12th Annual
GRADUATE ACADEMIC CONFERENCE

It Starts with Us: Graduate Students at the Forefront
February 22, 2020

February 22nd, 2020
Michigan State University Student Union
Meet the Graduate Academic Conference Committee

Hunter McFall-Boegeman is currently serving as the Recording Secretary for COGS and as the Chair of the GAC planning committee. Prior to that he served as the COGS representative for the Department of Chemistry, where he is a 4th year PhD candidate. His research interests include carbohydrate synthesis, glycobiology and immunology as they relate to cancer immunotherapies. His dissertation involves engineering the bacteriophage Qbeta (replace beta with the Greek symbol) to display tumor associated carbohydrate antigens and Cytotoxic T cell epitomes as part of a therapeutic and preventative anti-cancer vaccine. For his work he was named a 2018 Aitch Foundation Graduate Fellow. He earned his B.A. in Biochemistry from the University of Minnesota-Morris. There he played on both the football and track and field teams while serving as a Community Advisor for the Office of Residential Life. Outside of his own research he enjoys teaching, sports, and exploring nature.

Gabriela Shirkey is a PhD student in the Department of Geography, Environment and Spatial Science with a dual-degree in Environmental Science and Public Policy and a research appointment at the Center for Global Change and Earth Observations. Her work is close to home in Michigan, studying spatio-temporal changes in terrestrial carbon in the Kalamazoo Watershed and creating new method to measure landscape scale global warming potential.

Zoe Hansen is a 3rd-year PhD student in Microbiology and Molecular Genetics and Ecology, Evolutionary Biology, and Behavior program. In addition to acting as a departmental representative for COGS, Zoe is also very involved with the local chapter of Graduate Women in Science (GWIS). She is passionate about mentoring and outreach and especially loves supporting girls and women in STEM. In her free time, Zoe enjoys hiking, going on adventures with her dog, Pearl, playing sports and running, and hosting board game nights with friends.
Sarah McFall-Boegeman is currently serving as the COGS representative for the Chemistry Department. She is in her 3rd year of her PhD candidacy. Her research investigates the surface preparation methods of aluminum alloys in the aerospace sector to mitigate corrosion. Currently her work is looking at the advantages of laser surface treatments and an environmentally friendly coating system to inhibit corrosion. In addition to serving as the COGS representative she also serves on the steering committee of ACS Women in Chemistry where she helps encourage women and girls to stay in chemistry and to show that there is a strong network of Women Chemists.

Veronica Frans is from New Jersey, and has degrees in the environmental sciences, French (BS/BA at Messiah College) and International Nature Conservation (MSc. at Goettingen University, Germany). She specializes in ecology, geographic information systems, programing, ecological modeling, and community outreach and engagement. Veronica has lived, studied and worked in many different places around the world, mainly focusing on marine environments and emphasizing the importance of local knowledge and working with stakeholders and decision-makers to accomplish mutual goals for conservation. Currently, Veronica is a 2nd-year PhD student in Fisheries and Wildlife and Ecology Evolutionary Biology and Behavior. She is an NSF GRFP Fellow and University Enrichment Fellow and works at the Center for Systems Integration and Sustainability (CSIS) with Dr. Jianguo (Jack) Liu. She studies human influence on species distributions.

The Graduate Academic Conference Committee would also like to acknowledge the contributions of the COGS office staff and COGS Executive Board and the volunteers for their involvement in planning and executing this conference.
Welcome to the 12th Annual Graduate Academic Conference

February 22, 2020

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About the Keynote Speaker

Beronda Montgomery, PhD

Beronda L. Montgomery is MSU Foundation Professor of Biochemistry & Molecular Biology and Microbiology & Molecular Genetics in the Department of Energy (DOE) Plant Research Laboratory at Michigan State University. She also serves as Assistant Provost for Faculty Development - Research. Dr. Montgomery completed doctoral studies in Plant Biology at the University of California, Davis and was a National Science Foundation (NSF) funded postdoctoral fellow in Microbial Biology at Indiana University.

Since starting at MSU in 2004, Dr. Montgomery’s laboratory investigates the mechanisms by which organisms such as plants and cyanobacteria which have limited mobility are able to monitor and adjust to changes in their external environment. The ability of these largely immobile organisms to adapt their patterns of growth and development to fluctuations in external environmental parameters increases their survival and maximizes their growth and productivity. Dr. Montgomery’s scholarly efforts have been recognized by receipt of an NSF CAREER Award, being selected as a finalist in the 2014 Howard Hughes Medical Institute (HHMI) Professors Competition, a 2015 Michigan State University Nominee for the Council for Advancement and Support of Education (CASE) U.S. Professor of the Year Award, and as an 2017-2019 American Society of Microbiology Distinguished Lecturer. Dr. Montgomery was elected as a fellow of the American Academy of Microbiology in 2018.

Dr. Montgomery also conducts scholarship and training initiatives on effective research mentoring, research management and academic leadership, including issues related to mentoring diverse students and junior scientists, as well as faculty development.
## Conference Schedule

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<thead>
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<th>Time</th>
<th>Event</th>
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<td>9:00am</td>
<td>Registration Table Opens</td>
<td>Ballroom, 2nd Floor</td>
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<tr>
<td>9:30am - 11:00am</td>
<td>Workshops</td>
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<td></td>
<td>Policy Advocacy</td>
<td>Lake Superior, 3rd Floor</td>
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<td>Speaking with the General Public</td>
<td>Lake Ontario, 3rd Floor</td>
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<td>11:00am - 11:15am</td>
<td>Break</td>
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<td>11:15am-12:15pm</td>
<td>Oral Presentations Session I</td>
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<td>Science in Society I</td>
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<td>Healthy Societies I</td>
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<td>Bodies in Motion I</td>
<td>Lake Michigan, 3rd Floor</td>
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<td>Sustainability I</td>
<td>Lake Erie, 3rd Floor</td>
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<tr>
<td>12:15pm - 12:30pm</td>
<td>Break</td>
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<tr>
<td>12:30pm - 1:45pm</td>
<td>Lunch/ Keynote Speaker</td>
<td>Ballroom, 2nd Floor</td>
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<td>1:45pm - 2:00pm</td>
<td>Break</td>
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<td>2:00pm - 4:15pm</td>
<td>Poster Presentations</td>
<td>Lake Huron, 3rd Floor</td>
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<td>2:00pm - 3:00pm</td>
<td>Oral Presentations Session II</td>
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<td>Sustainability II</td>
<td>Lake Erie, 3rd Floor</td>
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<td>Healthy Societies II</td>
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<td>Sustainability III</td>
<td>Lake Michigan, 3rd Floor</td>
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<td>Science in Society II</td>
<td>Lake Superior, 3rd Floor</td>
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<td>3:00pm - 3:15pm</td>
<td>Break</td>
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<td>3:15pm - 4:15pm</td>
<td>Oral Presentations Session III</td>
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<td>Sustainability IV</td>
<td>Lake Erie, 3rd Floor</td>
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<td>Healthy Societies III</td>
<td>Lake Ontario, 3rd Floor</td>
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<td>Bodies in Motion II</td>
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<td>Science in Society III</td>
<td>Lake Superior, 3rd Floor</td>
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<td>4:15pm - 4:30pm</td>
<td>Break</td>
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<td>4:30pm - 5:30pm</td>
<td>Three Minute Thesis Contest</td>
<td>Ballroom, 2nd Floor</td>
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<td>5:30pm - 5:45pm</td>
<td>Break</td>
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<tr>
<td>5:45pm - 6:00pm</td>
<td>Awards</td>
<td>Ballroom, 2nd Floor</td>
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<tr>
<td>Time</td>
<td>Session</td>
<td>Abstract #</td>
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<tr>
<td>11:15 am – 12:15 pm</td>
<td>Science in Society I</td>
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<tr>
<td>11:15 am – 11:30 am</td>
<td>Geeta Kumari</td>
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<td></td>
<td>A strategy to make it stronger: bi-modal distribution of the γ’ phase in Allvac 718Plus</td>
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<td>11:30 am – 11:45 am</td>
<td>Justin Lee</td>
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<td>Listeria monocytogenes Infection During Pregnancy Alters Gene Expression in the Fetal Mouse Brain</td>
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<td>11:45 am – 12:00 pm</td>
<td>Natalia Pajares-Chamorro</td>
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<td>Bioactive Particles for Osteoregenerative Applications</td>
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<td>12:00 pm – 12:15 pm</td>
<td>Nidia Maradiaga</td>
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<td>Early Life Adversity Programs Bone Marrow-Derived Mast Cell Progenitors Toward a Hyperactive Phenotype into Adulthood</td>
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<td>11:15 am – 12:15 pm</td>
<td>Sustainability I</td>
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<tr>
<td>11:15 am – 11:30 am</td>
<td>Jack Walton</td>
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<td></td>
<td>The Effect of Chemical Milling on Aluminium Alloy AA2024</td>
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<tr>
<td>11:30 am – 11:45 am</td>
<td>Xinyi Tu</td>
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<td></td>
<td>Identifying Challenges to Build a Soil Health Decision Tool</td>
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<td>11:45 am – 12:00 pm</td>
<td>Vannessa Maldonado</td>
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<td>Electrochemical Destruction of Per-and Polyfluoroalkyl Substances (PFAS) in Landfill Leachates</td>
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<td>12:00 pm – 12:15 pm</td>
<td>Rosalane Kithan</td>
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<td>Characterization of the mechanisms of leaf-associated microbe-microbe interactions.</td>
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<td>11:15 am – 12:15 pm</td>
<td>Bodies in Motion I</td>
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<td>11:15 am – 11:30 am</td>
<td>Brandon Barker</td>
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<td>Constraining the Core Structure of Core-Collapse Supernovae</td>
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<td>11:30 am – 11:45 am</td>
<td>Rahul Jain</td>
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<td>X-rays from the space and their relation to Nuclear Reactions</td>
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<tr>
<td>11:45 am – 12:00 pm</td>
<td>Heather Miller</td>
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<td>Environmental controls on autotrophy in subsurface volcanically influenced systems</td>
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<tr>
<td>Time</td>
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<tr>
<td>11:15 am – 12:15 pm</td>
<td>Healthy Societies I</td>
<td>Fawaz Habba, OMS-IV It Counts: Accuracy of Inpatient Respiratory Rate Measurements</td>
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<tr>
<td>11:30 am – 12:15 pm</td>
<td>Healthy Societies I</td>
<td>Skye Russell Development of an Enzyme-Based Electrochemical Biosensor for ATP for In Vitro Measurements in the Gastrointestinal Tract</td>
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<td>11:45 am – 12:00 pm</td>
<td>Healthy Societies I</td>
<td>Raquelle Wilson Effects of docosahexaenoic acid (DHA) in treating lupus nephritis (LN) patients with systemic lupus erythematosus (SLE)</td>
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<td>12:00 pm – 12:15 pm</td>
<td>Healthy Societies I</td>
<td>Weiyang (Jessica) Yang A Fully Transparent, Flexible µECoG Array Based on Highly Conductive and Anti-reflective PEDOT:PSS-ITO-Ag-ITO Thin Films</td>
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<tr>
<td>2:00 pm – 3:00 pm</td>
<td>Sustainability II</td>
<td>Wilmer Cuervo Cysteine as potential antioxidant and immune enhancer on dairy calves</td>
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<tr>
<td>2:15 pm – 2:30 pm</td>
<td>Sustainability II</td>
<td>Daniel Hoffman Cropping System Diversity for Improved Soil Health on Michigan Farms</td>
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<tr>
<td>2:30 pm – 2:45 pm</td>
<td>Sustainability II</td>
<td>Matthew Kuhn In vitro evaluation of vitamin E analogs as ancillary antioxidants in dairy cattle</td>
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<tr>
<td>Time</td>
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<td>2:00 pm – 3:00 pm</td>
<td>Healthy Societies II</td>
<td>Lake Ontario</td>
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<td>2:15 pm – 2:30 pm</td>
<td>Marcion D. González Flores</td>
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<td>2:30 pm – 2:45 pm</td>
<td>Charuta M. Parkhi</td>
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<td>2:45 pm – 3:00 pm</td>
<td>Jessica Wagner</td>
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<td>2:00 pm – 3:00 pm</td>
<td>Sustainability III</td>
<td>Lake Michigan</td>
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<tr>
<td>2:30 pm – 2:45 pm</td>
<td>John Tran</td>
<td>Lake Michigan</td>
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<tr>
<td>2:00 pm – 3:00 pm</td>
<td>Science in Society II</td>
<td>Lake Superior</td>
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<tr>
<td>2:15 pm – 2:30 pm</td>
<td>Joelyn de Lima</td>
<td>Lake Superior</td>
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<tr>
<td>2:30 pm – 2:45 pm</td>
<td>Jainisha Chavda</td>
<td>Lake Superior</td>
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<td>2:45 pm – 3:00 pm</td>
<td>Tyler Derr</td>
<td>Lake Superior</td>
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<tr>
<td>Time</td>
<td>Session</td>
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<tr>
<td>3:15 pm – 3:30 pm</td>
<td>Bodies in Motion II</td>
<td>Carolyn Kroger</td>
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<td>3:30 pm – 3:45 pm</td>
<td>Sustainability IV</td>
<td>Fernando B. Vergara</td>
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<td>3:45 pm – 4:00 pm</td>
<td>Healthy Societies III</td>
<td>Emily Werner</td>
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<td>Salil R. Sapre</td>
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<td>Aaron J. Staples</td>
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<td>3:45 pm – 4:00 pm</td>
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<td>Hunter Dulay</td>
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<td>3:15 pm – 3:30 pm</td>
<td>Healthy Societies III</td>
<td>Maryssa Gilbert</td>
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<td>3:30 pm – 3:45 pm</td>
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<td>Erika Malana</td>
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<td>3:45 pm – 4:00 pm</td>
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<td>Amelia Stieren</td>
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<td>Time</td>
<td>Session</td>
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<td>3:15 pm – 3:30 pm</td>
<td>Science in Society III</td>
<td>Scott Knowles</td>
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<td>3:30 pm – 3:45 pm</td>
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<td>Xiaoyan Li</td>
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<td>3:45 pm – 4:00 pm</td>
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<td>Fatemehsadat Parvis</td>
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## POSTERS - 2:00 pm – 4:15 pm

