KENNESAW STATE UNIVERSITY
COLLEGE OF SCIENCE AND MATHEMATICS
DEPARTMENT OF CHEMISTRY AND BIOCHEMISTRY

The **Chemistry and Biochemistry Departmental Seminar Series** covers a broad range of fields in the Chemical and Biochemical Sciences. In past seminars, scientists from Academia, Government, and Industry have presented their most recent discoveries and contributions in their respective areas. This Seminar Series offers students and faculty the opportunity to interact directly with other leaders in their specializations and to gain a good overview of the entire range of fields in Chemistry and Biochemistry.

Spring 2019

Seminars are held on Tuesdays in CL 1009 (Clendenin Building, Room 1009 on the Kennesaw Campus), 12:30 - 1:30pm, unless otherwise noted with special day/time/location information. All are invited to attend.

Tuesday, January 22, 2019 – *SPECIAL LOCATION: CL 2007*

Dr. Jordan Harshman, Assistant Professor in the Department of Chemistry and Biochemistry at Auburn University

Title: *Instructional Profiles of STEM Instructors and Optimization of Cluster Analysis Techniques*

Abstract: Cluster analysis is a technique frequently used in discipline-based education research to empirically categorize participants into groups (clusters) based on characteristics not directly observable. Over 2,000 STEM instructors were observed via the Classroom Observation Protocol for Undergraduate Science (COPUS) and 7 primary instructional profiles emerged from a cluster analysis. There are thousands of algorithms that can be used in cluster analysis, leaving researchers with option-overload. This prompted a simulation study of 3.65 million cluster analyses to determine which one was the best, but it was clear that no single “best” algorithm ubiquitously produces accurate results for all data types.

View event on Facebook: https://www.facebook.com/events/224402001835186

Tuesday, March 5, 2019

Dr. Janet Arras, Postdoctoral Research Associate, Stollenz Research Group, Kennesaw State University

Title: *Low Valent Aluminium and Magnesium Compounds: Metalloid Clusters as Snapshots of the very fast Processes of Dissolution and Formation of Metals*

Abstract: The first description of a metalloid cluster of a base metal was published 20 years ago: $Al_{77}R_{20}$ (R = $N(SiMe_3)_2$). Before this highlight it seemed to be like a dream to trap intermediates on the way from AlR3 to Al metal because of their thermodynamic favorite decomposition to Al and AlR_3 and because of their extremely high sensitivity toward traces of O_2 and moisture. In the following decades, the Schnöckel group succeeded in synthesizing a series of metalloid aluminum and gallium clusters with dimensions even on the nanometer scale, since about 30 years ago a highly sophisticated disproportionation and trapping method was invented that allowed the synthesis of highly reactive intermediates: The high temperature molecules AlX/GaX/MgX (X = Cl, Br, I) were obtained at 1000 °C and subsequently trapped at -196 °C as donor stabilized toluene solutions. These donor stabilized toluene solutions of M(I) halides (M = Al, Mg) provide fundamental insights into mechanistic steps of reduction reactions using activated M metal (cf. Grignard reaction). Furthermore, crystallographically determined metalloid clusters are interesting from a technical perspective of potential interest in e.g. batteries.

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Spring 2019

Tuesday, March 19, 2019
Rio Febrian, Graduate Student in the Bracher Lab at Saint Louis University

Title: *Deliquescent Wet–Dry Cycling: A Tale from The Prebiotic and The Professional World*

Abstract: Elucidating the means by which the first functional biopolymers arose on Earth is a major focus of origin-of-life research. In my research, I explore the wet–dry cycling model— a widely regarded means of driving condensation reactions under prebiotic conditions to generate mixtures of prospective biopolymers. A criticism of this model is its reliance on unpredictable rehydration events, like rain storms. In this seminar, I will be talking about the ability of deliquescent minerals—which form aqueous solutions by absorbing water vapor— to mediate the oligomerization of glycine during spontaneous, iterative wet–dry cycles. The deliquescent mixtures can 1) foster yields of oligomerization over ten-fold higher than non-deliquescent controls, and 2) tightly regulate their moisture content. In parallel to my research, I will also talk about how we, as scientists, can apply the systematic, critical thinking approach of the scientific method to business and other everyday complex problems.

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Tuesday, March 26, 2019
Gregory Zetzsche, Lecturer at IUT Bordeaux Techniques de Commercialisation, France

Title: *Seeing and Smelling the Chemicals in Wine: An Interactive Seminar*

Abstract: This talk will include a discussion on skills in “sighting” wine’s appearance, and the scientific link to everything a wine can tell you just by looking at it. An audience-interactive "blind olfaction” activity involving smelling perfume vials of “wine faults” will follow with a discussion of their chemical sources.

View event on Facebook: https://www.facebook.com/events/592483034561391

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Spring 2019

Tuesday, April 23, 2019
Ph.D. Candidate, The Cancer Biology Graduate Program at Emory University

Title: *Desmosme Assembly and Disassembly: Lessons from studying Dermatological Diseases*

Abstract: Cell-cell adhesion complexes mediate fundamental cellular interactions crucial in maintaining the integrity of skin, an essential protective barrier to the outside world. Desmosomes are large adhesion complexes critical for epidermal integrity and differentiation. These junctions are rigid enough to confer resistance to mechanical stress but dynamic enough to allow for processes such as wound healing and epidermal differentiation. Altered desmosomal adhesion results in the formation and progression of several genetic and acquired skin disorders. Additionally, desmosome stability is altered during the process of epithelial to mesenchymal transition, a necessary step for tumors to metastasize. Thus, understanding the complex dynamics of desmosomal components and how desmosomes assemble and disassemble is necessary for developing novel treatments for a variety of skin diseases.

Lipid rafts are sphingolipid and cholesterol rich membrane domains that introduce membrane heterogeneity and act as platforms for protein aggregation and signaling. All desmosomal proteins have been shown to associate with lipid rafts, however the biological significance of this association is unknown. We investigate the mechanism by which desmoglein (Dsg) associates with lipid rafts and uncover that the length of the transmembrane domain (TMD) is a key regulator or raft association. Additionally, we identify a patient with severe dermatitis multiple allergies and metabolic wasting syndrome that is caused by a point mutation within the TMD of Dsg1. This mutation abrogates lipid raft association of Dsg1, prevents Dsg1 incorporation into the desmosome, and results in Dsg1 retention in the Golgi apparatus. Additionally, we demonstrate that the bilayer within the desmosome is thicker than non-desmosome bilayer, thus identifying the desmosome as a lipid raft-like domain.

We then study the disassembly of desmosome through a pemphigus vulgaris model. Pemphigus vulgaris (PV) is an autoimmune disorder in which autoantibodies targeting Dsg3 and Dsg1 disrupt desmosome adhesion resulting in intraepidermal blisters. Here we validate observations that have been seen in *in vitro* models to study the progression of PV by correlating in vitro data to clinical measures of disease severity. We also determine that the sum of antibody titers against Dsg1 and Dsg3 is more correlative to disease severity than either titer on its own. These data demonstrate a relationship between Dsg antibody titer and disease severity, validate current methods for studying PV in cell culture, and confirm that results seen in cell culture models are relevant to the pathogenesis of pemphigus vulgaris. Together, these studies increase our understanding of how desmosomes assemble and disassemble, thus providing a platform for future investigation of the mechanisms regulating desmosome stability during tumorigenesis.