that they are able to take the spent material after they have extracted what they need from it and put it into compost that can then be used as fertilizer. This way, they are reducing the amount waste that goes into the landfill and are actually able to use the material in a beneficial way.

Renea Mroczek—WMU student

Announcing New Faculty Arriving Fall 2018

Dr. Kelly Teske

Dr. Kelly Teske obtained her B.S. in Chemistry and Biochemistry & Molecular Biology in 2010 from Illinois State University and her PhD. in Organic (Medicinal) Chemistry in 2015 from the University of Wisconsin – Milwaukee. She was a post-doctoral researcher from 2015-2017 at the University of Connecticut in Dr. Kyle Hadden's medicinal chemistry lab. She was also an Adjunct Professor at the University of Connecticut in the Fall 2017 semester, teaching general chemistry. She has worked on the development of azole antifungal analogues for the treatment of medulloblastomas, the design of ATRX targeting inhibitors for the determination of their epigenetic role, the development of a universal kinase and GTPase assay kit, the design and evaluation of vitamin D receptor (VDR) modulators, and the interaction of gold with sulfur-based compounds. Dr. Teske's current research interests lie in the areas of medicinal chemistry, cancer research, small molecule synthesis, and biochemical evaluation.



She plans to develop potent and selective small molecule modulators targeting oncogenic microRNA functions to serve as novel anti-cancer therapeutics, as well as tools to learn more about their mechanistic role in cancer. She will use her interdisciplinary knowledge and experience in organic synthesis, biochemistry, and cellular biology to solve medicinal chemistry problems with a focus on anticancer agents and epigenetic mechanisms.

Research Stars in Dr. Sherine Obare's Lab

Graduate students in Obare's research group have been making significant contributions in understanding the Chemistry and toxicity of emerging contaminants. As a result, four graduate students were each nationally recognized through the American Chemical Society – Division of Environmental Chemistry, with a "Certificate of Merit". This award recognizes researchers who are making an impact through their research on a critical environmental problem and using interdisciplinary approaches. The student awardees are Hazim Al-Zubaidi, Niluka Dissanayake, Kelley Current and Tahseen Saeed.

Kelley and Niluka recently published their work on accelerated growth of microbes induced by nanoparticles in the journal *Biomedicine*. Several of lab work appeared in other journals and were presented in national meetings.

In addition, Obare's graduate student, Hazim Al-Zubaidi has been awarded the College of Arts and Sciences fellowship as well as the Gwen Frostic Award from the Graduate College.

In Spring 2018, Chartanay Bonner and Niluka Dissanayake both successfully completed their dissertations and are now Dr. Bonner and Dr. Dissanayake, respectively.



2017-2018 Dean's Appreciation Award Winner

Dr. Robert Sutton received the 2017-2018 Dean's Appreciation Award. The award recognizes Dr. Sutton's outstanding commitment to student learning over the course of his eight year career. The College honored Dr. Sutton with a reception on April 3, 2018.

New NMR

Nuclear Magnetic Resonance

After nearly two decades of service to the students, faculty and community the Department of Chemistry's current JEOL 400 MHz Nuclear Magnetic Resonance (NMR) Spectrometer will be replaced. Thanks to a generous gift by the Murvay Family, in honor of Mark A. Murvay, alumnus and former member of the Alumni Association and WMU Foundation Board of Directors along with support from the College of Arts & Sciences as well as the Office for the Vice President of Research at Western Michigan University the Department of Chemistry will house a new state-of-the-art JEOL 400 MHz this fall. The spectrometer will be available to all students and faculty for scientific research, as well as to outside researchers within the community.



Portage Northern STEM Field Trip

Nearly 200 Portage Northern 8th graders came to campus on November 21, 2017 for a Middle School Science Field Trip. Several departments on campus collaborated to celebrate STEM, including chemistry, biology, geography, geosciences, physics, and psychology. In the chemistry building, Chem Club shared supplies to make slime, play with dry ice, dissolve styrofoam, implode pop cans and entertain with elephant toothpaste. Graduate students had rotating demonstrations to include foaming colors, cobalt chloride colorimetrics, nanoparticles, and oscillating reactions. In addition to providing exciting



hands-on activities, volunteers talked about their college experiences and possible scientist career paths.

Many thanks to the student volunteers who made this a successful event, Chem Club members Renae Mroczek, Gregory Johnson, Emily Hanners, Paige Poindexter, Caleb McBride, Marcos Santiago, Jack Hicks, Steven Eddy. Graduate students Hem Kothari, Abubkr Abuhagr, Basil Ahmed, Wisam Al-Isawi, Chartanay Bonner, Jashaun Bottoms, Vageesha Gunawardana, Mohammed Hatshan and Tahseen Saeed. Special thanks to Dr. Guda, Dr. Mezei, Dr. Sutton, and Brianna Galli for their organization efforts.

Fast Facts From Department of Chemistry

Undergraduate Enrollment All Majors

	Fall 2007	Fall 2008	Fall 2009	Fall 2010	Fall 2011	Fall 2012	Fall 2013	Fall 2014	Fall 2015	Fall 2016	Fall 2017
Biochemistry (BCHJ)	40	50	51	62	67	78	79	92	77	71	85
Business-Oriented Chemistry (BUCJ)	2	1	2	1	3	4	4	5	2	4	3
Chemistry: ACS Certified (CHCJ)							1	7	10	10	12
Chemistry (CHLJ)	65	71	78	67	57	62	60	69	60	57	49
Chemistry:Secondary Education (CHSJ)	7	7	8	7	4	3	3	3	5	2	
Pre-Chemistry: Secondary Educ (CHSP)	4	6	5	12	8	5	3	3	4	4	4
Total	118	135	144	149	139	152	150	179	158	148	153

Graduate Enrollment All Majors

	Fall 2007	Fall 2008	Fall 2009	Fall 2010	Fall 2011	Fall 2012	Fall 2013	Fall 2014	Fall 2015	Fall 2016	Fall 2017
Chemistry (CHMD)	22	24	33	31	33	33	34	35	31	28	25
Chemistry (CHMM)	19	12	12	8	8	9	11	10	9	10	11
Total	41	36	45	39	41	42	45	45	40	38	36

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Important tax statement: We acknowledge that you will not receive any goods or services in return for your contribution, except for gifts designated to intercollegiate athletics.
Please consult your tax advisor regarding gifts to athletics.



Technology Comes to the Stockroom

For years, the Stockroom has been using inventory and sales software written by a former Stockroom employee and a group of students in the Department of Computer Science. It worked reasonably well for selling glassware and chemicals to the teaching and research labs, but there was room for improvement with regard to storing important information about the chemicals we stock as well as ease of use. We have upgraded to a credit/debit card reader for selling goggles, scrub pants, and lab coats to students, and QuickBooks Point of Sale for keeping track of our chemical and equipment inventory. It stores all sorts of useful information like vendors, item numbers, alternate names, CAS numbers, and storage locations, and all the information is searchable. Before switching to the new software, we closed down for two weeks to rearrange our chemical storerooms for better storage safety, and while doing so we conducted a complete chemical inventory.



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