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<thead>
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<th>Healthy Societies</th>
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<th>Science in Society</th>
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<tr>
<td>42</td>
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<td>The Incarceration of Black Men and Black Health</td>
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<td>Alexis Maroney</td>
<td>A Quality Improvement Analysis of Unexpected Readmissions Within 30 Days of Discharge following Congenital Heart Defect Repair Surgery</td>
<td>Christopher Cenzer</td>
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<td>44</td>
<td>Basma Al Masraf</td>
<td>School-based opioid awareness and prevention approach</td>
<td>Geeta Kumari</td>
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<tr>
<td>45</td>
<td>Dilnora Azimova</td>
<td>Asian American health values and family communication in context of chronic hepatitis B</td>
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<tr>
<td>46</td>
<td>Emily Thomas</td>
<td>Chemistry in the Classroom: Social Networks in an Undergraduate Chemistry Course</td>
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<tr>
<td>47</td>
<td>Fawaz Habba</td>
<td>Effective Teaching Strategies in Patient Education</td>
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<tr>
<td>48</td>
<td>Fawaz Habba</td>
<td>Physician Non-Verbal Communication Skills: A Patient’s Perspective</td>
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<td>49</td>
<td>Jamie L. Ragos</td>
<td>An evaluation of the long-term consequences of Shiga-toxin producing Escherichia coli and their various comorbidities</td>
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<td>50</td>
<td>Jessica D.A. Lee</td>
<td>Role of vasopressin in the ventral pallidum in regulating social play in juvenile rats</td>
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<td>51</td>
<td>Katayoon Maghami</td>
<td>Drug-target residence time as a complementary parameter for drug design</td>
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<td>52</td>
<td>Lisaura Maldonado-Pereira</td>
<td>The role of oxidative compounds in the toxicity of ultra-processed foods in the Western Diet</td>
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<td>53</td>
<td>Vinai Reddy</td>
<td>How Can 2 hours Change YOUR Quality of Life</td>
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<td><strong>Sustainability</strong></td>
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<td>Akash Gondaliya</td>
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<td>Brianna Alred</td>
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<td>Mona Alinejad</td>
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<td>Noleen R. Chikowore</td>
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<td>Olivia Simaz</td>
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<td>Rosalane Kithan</td>
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<td>Shardula Gawankar</td>
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<td>Tara Watkins</td>
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<td>Tatiana A. Iret skaia</td>
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<td>Xinyi Tu</td>
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<tr>
<th><strong>Bodies in Motion</strong></th>
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<td>Dhrubajit Chowdhury</td>
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<td>Pratap Bhanu Solanki</td>
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"An 80,000 word thesis would take 9 hours to present. Their time limit....3 minutes."

<table>
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<tr>
<th>Three Minute Thesis Competition</th>
<th>Ballroom, 2nd Floor</th>
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<tbody>
<tr>
<td>Amelia Stieren</td>
<td>To Translate a Life: Understanding the Holocaust through Autobiographical Storytelling</td>
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<tr>
<td>Geeta Kumari</td>
<td>A strategy to make it stronger: bi-modal distribution</td>
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<tr>
<td>Xinyi Tu</td>
<td>Soil Health - Foundation of Resilience in Global Food Systems</td>
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<td>Nidia Maradiaga</td>
<td>Do Stressful Early Life Experiences Shape your Immune System?</td>
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<td>Syeda Anum Hadi</td>
<td>Enhancing Specificity of Diagnosing Bovine Tuberculosis</td>
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<tr>
<td>Dhrubajit Chowdhury</td>
<td>Accelerated Convergence in Large Scale Networks</td>
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<tr>
<td>Hamid Karimi</td>
<td>Understanding and Promoting Teacher Connections in Online Social Media: A Case Study on Pinterest</td>
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<tr>
<td>Mathis Allen</td>
<td>Nonlinear Model Predictive Control with Output Feedback</td>
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<tr>
<td>Manjot Kaur Sidhu</td>
<td>Influence of Tree Density and Training Systems on Solar Radiation Interception and Fruit quality of Peach in the Sub-tropics of India</td>
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<td>Prabhjot Kaur</td>
<td>Understanding the genetic mechanism of plant vegetative development rate</td>
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#1) A strategy to make it stronger: bi-modal distribution of the γ’ phase in Allvac 718Plus
Geeta Kumari*, Carl Boehlert, M. Sundararaman, and S. Sankaran

Superalloy or the high-performance alloy is the backbone of the gas turbine engine because of its excellent properties at high temperatures in the range of 540-1204°C (1000-2200°F). The service temperature of the materials used in here determines the efficiency of the engine. It is a well-known fact that the strength and life of a material is determined by the stability of its microstructure. Alloy Allvac 718Plus is relatively a new superalloy developed to improve upon the properties of the widely used superalloy Inconel 718 (IN718). It shows improvement in service temperature up to 704°C (55°C more than IN718) because of its chemical composition, microstructure and major strengthening phase, γ’. The γ’ precipitates in the alloy help in withstanding such high temperature and stressed environment by hindering the motion of dislocation. When there is smaller γ’ precipitates present, dislocation prefers to shear through them whereas in case of larger precipitates, dislocation tries to loop around them. The present study aims to develop a bi-modal (smaller and larger both) distribution of the γ’ precipitates by conducting various heat-treatment of the sample. The heat-treatment involved solutionizing and two-step aging treatment in the range of temperatures 700-1000°C. The developed microstructure will be studied to investigate the mechanism of deformation under the effect of stress and temperature similar to service environment similar to aerospace engine.

#2) Listeria monocytogenes Infection During Pregnancy Alters Gene Expression in the Fetal Mouse Brain
Justin Lee

Prenatal infection causes serious fetal consequences such as miscarriage, stillbirth, and neurodevelopment brain disorders. Numerous epidemiological studies reveal correlations between prenatal infection and neurodevelopmental disorders such as autism spectrum disorder, schizophrenia, and bipolar disorder in the offspring of the pregnancy. Prenatal infection triggers maternal immune activation (MIA) and induces pro-inflammatory cytokines such as interleukin-1a (IL-1a), IL-6, IL-17a, or TNF-a. MIA seems to play a key role in abnormal behaviors by disrupting fetal brain development. In this study, we used a bioluminescent labeled Gram-positive intracellular foodborne pathogen, Listeria monocytogenes, to induce MIA in pregnant CD-1 mice by intravenous infection on gestational day 14.5. RNA-seq of the fetal brain on gestational day 18.5 was performed to identify gene expression patterns of the fetal mouse brain. A total of 383 dysregulated genes (adjusted p < 0.05) were observed using a DESeq2 package in R. The functional annotation of upregulated genes suggested that MIA induces a hypoxic like environment in the fetal brain which leads to having abnormal stimulus of vascular endothelial growth factors whereas downregulated genes reduced expression of keratinocyte differentiation and re-entry into mitotic cell cycle. Our results provide a novel molecular mechanism by which MIA induces subtle altered gene expression in the fetal brain during brain development.

#3) Bioactive Particles for Osteoregenerative Applications
Natalia Pajares-Chamorro*, Chima Maduka, Sandra Hernandez-Escobar, Yadav Wagley, Neal Hammer, Parker Acevedo, Daniel Youngsrom, Kurt Hankenson, and Xanthippi Chatzistavrou

Bone infections by multi-drug resistant bacterial strains are a global threat. Methicillin-resistant Staphylococcus aureus (MRSA) is the most common bacterium in bone infectious diseases, and it has been identified by the World Health Organization (WHO) as a high priority bacterium. Unfortunately, the efficacy of traditional antibiotics is dramatically reduced against MRSA. The elevated morbidity and mortality associated with multi-drug resistant infections support the need for innovative approaches that not only improve treatment outcomes but also reduce the time of patient hospitalization. In this project, we focus on the development of novel biomaterials that could promote new bone formation while simultaneously combating bacteria in infected bone. Bioactive glass (BG) microparticles have been used as delivery vehicles for therapeutic ions such as Ag+ as a strategy to combine regenerative and antibacterial properties in a single system. Our results showed the unique capability of this system to resurrect antibiotics MRSA resists at concentrations that induce significant new bone growth on a mice calvarial defect. Advanced biological and bactericidal effects were observed in vitro by reducing the particle size below 100 nm. Our nanoparticle treatment accelerated both in vitro cell proliferation as well as bacterial inhibition using only 2% of the concentration required for microparticles to yield similar results. In conclusion, this research work presents a novel approach against multi-drug resistant strains and serves as a foundation for further studies to advance the treatment options in orthopaedic infections.
#4) Early Life Adversity Programs Bone Marrow-Derived Mast Cell Progenitors Toward a Hyperactive Phenotype into Adulthood

Nidia Maradiaga*, Calvin S. Phol, Emily Mackey, and Adam J. Moser

Early life adversity (ELA) is a risk factor in the onset and exacerbation of inflammatory disorders later in life including allergies, asthma, cardiovascular diseases and functional gastrointestinal disorders (FGIDs) such as irritable bowel syndrome (IBS) and inflammatory bowel disease (IBD). Our previous studies using murine and porcine models showed that mast cells (MCs) a key immune cell driving allergies and chronic pain disorders, display a hyperactive tissue phenotype in adult animals exposed to ELA. The mechanism by which ELA induces MC activation in adulthood remains unknown. The aim of this study was to determine that ELA programs bone marrow-derived mast cell progenitors toward a hyperactive phenotype into adulthood by using an ELA model of neonatal maternal separation (NMS) plus early weaning. Pups (C57BL/6) were either raised normal handled (NH) or subjected to 3 h of daily NMS plus early weaning (NMSEW). At 10 weeks, serum and mesenteric windows from jejunum were collected to evaluate histamine and tissue MC activation. Bone marrow derived MCs (BMMCs) from adult mice were harvested and stimulated with IgE-DNP, IL33 and LPS to assess degranulation and cytokine release. BMMCs from NMSEW mice exhibited greater histamine and MC protease-1 release (P<0.05) upon IgE-DNP stimulation. Higher IL6 release (P<0.001) upon IL33 stimulation and higher TNFα release (P<0.05) upon LPS stimulation. Our data demonstrates that ELA induces long-lasting functional changes in MC progenitors. Future studies will elucidate the mechanisms by which ELA drives lasting hyperactivity of MC progenitors and its role in MC-related disorders in adulthood.

#5) The Effect of Chemical Milling on Aluminum Alloy AA2024

Jack Walton

Aluminum alloys are used in the aerospace industry because of their high strength to weight ratio. However, these alloys are susceptible to corrosion. Intermetallic particles (IMP’s) create a galvanic couple with the surrounding metal. In the presence of water and electrolyte, electrons are transferred from the aluminum matrix to more noble metals. This causes pitting, which can weaken the material and cause mechanical failure. One way to combat this corrosion is to employ a coating system that prevents water and electrolyte from accessing the surface of the metal. The success of these coating systems relies heavily on the surface morphology of the metal. The substrate must be properly cleaned and treated before coating. One common pretreatment is chemical milling, which aggressively removes material at the surface. This presentation will focus on the basics of corrosion electrochemistry and the effect of chemical milling on surface morphology and atomic composition. This will be explained through electrochemical data paired with scanning electron microscopy, digital optical microscopy, and optical profilometry techniques.

#6) Identifying Challenges to Build a Soil Health Decision Tool

Xinyi Tu* and Sieglinde Snapp

The importance of sustainable management in agriculture is well-recognized as it stabilizes food security while mitigating the environmental drawbacks of intensive farming. The concept of soil health (SH) is widely used in discussions of sustainable agriculture to understand the function of soil and many researchers assert that soil health constitutes the inherent connection between ecosystem services and human health. There is a need for soil health decision tool enhance SH to improve yield for economic profit and to protect the environment. There are a number of ways for farmers to submit soil samples to testing labs for analyses, yet there is a gap between researchers’ suggested SH framework and the lab analyses that are offered by commercial test labs. Additionally, the tools for farmers to evaluate SH through on-farm assessment is not well developed. Andrews and Carroll (2001) created a framework for identifying a minimum data set (MDS) to assess SHI from a large pool of physical, chemical, and biological variables. However, some SH indicator suggested by the researchers’ MDS is not available for commercial soil test labs, such as mean weight diameter suggested by Xue et al. (2019). Farmers’ opinions rarely have been considered for SH indicators. Also, the adoption and development of MDS by different research groups has been inconsistent, posing a challenge to assessment of soil health.

#7) Electrochemical Destruction of Per-and Polyfluoroalkyl Substances (PFAS) in Landfill Leachates

Vannessa Maldonado*, Greg Landis, Mary Ensch, Michael Becker, and Cory Rusinek

Per and Polyfluoroalkyl Substances (PFAS) are a group of synthetic chemicals with exceptional physicochemical properties which make them resistant to biodegradation. They have been identified as emerging environmental contaminants
due to their recalcitrant nature and their associated high-risk health effects. Multiple consumer products containing PFAS end up in landfills, and their presence have been reported in landfill leachates in the ppb range. In addition, landfill leachates present multiple precursor compounds which can be further oxidized to the most common forms of PFAS: PFOA and PFOS. We used electrochemical oxidation with Boron Doped Diamond (BDD) electrodes as a destructive technology to break down PFAS present in landfill leachates to non-detect levels. The BDD material provides a combination of rigidity, high oxygen over-potential, and overall electrode lifetime, which makes it an attractive option for an electrochemical treatment system. This presentation will cover the basic and applied research findings of using electrochemical oxidation (EO) with BDD electrodes to destroy PFAS in landfill leachates.

#8) Characterization of the mechanisms of leaf-associated microbe-microbe interactions.
Rosalane Kithan

In plant innate immunity, the first line of microbial recognition relies on the pattern-recognition receptors (PRRs) to detect pathogen-associated molecular patterns (PAMPs) and initiate PAMP-triggered immunity (PTI). PTI is found to be a principal component of the plant genetic network maintaining the leaf microbiome. An Arabidopsis thaliana mutant disrupted in both PTI signaling and the AtMIN7 gene (mbbc) showed an excessive proliferation of bacterial endophytes. Interestingly, 16s rRNA sequencing analysis showed that proteobacteria dominated the leaf microbial community in the mutant and firmicutes, which were present in abundance in wild type leaves, were nearly eliminated. This suggests that PTI signaling and the AtMIN7 gene are two important components of a host barrier that controls the level of commensal and possibly beneficial microbiota from excessive proliferation in the phyllosphere, crucial for optimal plant health. Furthermore, the mbbc mutant leaves showed tissue chlorosis and/or necrosis when shifted to high humidity. We hypothesize that PTI and AtMIN7 are required for mediating the proteobacteria-firmicute interactions on the leaf and in the absence of these components ‘opportunistic’ proteobacteria are able to proliferate at the expense of firmicutes. Perhaps to sustain a high population level, proteobacteria antagonize firmicutes by secreting antimicrobial, secondary metabolites as a means for their survival and persistence. To characterize the metabolites responsible for the antagonism, we will employ a dual approach: (i) a functional genomic approach involving the use of antiSMASH (antibiotic & Secondary Metabolite Analysis Shell) and (ii) bioassay-guided metabolite fractionation. The main goal of this project is to study the molecular basis of the proteobacteria-firmicute interactions and to understand the mechanism by which plants control the leaf microbiota to benefit plant health.

#9) Constraining the Core Structure of Core-Collapse Supernovae
Brandon Barker

Observations of core-collapse supernovae (CCSNe) reveal a wealth of information about the dynamics of the supernova ejecta and composition, for example, but tell little of the progenitor star without invoking a theoretical model. Until recently, one dimensional (1D) theoretical CCSN models did not include a robust treatment of the core physics. We use a new model for driving turbulence-aided neutrino-driven core-collapse supernovae in 1D which contains a high fidelity treatment of the neutrino and proto-neutron star physics while also accounting for turbulent and convective energy. With this, we correlate observable properties of the light curves obtained from our model such as plateau luminosity and photospheric velocity with properties of the core structure of the supernova such as the core compactness parameter. This will allow for properties of the core structure of the progenitor stars to be estimated using easily-observed quantities from the light curves. Moreover, we present a comparison of our population of type IIP supernovae to observed type IIP supernovae for which archival pre-supernovae data are available.

#10) X-rays from the space and their relation to Nuclear Reactions
Rahul Jain* and Hendrik Schatz

X-ray bursts are some of the most energetic events observed in the cosmos. A typical outburst releases $10^{39-40}$ ergs of energy lasting for 10-100 seconds. This is equivalent to the total energy released by the sun over the course of a full year. These X-rays are detected by the space-based telescopes since X-rays cannot travel through the earth’s atmosphere. Owing to the recent advances in astronomy with new and fancy satellites, a large number of such outbursts from all over the sky are now observed and recorded. These outbursts are thermonuclear explosions occurring onto the surface of neutron stars in a binary system. Hydrogen and helium-rich gas from the companion star is deposited onto their surface due to their extreme gravitational pull. The deposited gas ignites and burns explosively due to the high density and temperatures on the surface of neutron stars. Analyzing the recorded profiles of such bursts can provide information about the structure and composition of neutron stars.
However, interpreting such properties from observations requires a complete understanding of nuclear reactions that happen inside neutron stars. These reactions can significantly alter the conditions that affect the X-ray bursts. I will present the types of nuclear reactions that are thought to take place in such environments focusing on pycnonuclear fusion which is the main topic of my thesis.

11) Environmental controls on autotrophy in subsurface volcanically influenced systems
Heather Miller

Subduction-related processes, including the movement and alteration of carbon compounds, are an important component of global geochemical cycles. Actively degassing arc volcanoes offer interesting opportunities to not only characterize the composition and abundance of volatilized gases, but to investigate the geomicrobiological contribution to element cycling. Subsurface chemosynthetic activity has been found to thrive in these extremely harsh, nutrient-limiting environments, where volatilized CO2 derived from plate subduction and deeply sourced magmatic activity is utilized. Not only have temperature, pH, and dissolved inorganic carbon (DIC) demonstrated control over microbial diversity in the present, but tectonic processes have been correlated to the distribution and function of these subsurface bacteria on a geological time scale. Deep subsurface microbial activity has been found to significantly impact the flux of reduced volcanic gases, either through transformation or assimilation into fixed biomass. Chemolithoautotrophs have been found responsible for sequestering at least 3% of outgassed carbon released throughout the forearc of Cocos-Nazca Spreading (CNS) Center in central Costa Rica, with a yet unquantifiable contribution to the biomineralization of CO2 in the form of calcium carbonate precipitation and calcite formation. Furthermore, proteomic analysis has revealed microbial preferences for specific carbon fixation pathways depending upon site geochemistry (e.g., metal ion concentrations, pH) and ATP requirements.

#12) It Counts: Accuracy of Inpatient Respiratory Rate Measurements
Fawaz Habba, OMS-IV

As respiratory rate is not an electronic measurement, but rather a manual one, healthcare providers may utilize different techniques to measure this vital sign. This study compares the respiratory rates of hospitalized patients recorded by health professionals to the measurements obtained utilizing the current recommended method of measuring respiratory rate.

Participants were adult male and female patients admitted to Ascension Providence Hospital. The respiratory rates of patients were measured and recorded, utilizing the current recommended method by the World Health Organization (WHO). Measuring and recording of the respiratory rate for each patient was performed within fifteen minutes of the documented respiratory rate as reflected in the patient's chart. Sixty-four patients (49 percent) had a respiratory rate difference of three breaths per minute when comparing the documented respiratory rate to that obtained utilizing manual counting; twenty-nine patients (22 percent) had a respiratory difference of one breath per minute. Among all 131 patients examined, the mean difference in respiratory rate was 2.84 breaths per minute.

The results of this study indicate that respiratory rate measurements varied when comparing facility documented respiratory rates to respiratory rates measured utilizing the current recommended method. On the surface, a small difference in respiratory rate measurement may seem trivial; however, when using this vital sign when assessing the severity of disease states, precision is paramount.

#13) Development of an Enzyme-Based Electrochemical Biosensor for ATP for In Vitro Measurements in the Gastrointestinal Tract
Skye Russell

Adenosine triphosphate (ATP) is a purinergic neurotransmitter involved in extracellular signaling that plays an important role in metabolism and gastrointestinal function. Purinergic signaling is involved in several disease states including irritable bowel syndrome, inflammatory bowel disease, and some cancers. Since onset of gastrointestinal disease may be linked to obesity, how inhibitory neuromuscular signaling mediated by ATP is altered in diet-induced obesity is a goal of this research. To detect ATP, an electrochemical sensor is used which utilizes two competing enzyme reactions to produce an indirect measurement for ATP via decreasing current response using continuous amperometry. Enzymes glucose oxidase and hexokinase are immobilized in a 1:4 concentration ratio within a conducting polymer matrix on a platinum microelectrode surface. The sensor works by electrochemically detecting H2O2 produced by the oxidation of glucose in the presence of glucose oxidase. At the same time glucose reacts with ATP in the presence of hexokinase, decreasing the amount...
of glucose available for the counter reaction. This produces a decreasing current response for ATP when concentration of glucose is kept constant.

A challenge in performing in vitro measurements is the lower detection limits needed to measure ATP in real samples.

Our current sensor design uses an organic solvent which is detrimental to enzyme activity. To push detection limits an aqueous electropolymerization process using 3,4-ethylenedioxythiophene, which is oxidized to form conducting polymer poly(3,4-ethylenedioxythiophene), in phosphate buffer. This presentation will focus on sensor preparation, characterization, benefits of aqueous electropolymerization, and how the sensor may be utilized in vitro.

#14) Effects of docosahexaenoic acid (DHA) in treating lupus nephritis (LN) patients with systemic lupus erythematosus (SLE)
Raquelle Wilson

Systemic lupus erythematosus (SLE) is an autoimmune disease with variable manifestations and unknown etiology. The proposed mechanism involves the interaction of genetic dysregulation and environmental risk factors leading to the production of autoantibodies that attack healthy cells and cause wide-spread inflammation. Given its systemic nature, SLE often presents with secondary conditions, ranging from mild to potentially fatal. Lupus nephritis (LN) is one of the most severe secondary conditions of SLE, and although mortality rates for LN have improved due to novel therapeutics, side effects of the current treatments often come with their own set of complications. Rheumatologists, researchers, and patients with SLE occasionally investigate alternative treatments; however, many of these options are met with unsuccessful results. One alternative treatment that has shown moderate efficacy in treating inflammation is the use of omega-3 fatty acids, commercially packaged as fish oil supplements. Recently, docosahexaenoic acid (DHA), one component of fish oil supplements, has been shown to be superiorly beneficial in treating SLE and LN in mouse models, when isolated from its counterpart eicosapentaenoic acid (EPA). This review analyzes clinical and experimental studies that utilize the established lupus-prone New Zealand Black/New Zealand White (NZBWF1) mouse model, in order to explore the hypothesis that DHA improves SLE and LN by altering inflammatory pathways and inactivating autoantibody production. Overall, DHA seems to be beneficial in treating mice; however, its efficacy in treating humans remains questionable. Future research should be implemented in humans in order to analyze the effect of DHA in treating SLE and LN.

#15) A Fully Transparent, Flexible μECoG Array Based on Highly Conductive and Anti-reflective PEDOT:PSS-ITO-Ag-ITO Thin Films
Weiyang (Jessica) Yang*, Qi Hua Fan, and Wen Li

Optogenetics is a revolutionary neuromodulation technique that utilizes light to excite or inhibit the activity of genetically targeted neurons, expressing light-sensitive opsins proteins and potentially treating nerve diseases, such as, Parkinson’s disease, Alzheimer’s disease, and epilepsy. To fully realize the potential of the optogenetics tools, microelectrocorticography (μECoG) electrode arrays as neural interface devices with recording capability are vital for future engineering development. Conventional transparent μECoG electrodes made of a single material, such as indium tin oxide (ITO), ultrathin metals, graphene and poly-(3, 4-ethylenedioxythiophene)/poly(styrenesulfonate) (PEDOT:PSS), hardly possess the desired combination of broadband transmittance, low electrical resistivity, mechanical flexibility, and biocompatibility. Herein, we constructed an ultra-flexible, highly conductive, fully transparent, and peak-transmittance-tunable μECoG array using a PEDOT:PSS-ITO-Ag-ITO multilayer structure on a thin Parylene C substrate. Each array consisted of 32 transparent microelectrodes distributed uniformly and divided equally into two 3mm×3mm panels. The transmittance of the PEDOT:PSS-ITO-Ag-ITO assembly under the 550 nm targeted wavelength on the Parylene C substrate was ~7% higher than that of a single ITO layer of the equivalent thickness. The average impedance of microelectrodes at 1 kHz was ~45 kΩ and increased to ~59 kΩ after four weeks of soaking test, suggesting the stability for long-term electrophysiology recording. These microelectrodes based on PEDOT:PSS-ITO-Ag-ITO also showed a neglectable signal-to-noise ratio (SNR) changes under blue, green, yellow and red LEDs compared with no light. In vivo recording from the primary visual cortex (V1) of anesthetized rats validated the efficacy of the transparent electrodes for recording ECoG activity in living brain tissues.

#16) Cysteine as potential antioxidant and immune enhancer on dairy calves
Wilmer Cuervo* and Angel Abuelo

Immune response of newborn calves has become central, due to their susceptibility to enteric and respiratory diseases. These diseases can be prevented through vaccination, however key functions of calves’ lymphocytes may be inadequate.
In humans, lymphocytes’ functions are impaired by the accumulation of reactive oxygen species and subsequent Oxidative Stress (OS). OS level reported in calves and adult cows is comparable and can be prevented through antioxidants. Among the antioxidants, Glutathione is the most abundant, changes in its concentration impair proliferation differentiation and cytokine production of human lymphocytes’. Glutathione concentration depends on cysteine availability, an amino acid with direct effects on antioxidant potential, proliferation, cytokine production and infection’ resistance in human lymphocytes. These observations suggest that cysteine could represent an enhancer of immune response after vaccination for calves’ lymphocytes. Surprisingly, cysteine concentration is insignificant in newborn calves’ diet. Therefore, the aim of the first section of the project was to determine the OS effect on immune functions of calves’ lymphocytes related to vaccination response. Peripheral blood mononuclear cells (PBMCs) were isolated and incubated under OS conditions and simultaneously challenged with a viral antigen to evaluate Antigen-specific antibody production, cytokine production, and clonal expansion. Preliminary results showed that PBMCs under OS exhibit changes in key immune functions that are relevant to vaccine responsiveness, showing that changes in antioxidant potential modify key function of the lymphocytes relative to vaccination response. Sequential experiments will be focused on evaluate in vitro addition of CYS to potentially restore immune functions affected by OS.

#17) Cropping System Diversity for Improved Soil Health on Michigan Farms
Daniel Hoffman

Healthy soil provides multiple benefits to society, by providing nutrients for crops grown by farmers, by acting as a sponge for water (and mitigating flooding), and by sequestering carbon from the atmosphere. In grasslands in the Midwest, a positive linear relationship has been established between high plant diversity and indicators of healthy soil, such as increased soil carbon storage and increased nitrogen availability. However, this observed relationship in grasslands has not been fully investigated in Midwestern agricultural ecosystems, which have extremely low plant diversity. In the majority of farmland in Michigan, farmers typically grow a single crop such as corn, soybeans, or potatoes over one season. When combined with chemical fertilizer this approach has led to high yields, however low plant diversity in agricultural fields has resulted in less healthy soils, evidenced by lower levels of soil carbon accrual and nitrogen availability. Increased fertilizer use on soils with decreasing health has led to excess chemicals entering our waterways; soils with limited ability to absorb water, evidenced by the spring floods in the Midwest last spring; and soils with a decreased ability to sequester carbon from the atmosphere and mitigate climate change. Increasing on-farm cropping diversity has the potential to increase nitrogen availability and soil organic matter accrual, therefore increasing yields and soil health while decreasing chemical fertilizer use. My research investigates how increased cropping diversity on Michigan farms can facilitate soil carbon formation and increased nitrogen availability, leading to healthier soils that benefit everyone living in Michigan.

#18) In vitro evaluation of vitamin E analogs as ancillary antioxidants in dairy cattle
Matthew Kuhn

Disease disproportionately impacts dairy cattle around the time of calving, known as the transition period. Focusing on preventing transition disease, rather than treatment, reduces the need for on-farm antibiotic use, creating a more sustainable agricultural system. Transition disease is due, in part, to increase production of pro-oxidants and subsequent oxidative stress brought upon by increased metabolic demands around calving. Oxidative stress can disrupt the delicate inflammatory balance leading to dysfunctional inflammatory responses and disease predisposition. A form of vitamin E, α-tocopherol, has been consistently used as an antioxidant supplement for decades, however, some transition cattle remain oxidatively stressed. Studies suggest that further increasing α-tocopherol supplementation above industry standards may have harmful effects. This situation creates a crucial need for new approaches to antioxidant supplementation. Non-α-tocopherol analogs of vitamin E also have antioxidant properties and are potential candidates for further antioxidant supplementation. An in vitro primary bovine mammary endothelial cell model was used to evaluate potential benefits of γ-tocopherol and γ-tocotrienol in an environment with increased oxidant status. Both γ-tocopherol and γ-tocotrienol showed greater potency for reducing the production of pro-oxidants compared to α-tocopherol. Further, these analogs showed a greater ability to protect cells from damage and death in this environment. Together, these data set the foundation for further assessment of the safety and efficacy of vitamin E analogs in cattle. Their successful use may lead to more oxidatively balanced and healthy cattle requiring less veterinary attention.
#19) Disregarding Diversity: Prescriptive Political Curricula in India and the People’s Republic of China
Kyle L. Chong* and Darshana Devarajan

Healthy societies are foregrounded within critical studies in education. Absent from the conversation is an interrogation of who decides what a healthy society is. Two cases, the Chinese (PRC) Patriotic Education Campaign (PEC) and India’s New Draft Education Policy 2019 (NEP), offer a warning about the nation-state’s systemic penetration into governing of the child’s intellectual development (Giroux, 1983; Chu, 2017). This paper applies a critical theoretical framework (Bourdieu, 1966; Yang, 2016; Townsend, 1992; Tatum, 2000) to these two policies. We argue that, prescriptive political education, via the Draft PEC and NEP, erases marginalised and minoritised communities in China and India, towards developing a conservative nationalist polity, which the state regards as a healthy society. We do so by discussing the ways languages (Link, 2013) are purported to be taught in the K-12 curriculum under the PEC in China and the 2019 Draft NEP in India. We then argue that the subtlety in the assertion of state soft power (Thiong’o, 1986) to colonise the child’s consciousness contributes to a more robust idea of these nation-states (Pinar, 2015, Gao 2013), while it disregards diverse identities (Dirks, 2001; Ayyub, 2018). We conclude that education cannot produce an equally stable claim for diverse students’ belonging (Pathak, 2019) as it does for formalised citizenship (Wolin, 1994).

#20) Una escuela para transformar: Linking Public Schools to Community Organizing Work through Curriculum Deliberation for Social Transformation
Marcos D. González Flores

This case study delves into the emergence and evolution of a collaboration between the highly centralize Department of Education in Puerto Rico and a community organizing group from El Caño Martín Peña (a group of eight communities bordering a contaminated water channel in San Juan, Puerto Rico) in developing a curriculum focus in leadership and social transformation. Understanding how this collaboration emerged and evolved in the context of the social and environmental agenda lead by this organization; how other community initiatives informed the emergent collaboration and the curriculum design process; and what meaning does the implementation of a curriculum focus on leadership and social transformation have on those involved in the curriculum deliberation, sheds light on the collaboration process and demonstrate the critical role community-based organizations can play in linking public schools to their community organizing work as a mean to improve public education, their neighborhood and society. The potential implications of this work can also be extended to the field of teacher education as a way to understand how community organizing work can help educators in establishing effective partnerships by bridging the school-community divide.

#21) The role of time preferences in the demand for safer food products: Evidence from a choice experiment in Nigeria
Charuta M. Parkhi*, Saweda Liverpool-Tasie, and Vincenzina Caputo

While food systems across Africa are transforming rapidly leading to increased demand for safer foods new food safety concerns are emerging. One way to promote the production and consumption of safe and nutritious foods is the use of labels and its success depends on consumer awareness about various food safety issues. Along with awareness time preference plays a key role in consumer choices. Several studies have confirmed the role of time preference in choices related to the adoption of healthy behaviors. However, few studies have explored the role of time preference on food choices directly and none (we are aware of) have looked at the effect of time preference on food safety choices. This study explores the link between time preference and preferences for food safety in Nigeria. Using a real choice experiment we assess consumer preference for maize based cereal labeled to be safe from contamination with aflatoxins vs. a similar product without such a label. We perform a cluster analysis on the time preference data gathered using the Consideration of Future Consequences scale. The identified clusters are included in the real choice experiment data to look at the role of time preference in consumers' purchase decisions using a random parameter logit model with error component with panel structure. Our preliminary results indicate that majority of Nigerian consumers have low time preference. We also find that consumers with low time preference derive more utility from the aflatoxin-free label than those with high time preference and are sensitive to prices.
22) Changing the Pipeline for Library Recruitment
Jessica Wagner

Academic libraries are an important hub for information, research and innovation. As libraries grow the emphasis of diversity hiring has increased as well. For all the attempts at equality and equity that libraries can offer, especially when providing access to information, a continuing problem is the lack of diversity within the library staff. This trend is something that I would like to focus on. My initiative is to create a cohort between MSU libraries and library staff with minority high school students to engage them with the Information Sciences field and increase minority roles within library and museum systems. Marginalized students should be given the opportunity to learn about libraries and the information sciences early enough to understand that there are more options to work in academic spaces beyond becoming a professor. Collectively, this group would create a project exploring the different aspects of the library and present it to other students in their classes or even submit a paper for publication. If the pilot is successful then the MSU library can partner with other academic libraries, public libraries and museums to invite other high schools to participate in this mentorship program. The goal of this initiative is twofold: direct engagement of high school students with all facets of academic libraries and to promote interest for Information Sciences careers within minority groups.

#23) Lignin-based Formaldehyde-free Phenolic Adhesives for Engineered Wood Products
Sasha Bell* and Mohsen Siahkamari

Phenolic adhesives are the major adhesives used worldwide for the production of exterior grade wood panels like plywood and oriented strand board (OSB). Resole phenolic adhesives are base-catalyzed adhesive with a higher ratio of formaldehyde to phenol. Both phenol and formaldehyde pose major concerns related to health and environmental concerns. In recent decades, these concerns have motivated many researchers to look for suitable bio-based substitutions for phenol and formaldehyde. In this study, both phenol and formaldehyde were replaced with lignin (natural polymer from biomass) and glyoxal (biobased, nontoxic, dialdehyde). Different resins were formulated in which phenol was completely replaced with 100% unmodified lignin, formaldehyde was substituted with glyoxal in increments of 10%. Advanced analytical techniques such as Differential Scanning Calorimetry (DSC), Phosphorous Nuclear Magnetic Resonance Spectroscopy (31P-NMR), Gel Permeation Chromatography (GPC) were used to determine the physical and thermal properties of the formulated adhesives. For measuring the mechanical properties of the adhesives, single-lap-joint veneer samples were prepared and pressed under the same conditions, (temperature, pressure, time) as recommended by industry. The results indicated that the adhesive prepared with replacing 100% of phenol with lignin and 100% of formaldehyde with glyoxal had dry lap shear strength of 3.3 (±0.44) comparable with adhesion strength of commercially formulated phenol resorcinol adhesive (3.6 ±0.5 MPa).

#24) Garden Variety Crime: The Impact of DFC Gardens on Crime
Chayse Hurley

The city of Detroit is notorious for being one of the most dangerous cities in the world. While much of the fear of visiting the city has been diminished by the economic growth of Downtown Detroit, there is still a great hesitancy for people to go into the neighborhoods where the “prosperity” is not so apparent. Crime rates for Wayne County have decreased in even the last five years but there is still work to be done (MSP Annual Publications fo Crime in Michigan).

Detroit Future City (DFC) began providing mini-grants to community non-profits in 2016 to install community gardens designed to help with bioretention, beautification, attracting native species, and building community. There is a growing body of evidence in other states including Ohio and Maryland showing that in addition to these benefits, community gardens may help decrease crime (CityLab “Another Reason to Love Urban Green Space: It Fights Crime” 2016). I employ a Difference-In-Difference analysis to study the impact of DFC’s garden mini-grants on the crime rates in the areas in which they are located. Additionally, in order to better understand how the garden’s overall impact on the community I do a case study of a particular garden installed by Harvest Christian Church. Preliminary analysis shows a decrease in crime rates overall as well as an increased feeling of community pride.
#25) Redesigning Plants for Biofuel with CRISPR-Cas9
John Tran

Lignin is a complex polymer deposited in the plant secondary cell wall. The aromatic polymer is key to forming structural materials that support the growth and development of vascular plants. Genetic approaches to perturb lignin in Arabidopsis have led to the modification of lignin composition, which are comprised of mainly three monolignol subunits: p-coumaryl alcohol, sinapyl alcohol, and coniferyl alcohol. While perturbations have provided insight into the biosynthetic pathway of lignin and strategies for redesigning it in plants to improve biofuel technologies, a critical step during its synthesis is not well understood. An understanding of how the building blocks of lignin are moved out of the cell from the cytoplasm to the apoplastic space where polymerization occurs has potential to advance biofuel technologies. I have data that suggest a transporter protein plays a role in this step. Findings from my research could provide insights to regulate the amount of lignin in biofuel crops. I will discuss efforts using gene expression data, T-DNA knockout lines, and CRISPR-Cas9 to identify this protein and support its role in monolignol translocation.

#26) Teacher Connection in Online Social Media: Understating and Prediction in Pinterest
Hamid Karimi*, Tyler Derr, Kaitlin T. Torphy, Kenneth A. Frank, and Jiliang Tang

Increasingly many teachers turn to online social media to supplement educational resources and meet students' needs in the classrooms. The diffusion of information from online social media to the classroom is significantly faster than traditional curriculum-based approaches. However, this is contingent upon how well teachers across an online social media network are connected. Hence, to further facilitate this diffusion and fully exploit the power of social media in connecting people, we need to have a proper link prediction model specifically designed for teachers in social media. To achieve such a model, we need to overcome three challenges. First, we need a large-scale sample of teachers on social media. Second, we need to have a deep understanding of teacher connections in the context of the network in which they belong. Third, we need an efficient method incorporating salient network features as well as teacher-related attributes to yield an efficient link prediction method. This paper is an attempt to overcome these challenges. We construct the largest dataset of teachers on Pinterest and thoroughly analyze the data and deriving factors behind the teacher connection establishment. Further, we utilize advances in machine learning and social network analysis and propose an efficient link prediction algorithm. We investigate the efficiency of our method on the constructed dataset and provide insights into the network of teachers on Pinterest.

#27) Mode of Responses Influences Content of Student Responses
Joelyn de Lima* and Tammy M. Long

Knowledge is not created in a vacuum. Context plays a vital role not only in shaping, but also in eliciting this knowledge. Understanding how context both helps and hinders, learning and assessment therefore important to improve science literacy. We tested whether contextual features such as the wording in a prompt and the mode by which students were asked to respond influenced students’ responses. While narrative responses are a common way by which students’ reasoning is assessed, models are increasingly being used both in instruction and assessment. Features of student-constructed models can give us insights into student thinking and reasoning that are not captured in multiple choice or even narrative responses, such as the robustness or connectedness of their understanding.

We asked students in a 2 sections of a large introductory biology course how a biologist would explain the evolution of traits in a taxon. Students responded in two modes (narrative and model) to two prompts each (differing in the taxon). We analysed for the effect of the mode of response on the content of the response. We developed a coding rubric using the theory of qualitative content analysis. Student responses were then analysed using this rubric. Preliminary analysis suggests that mode of response has a significant influence on the content of student responses. Certain evolutionary concepts were seen to expressed much more in narrative responses than in the model based responses. However, a holistic view of the students understanding of evolution can be obtained by considering both modes of responses.
#28) Challenges of School Retention in India: Learning from Student Experiences to Improve Education System
Jainisha Chavda

The government schooling system in India, which is largely accessed by poor and marginalized students, is incongruent in terms of policy, norms, infrastructure, and governance at different levels of schooling (i.e. elementary and secondary). Government schools are currently facing severe learning crisis as demonstrated by Annual Status of Education reports, where students reaching secondary level are struggling with basic reading and math proficiency. Every year government school students perform poorly in secondary and higher secondary level exams organized by state governments. In academic studies focusing on causes of learning crisis in India, one of the biggest issues that remains unexamined is the influence of the incongruent system of schooling on learning experiences of students. Therefore, this presentation will discuss why it is important to consider incongruence between elementary and secondary education as an important influence on learning experiences of students, and what implications it might have on educational development of the country. Along with theoretical arguments, it makes case for pursuing this area by drawing on qualitative interview data of 22 marginalized students and families in India and their experiences of persisting in the government school system.

#29) Analyzing Negative Relations in Social Media
Tyler Derr

Most existing network analysis has solely focused on unsigned networks (or networks with only positive links). However, in many real-world systems, relations can be both positive and negative. For instance, social media users not only have positive links such as friends, followers, and those they trust, but also can establish negative links to those they distrust, block, or unfriend. These relations can be represented as networks with positive and negative links (or signed networks). On the other hand, the introduction of negative links in signed networks not only increases the complexity of the representation, but also presents tremendous challenges for traditional unsigned network analysis. Furthermore, it is evident from recent research that negative links in signed networks have distinct properties from positive links. In addition, the fundamental principles and theories of signed networks are substantially different from those of unsigned networks. Hence, signed network analysis cannot be carried out by simply extending unsigned network analysis. On the other hand, the existence of negative links also brings about unprecedented opportunities for network analysis. In this talk, I will highlight some of my research that has focused on the development of novel contributions to the four main directions of network analysis: measuring, mining, modeling, and applications. I will then conclude with providing insights and highlighting multiple future directions.

#30) Monkey see, monkey tap: Mimicry of movement dynamics during coordinated tapping
Carolyn Kroger*, Florian Kagerer, and J. Devin McAuley

Many everyday behaviors, such as having a conversation, dancing, playing a team sport, require precise interpersonal coordination of the timing of actions. One question that emerges in research on interpersonal coordination is to what extent mimicry of movement dynamics plays a role in movement execution. Two experiments addressed this question using an interpersonal synchronize-continue tapping paradigm in which continuous motion tracking was used to examine movement dynamics. Pairs of individuals tapped with their index finger in synchrony with an auditory metronome and then continued tapping at the same tempo when the metronome stopped. On some trial blocks, pairs of individuals tapped together (inter-personal tapping), but on other trial blocks, individuals tapped alone (solo tapping) either with their tapping partner present or absent from the testing room. Tap amplitudes (how high individuals moved their finger off the table) and tap dwell times (the amount of time a person keeps their finger on the table) were correlated between tapping partners when they tapped together but not when they tapped alone. Results indicate that during coordinated tapping, individuals mimic some aspects of movement dynamics; moreover, some aspects of mimicry carry over to both timing performance and to solo tapping after individuals have tapped together.

#31) Stride length and frequency of Thoroughbreds and Quarter horses during ‘Sprint’ and ‘Classic’ races
Fernando B. Vergara*, B.D. Nielsen, C.I. Robison, T.A. Fabus, J.L. Kenny, and R.A. LeCompte

Stride length (SL) and stride frequency (SF) are the main factors influencing speed in athletes. Those elements have been studied with different conclusions as to whether are advantageous for obtaining higher speeds and improved performance. It is recognized that Quarter horses (QH) are faster than Thoroughbreds (TB) in short distances, hence the main
objective of this study was to determine which factor was the major component influencing speed. It was hypothesized that QH have higher SF in comparison to TB; secondly, that SF decreases as distance increases between and within the breeds. Two types of races were analyzed by breed (sprint and classic distances): QH races of 100.6 and 402.3 m and TB races of 1,207.0 m and 2,011.7 m. Five individuals watched every race three times and counted the number of strides of every winning horse, using slow-motion when needed. Using the mixed procedure, the average number of strides from the five observers was used in order to compare differences between breeds, and between distance within the same breed. The SL was calculated factoring the total distance of the race by the number of strides. QH showed a higher SF average than TB (2.88 vs 2.34 + 0.03 strides/s; P<0.001). Moreover, TB SL was longer in comparison with QH (P<0.001). The SF and SL are inversely related, therefore, QH achieve a large speed increasing their SF, between 14-20% more than TB. These differences in acceleration rate and the coupling-breathing system could have health repercussions in the racehorses’ performance.

#32) How Hard is Sparty Working
Emily Werner, MS, RD*, Alyssa Guadagni, Ashley Triplett, Sue Petrisin, and James M. Pivarnik

An important yet understudied group who exerts substantial effort during sporting events are team mascots. They wear heavy suits creating an environment not conducive to effective temperature regulation, thus putting the wearer under high physiologic stress. Although physiologic responses experienced by collegiate athletes and mascots during athletic competitions have been studied previously, it is unknown how these responses compare with one another. PURPOSE: To compare in-game heart rate (HR) responses and accelerometer data of a collegiate mascot with those of collegiate soccer athletes. METHODS: A tracking system was used to evaluate HR and movement from three groups: a mascot while “in suit” [N=7 (1 female)] and players in a varsity men’s (N=9) and women’s (N=9) soccer game, separately. Variables analyzed were time “in suit”/on the field, distance traveled (meters/min), and percent of time in pre-established HR zones [HRzone1 (50-59%HRmax), HRzone2 (60-69%HRmax), HRzone3 (70-79%HRmax), HRzone4 (80-90% HRmax), and HRzone5 (>90%HRmax)]. Differences between groups were evaluated via a one-way ANOVA. RESULTS: There was a significant difference between groups for distance traveled (p<0.001), with the mascot traveling less distance (35±6 m/min) than soccer players (men, 115±25 m/min, women, 107±4 m/min). All groups spent >90% of time “in-suit”/on the field in HRzones 3, 4 or 5, and 75% of time in HRzone 4 or 5. There were no significant differences between groups for time spent in various HRzones. CONCLUSION: The mascot suit created a physiological strain on the wearer similar to that of a varsity collegiate soccer athlete, despite much less movement performed per session.

#33) Gender-Blindness and its Discontents: The Curious Case of an Indian Feminist Trade Union
Salil R. Sapre

Feminization of work in global supply chains commonly marks employment relations (ER) in emerging economies. While investigations of ER in developing contexts largely borrow from work done in the West, the exploration and application of gender as a key construct within ER frameworks in the Global South remain underexplored. Specifically, gendered interrogations of internal union dynamics in newly globalized economies have traditionally received limited analytical attention in mainstream ER scholarship. To address these issues, I employ a gender-based perspective to investigate the case of migrant workers in an export- oriented garment sector trade union in India that also identified as feminist. I find that despite the union’s feminist foundations and a high degree of feminization of union membership, union participation of its migrant female members was circumscribed to a larger extent in comparison to that of migrant males. Through in-depth fieldwork, I demonstrate that internal union mechanisms emphasized members’ migrant status at the expense of a commensurate focus on female migrants’ gender identity. In other words, gender-blind, as opposed to gender- equitable, processes in the union reproduced migrant women’s subordination and precluded their active union involvement. I contend that such a de-emphasis on gender may be detrimental especially in feminized contexts as shifting attention away from women’s gender identity may disincentivize them from proactive union participation. This has critical implications for unions’ ability to uphold the rights and dignity of vulnerable gendered workforces as well as for union renewal in highly feminized anti-union contexts.
#34) Consumer Willingness to Pay for Sustainable Beer: A Choice Experiment Using Eco-Labels
Aaron J. Staples*, Carson J. Reeling, Nicole J. Olynk Widmar, and Jayson L. Lusk

Brewing beer is a water-and energy-intensive process that generates a great deal of solid waste. Commercial and regional craft breweries are increasingly investing in sustainability equipment to reduce their environmental impact, while microbreweries are unable to invest due to significant up-front capital costs and smaller profit margins. The primary goal of this study is to estimate beer buyers’ willingness to pay (WTP) for beers produced with sustainable technologies—ones that reduce water use, energy use, or increase landfill diversion.

The study uses a stated-preference choice experiment modeled after Van Loo et al. (2015) where survey respondents are presented with a series of different hypothetical beers available for purchase. The beers vary in price, packaging, and three sustainability attributes, including water reduction, energy reduction, and landfill diversion. Respondents are asked to choose the hypothetical beer they most prefer, and observations of respondents’ choices are used to estimate WTP for the three sustainability attributes using a traditional multinomial logit and latent class model.

Results indicate beer buyers have a positive and statistically significant WTP for these sustainability attributes, with landfill diversion generating the greatest mean price premium. In other words, consumers are willing to pay premiums for beers produced with sustainable technologies. Thus, investment in sustainable technology becomes more feasible for microbreweries, as they could either: (i) shift some of the investment cost onto the consumer; or (ii) potentially attract new consumers by marketing their product as sustainably produced.

#35) Biological and synthetic platforms for cobalt biomineralization using microbial nanowires
Hunter Dulay*, Marcela Tabares, Kazem Kashefi and Gemma Reguera

As our society becomes increasingly connected to the use of electronics and high-performance components, our need for metals that can meet these demands is clear. The reliance on cobalt (Co) as a component of rechargeable cathodes in batteries and as a superalloy in many heat-resistant mechanical parts is met with pressure to find more reliable refining and mining practices. One such method is the use of biological compounds and organisms to isolate metals for industrial use. Of particular interest is the bacterium Geobacter sulfurreducens which has been extensively characterized to respire a broad spectrum of metals through protein appendages (pili) that can seed the formation of nanoparticles. These unique pili contain a metal trap at their c-termini that enable the capture of metals between key aromatic residues, poising them for electron transfer. Assembling purified pili along gold electrodes has revealed the reversible binding and reduction of Co2+ via these traps and has led us to probe the ability for live cells perform similar reactions. Here we present our findings that G. sulfurreducens is able to withstand much higher concentrations of Co2+ than previously observed and relies on the proper expression of these conductive pili for its metal tolerance. The implications of our findings suggest a possible role for G. sulfurreducens in accumulating Co and for the utilization of its pili in metal scrubbing devices for waste materials.

#36) Experience, Knowledge, and Attitudes of Patients and Public Regarding Psychiatric Electroceutical Interventions for Treatment-Resistant Depression
Maryssa Gilbert, MA, RD*, Aaron McCright, Eric Achtyes MD, Robyn Bluhm, Laura Cabrera

Psychiatric Electroceutical Interventions (PEIs)—designed to treat psychiatric conditions with electrical stimuli—may be especially prone to misconceptions and stigma. The views of patients and members of the public influence help-seeking behavior, and as such should be considered by professionals in their treatment recommendations. We conducted interviews with 16 individuals living with depression and 16 non-depressive members of the general public. We performed qualitative content analysis of interview transcripts to identify major themes on important neuroethical considerations across the groups. This presentation will focus on experience with, knowledge of, and attitudes towards two PEIs for treatment-resistant depression: electroconvulsive therapy (ECT) and transcranial magnetic stimulation (TMS). Patients had the most experience with ECT, and the public had the most knowledge about ECT, yet both groups expressed an overall negative attitude toward ECT. Patients commonly described the treatment as scary, traumatic, or intense, while members of the general public often referenced One Flew over the Cuckoo’s Nest. Patients with TMS experience were more likely than were patients without such experience to hold a positive attitude toward the intervention. TMS was seen by the general public as potentially viable option only if medication was not effective. Considering that not all
PEIs are viewed equally by patients and the general public highlights the need for unbiased education to fill the gaps in knowledge among popular media, the scientific literature, and perceptions of those who may benefit from these treatments.

**#37) Evaluating Hamilton Public Library’s Memory Cafes: A Multimodal Approach to Serving Older Adults with Memory Impairments**  
Erika Malana

Cognitive impairments in older adults can lead individuals to experience anxiety, depression, loneliness, and feelings of incompetence which may accelerate the progression of disease. Non-pharmacological interventions, including socialization, physical activity, and mental activity, have been shown to support the cognitive abilities of older adults. Additionally, socialization and support networks may allow such individuals to regain a sense of self-worth and obtain a better quality of life. However, the literature reveals poor integration of physical activity and mental stimulation in support programs and thus, this study aims to evaluate a multimodal approach to care. Memory Cafes hosted by Hamilton Public Library are designed for older adults with cognitive impairments and their caregivers to socialize in a safe, comfortable, and supportive space. Participant observation, semi-structured interviews, and surveys are utilized to collect feedback about the program. Through this study, aspects of physical activity, mental stimulation, socialization, and peer support, along with their connections to social inclusion and improved social and emotional well-being, are investigated.

**#38) To Translate a Life: Understanding the Holocaust through Autobiographical Storytelling**  
Amelia Stieren

Many people across time and space have experienced displacement, dealt with questions of identity, and confronted issues of cultural meaning within and across languages. As a result, some have sought to ‘translate’ their memories, experiences, and traumas, as well as their removed connections to the past, in the form of storytelling. The Holocaust is one central example of displacement, making it worthwhile to evaluate the past and our perceptions of this event through the consideration of stories and accounts by those whose lives have been impacted. Stemming from my MA thesis, I will consider what it means to translate the Holocaust and, what roles memory and postmemory play in the construction of autobiographical narratives, using the autobiographical works of Nora Krug (Heimat, 2018) and Ruth Klüger (weiter leben, 1992).

As both authors have written English and German versions of their works, I will explore not only cultural, but also linguistic translation in their autobiographical storytelling. I anticipate that translating the Holocaust means translating both memories and postmemories on individual, national, and collective levels, and that autobiographical accounts are necessary means, because people make sense of their experiences, memories, and postmemories through narrative frameworks. While there will likely be no end to translating the Holocaust and the lives impacted, if we wish to continue learning from the Holocaust in the hopes of constructing a better world in which to live, then we must acknowledge the past and participate in the postmemory work.

**#39) The Impact of Cloud Seeding on Small Grain Crops: Evidence from the North Dakota Cloud Modification Project**  
Scott Knowles* and Mark Skidmore

The North Dakota Cloud Modification Project (NDCMP) was established in 1951 to reduce severe hail damage and increase precipitation in specific counties in North Dakota. Annually, every June until August, participating counties receive cloud seeding treatment. Although some atmospheric studies have examined the efficacy of the procedure, few studies have used robust procedures to determine how the program has affected crop yields and losses attributable to hail. Using the panel nature of historical cloud seeding participation data, county-specific time trends and differences are controlled using a fixed effects regression framework to estimate the treatment effect of cloud seeding on wheat, barley, and oats yields. In addition, federal crop insurance data is used to estimate the treatment effect of cloud seeding on losses attributable to hail for those same crops. Significant positive effects of the program to participating counties are realized through increased crop yields and decreased hail damage indemnity payments made to insured farmers.
#40) Convolutional neural network with the coffee ring effect in water quality monitoring
Xiaoyan Li* and Rebecca Lahr

Monitoring water quality efficiently and effectively is a challenging but critical problem influencing people’s health. In this research we propose a cheap and fast water monitoring technique by using convolutional neural network (CNN) to analyze tap water composition through coffee ring effect. First, droplets of tap waters and salt mixtures were dried using the coffee ring effect and the residues photographed under 30x magnification. Principal component analysis (PCA) was conducted for synthetic water samples on both water chemistry data and their residue pattern image files. PCA couldn’t classify water components effectively. Second, thirty tap water samples were collected in different cities across Michigan and water chemistry data (cations and anions) was measured using standard methods for water analysis. The thirty water samples were classified into six composition groups using cluster analysis. Water sample residue patterns (ten replicates) were collected and randomly divided into training and testing dataset. Ten individual convolutional neural network (CNN) models were built and trained to assign residue images into groups with similar water chemistry data. The classification accuracies of these ten models are all above 70%. These results demonstrate that a CNN model can effectively recognize coffee ring effect patterns where a simple machine algorithm like PCA cannot.

#41) Electrochemical Properties of an Optically Transparent Diamond Electrode in Room Temperature Ionic Liquids
Fatemehsadat Parvis* and Greg Swain

Electrodes transparent to visible light (so called optically transparent electrodes (OTE)) can be prepared by depositing a thin layer of boron-doped nanocrystalline diamond on quartz by chemical vapor deposition. Diamond OTEs are 0.5 – 1 μm thick and exhibit ~60% transmittance in the visible region of the electromagnetic spectrum. The transparency and electrical conductivity depend on the film thickness and boron doping level. Diamond OTEs are useful for transmission spectroelectrochemical measurements because of (1) a wide optical and working potential window, (2) high microstructural stability during exposure to harsh electrochemical conditions and (3) stable optical properties. The goal of the research was to evaluate the basic electrochemical properties of these OTEs in room temperature ionic liquids (RTILs). RTILs are salts that are liquid at room temperature. They consist of no solvent. Their use in electrochemistry has garnered attention recently. In this presentation, results from cyclic voltammetric, chronoamperometric and electrochemical impedance spectroscopic studies of the potential dependent background current, the potential dependent capacitance and the voltammetric response for several soluble redox probe molecules in different RTILs will be discussed. The redox systems used include ferrocene and ferrocene derivatives and the RTILs used were [EMIM], [BMIM] and [HMIM] [BF4]. Comparison studies will be reported for redox systems in aqueous electrolyte solution. The results indicate that the diamond OTEs exhibit good electrochemical activity for all the redox systems in both aqueous and RTIL media, but the mass transfer and electron-transfer kinetics are slower in the RTILs, in part, due to the higher viscosity of these electrolyte media.
#42) The Incarceration of Black Men and Black Health  
Adjoa Kusi-Appiah

The United States holds the second-highest rate of incarceration in the world. Black males make up 40% of this population, making them six times more likely to be incarcerated. The growing literature has recognized this racial disparity in incarceration rates but has yet to explore its influence on the health disparities of the black community. This presentation will examine the bidirectional relationships between the social determinants of health and incarceration through the lens of black males. Using the determinants: economic stability, neighborhood, education, and health care, we will explore the compound consequences of being a black man in America.

#43) A Quality Improvement Analysis of Unexpected Readmissions Within 30 Days of Discharge following Congenital Heart Defect Repair Surgery  
Alexis Maroney

Background: Unexpected readmission rates for adult and pediatric patients following surgery to repair congenital heart defects fall between 8.7-15% depending on the procedure. These events are not only extremely distressing for patients and their family, but exert significant financial strain on the healthcare system. The aim of this study was to analyze the causes and risk factors surrounding unexpected readmissions within 30 days of discharge in patients with congenital heart disease that had cardiothoracic surgery between 2012-November 2019 at Helen DeVos Children's Hospital.

Methods: We analyzed 164 patients that were readmitted unexpectedly within 30 days of discharge following congenital heart surgery. Primary and secondary indications for readmission were determined. Subjects were also evaluated for chromosomal abnormalities and other pertinent risk factors.

Results: There were a total of 177 readmissions in 1442 unique surgical admissions (2.3%). The most common primary categorical reasons for readmission included respiratory (53, 29.9%), septic (39, 22.0%), and cardiovascular (33, 18.6%). Further analysis revealed increased work of breathing (27, 15.0%), viral respiratory infection (20, 11.3%), superficial wound infections (22, 12.4%), and pericardial effusions (14, 7.9%) to be the most common secondary reasons for readmission. Chromosomal abnormalities were accounted for in 48 (27.1%) of the readmissions, with Trisomy 21 being the most common.

Conclusions: Unexpected readmissions following congenital heart surgery continue to exert strain on patients, caregivers, and the healthcare system as a whole. Efforts to better understand indications for readmission are imperative to guide quality improvement measures.

#44) School-based opioid awareness and prevention approach  
Basma Al Masraf*, Saaranga Sasitharan MHA, Brittany Ladson, Christian Dieter, Maricar Gener, Zack Howarth, and Maximilian Volk

Since 2017, there have been over 70,000 opioid related deaths, particularly in the 25-30 year old age group (1,2). In addition to loss of lives, the nationwide financial system suffers a loss of approximately $115 billion annually, from inpatient hospitalizations related to opioid and heroin crisis alone (3). It has been shown in the past, however, that the number of local educational and naloxone distribution programs can reduce the opioid overdose rate by up to 55% (4). In fact, the study showed that with increased implementation of local prevention programs, the rate of overdose reduction increased as well. Therefore, this project aims to connect with individuals early in their education, particularly in high school, to increase the awareness of young students regarding the current opioid epidemic and to determine how impactful training can be. We hypothesize that prior to our education program, the majority of high school students do not know the causes, health consequences, and financial loss of opiate misuse, and are underinformed of the availability of safe methods of opioid overdose reversal medications. We have accomplished this by administering pre- and post-educational program surveys to students in mid- and southeastern Michigan. We plan to use this data to advocate for early educational opioid overdose prevention programs in high schools statewide to educate on opioid misuse.
#45) Asian American health values and family communication in context of chronic hepatitis B
Dilnora Azimova

This presentation offers a discussion of the results of a study that seeks to understand the lived experiences of Asian Americans with hepatitis B virus (HBV) and their primary caregivers. The study seeks to understand the ways, in which Asian American patients and their caregivers perceive illness and health values, seek and apply hepatitis B information, and interact with social environments. Chronic hepatitis B has affected Asian American populations in Michigan where the study is being conducted, and research efforts have highlighted the significance of the role of families in engaging affected members in treatment for hepatitis B. Given the risk of intrafamilial transmission of hepatitis B infection, family-centered care appears as a promising perspective to consider in scaling up screening, vaccination, and treatment among foreign-born and at-risk communities. The study examines the factors affecting patients’ HBV knowledge, beliefs, and behaviors and explores the ways in which caregiver-patient communication about HBV works in concert with treatment and information offered by primary care and specialized physicians. The methods of this study are engagement with 20 chronic hepatitis B patient-caregiver dyads for in-depth, semi-structured interviews. Findings are expected to provide health care providers with some guidelines on the value and need for family-based communication interventions that leverage the specifics of an Asian-American sub-culture within the United States. This research is preliminary, and the presentation is meant to engage questions and feedback from the audience.

#46) Chemistry in the Classroom: Social Networks in an Undergraduate Chemistry Course
Emily Thomas

As any instructor can tell you, their classroom is abuzz; classrooms are social places with students talking about class, clubs, social activities, just about anything. Social network analysis (SNA) is the study of how people are interconnected and how these relationships impact the network as a whole. Social interactions have a weighty impact on student behavior, and studying these interactions sheds light on how student interactions change over time and students influence each other’s behavior.1 A network study was conducted in a small chemistry bridge course preceding general chemistry over the course of a semester. Through a self-reporting survey administered twice during the semester, students stated with whom they were studying and how often they were studying for class with this other person.2 Sociograms of the network were built to examine the difference in the network at both time points with features that represent the direction of the relationship, the weight of the relationship, as well as the amount of time spent studying. A model was also made to describe the impact students have on each other’s study habits in the class over the semester.3 By learning about how students are connected in classrooms and how this impacts their study habits, student experience and outcomes can be improved in the future.

#47) Effective Teaching Strategies in Patient Education
Fawaz Habba, OMS-IV

Introduction: Patient education is a significant medical health concern. By having a better understanding of which education techniques patients find effective, physicians can make sure to utilize these techniques during the physician-patient encounters. The purpose of this study is to determine the effectiveness of several patient education strategies.

Methods: Adult patients were recruited from Ascension Providence Hospital Family Medicine Clinic. Participants completed a questionnaire asking them to indicate which patient education teaching tool they find most effective. The options were selected from the U.S. National Library of Medicine recommendations regarding effective patient education materials and included the following: One-on-one teaching, demonstrations, analogies, brochures or other printed materials, podcasts, YouTube videos, videos or DVDs, PowerPoint presentations, posters or charts, models or props, group classes, and trained peer educators.

Results: The distribution of the most effective patient education strategies indicates that 48% of the patients reported one-on-one teaching as the most effective method. Other notable mentions include YouTube videos and brochures or other printed materials, as reported by 23% and 15% of the patients, respectively.

Conclusion: This study helped identify which education strategies were deemed most effective by patients. In utilizing highly effective education strategies physicians may be able to strengthen the physician-patient relationship and
empower their patients with medical knowledge so they have a better understanding about their disease process and treatment plan.

#48) Physician Non-Verbal Communication Skills: A Patient’s Perspective
Fawaz Habba, OMS-IV

Introduction: During the physician-patient encounter, communication is crucial to building trust and rapport. However, the communication is not only the verbal component but also, and possibly more critical, the non-verbal elements. This study seeks to determine which non-verbal communication skills are most and least significant using a rating system. Methods: Adult participants were patients recruited from Ascension Providence Hospital Academic Internal Medicine Clinic. Participants were given a survey that asked them to rank the following non-verbal communication skills, from 1 to 5, with one being the “most important” to 5 being the “least important” during the physician-patient encounter, using each number only once. The five non-verbal communication skills were as follows: appearance, eye contact, facial expressions, posture, touch. Results: Thirty-four participants (42%) ranked eye contact as the most crucial non-verbal communication skill utilized by physicians. Posture was rated as the least essential non-verbal communication skill. In addition, forty-four participants (54%) ranked posture lower than all other non-verbal communication skills. Conclusion: This study elucidates some of the most and least significant non-verbal communication skills and equips physicians, residents, and medical students with knowledge about the most effective non-verbal communication techniques when interacting with their patients in order to build stronger ties with them.

#49) An evaluation of the long-term consequences of Shiga-toxin producing Escherichia coli and their various comorbidities

According to the World Health Organization, each year there are 600 million cases of foodborne diseases worldwide. A major foodborne pathogen that can result in potentially fatal sequelae is Shiga-toxin producing Escherichia coli (STECs). STECs —the main etiology of Hemolytic Uremic Syndrome (HUS) and Thrombotic Thrombocytopenic Purpura (TTP) —can result in various comorbidities such as End-Stage Renal Disease (ESRD), diabetes, hypertension, neurological and psychological damage, and cardiovascular disease. The purpose of this study is to determine the prevalence of chronic conditions following infection with Escherichia coli (E. coli). A survey was developed in Qualtrics detailing initial visits with healthcare providers, treatment plans, and medical conditions experienced following an E. coli infection. Participants are asked a variety of questions in various formats (e.g. multiple choice, open-ended, etc.) to elucidate details about the prognosis of the illness and further complications. Respondents are also given a voluntary option to send medical records to confirm the treatment plan and chronic medical conditions listed on the survey. The survey is being distributed via an anonymous link to the constituency of Stop Foodborne Illness and Facebook pages that provide support to people affected by HUS and their families. Distribution of the survey began January 8, 2020 and will close March 31, 2020. A minimum of 100 responses is expected at the closing of the survey. Using Qualtrics, correlations, trends, and frequencies will be determined using Chi-Square tests. Preliminary findings based upon initial analyses will be reported.

#50) Role of vasopressin in the ventral pallidum in regulating social play in juvenile rats
Jessica D.A. Lee*, Remco Bredewold, and Alexa H. Veenema

Social play is predominantly displayed by juveniles of many mammalian species, including rats and humans. Engagement in social play helps develop social competence throughout life. Children diagnosed with autism spectrum disorder (ASD) show decrease involvement in social play. Moreover, ASD is more prevalent in males than females. Thus, there is a need to better understand the neural mechanisms underlying social play in both sexes. We recently showed that vasopressin acting in the lateral septum (LS) of juvenile rats regulates social play behavior in a sex-specific manner. Vasopressin projections to the LS originate in the bed nucleus of the stria terminalis (BNST) and medial amygdala (MeA). We further showed that the ventral pallidum (VP) also receives vasopressin projections from the BNST and MeA.
Here, we hypothesized that, similar to the LS, vasopressin in the VP regulates social play in a sex-specific manner. Using a specific V1aR antagonist, we determined the effects of V1aR blockade in the VP on social play behavior in 5-week-old juvenile male and female rats. In addition, by combining retrograde tracing in the VP and LS with RNAscope for vasopressin and Fos mRNA expression, we will determine the extent to which vasopressin neurons in the BNST and MeA project to both the LS and the VP and are activated in response to social play. This study will provide insights into the brain regions recruited by vasopressin for the sex-specific regulation of social play behavior as well as the larger neural network modulated by the BNST/MeA-vasopressin system.

#51) Drug-target residence time as a complementary parameter for drug design
Katayoon Maghami and Kin Sing Lee

The drug discovery and development process are very expensive with a dampening success rate. Even after the decades of research, lack of efficacy remains the leading cause of drug failure in Phase II and Phase III clinical trial. It suggests that there may be other factors that are overlooked during the process. Over the years, the binding kinetics has been proposed to be one of the critical in-vitro parameters in the optimization of drug efficacy. Unfortunately, it has been neglected for a long time. However, due to the recent development of technology, we can measure binding kinetics in a high-throughput manner. The drug residence time (tR) which defines as the duration of drug bound to its target, has been shown to play an important role in dictating drug’s biological effects and efficacy. Therefore, improving tR through drug design could be a better strategy to improve the efficacy of the drug. Nonetheless, unlike structural activity relationship (SAR), the structural kinetic relationship (SKR) has never been well studied. To identify key elements for SKR, here, we used soluble epoxide hydrolase (sEH) as a biological model because we have a big library of sEH inhibitors and a high-throughput screening to determine the tR of the inhibitors. sEH metabolizes polyunsaturated long fatty acids (PUFA) epoxides to their corresponding 1,2-diol. These fatty acid epoxides demonstrate anti-inflammatory, anti-hypertensive, and analgesic effects while the diols have pro-inflammatory effects in our bodies. Inhibition of sEH and stabilizing the PUFA epoxides is beneficial to many diseases. I will present our screening results which will help us to understand the structure-kinetic relationship (SKR) of these inhibitors. These results will lead us to design better inhibitors with longer drug-target residence time for treating diseases. The long-term goal of this project is to identify key SKR that can be applied to other targets to design more efficacious drug candidates and to understand how tR helps to translate better in vivo activity of the drug.

#52) The role of oxidative compounds in the toxicity of ultra-processed foods in the Western Diet
Lisaura Maldonado-Pereira*, Nama Naseem, Lisa Zou, Grant Gmitter, and Ilce Medina-Meza

In recent years, a significant increase in the consumption of ultra-processed, calorie-dense, and nutrition-poor food has been noticed in developed countries. The Western diet is characterized by inexpensive ultra-processed foods, processed meats, sweets, fried foods, and refined grains. A variety of processing techniques (such as thermal treatments, light exposure, storage, and aging) of ultra-processed foods are generally designed to improve food quality, nutrition, and safety. However, they can lead to the generation and accumulation of certain chemical compounds able to exert toxic activities against human health. Cholesterol from foodstuff, is the precursor of several toxic molecules known as cholesterol oxidation products (COPs), and has been demonstrated their relationship with different chronic diseases such as Alzheimer’s disease, Parkinson’s disease, etc. The aim of this study was to quantify the oxidative load of most consumed ultra-processed food in the Western diet. Macaroni and cheese (microwaved) showed the highest total COPs content (24.13 ± 4.72 mg/100 g fat), followed by the supreme pizza from Marco’s Pizza (11.88 ± 0.019 mg/100 g fat). Results showed that different processing technologies during manufacturing of ultra-processed foods result in the formation of high amount of COPs and other oxidized derivatives. Creation of a database is imperative to monitor the formation of COPs, as part of the development of a nationwide framework of tools for surveillance, inspection and traceability of COPs in different food products, which will enable knowledge about processing-formed unintentional compounds.
#53) How Can 2 hours Change YOUR Quality of Life

Vinai Reddy

Objective: The objective of this study is to determine the barriers for seeking a Total Knee Replacement (TKR) in Indian individuals with osteoarthritis, despite an increasing need for the surgery.

Methods: In-depth interviews were conducted with 350 Indian patients (109 Males, 241 females) who underwent TKR at Sunshine hospital, Secunderabad. The interviews were conducted with each individual based on a questionnaire of 18 questions, which emphasized the patient’s reasoning and perceptions regarding TKR. Questions were asked after the patients were admitted but before undergoing TKR. Pain Severity and Disability prior to receiving TKR were measured with the Lequesne index and Oxford Knee Score.

Results: Patients requiring TKR were undergoing surgery 13 months after being advised for surgery. Multiple barriers in choosing surgery were identified: (i) Wanting to manage pain and disability for as long as possible, (ii) loss of autonomy in making the decision to undergo surgery, (iii) Financial issues in affording surgery, (iv) Belief that the patients themselves are unfit for surgery and fear of post-surgical complications and morbidity.

Conclusion: Despite there being several barriers to the surgical treatment of knee osteoarthritis, physicians must develop strategies to help bridge the gap between patients requiring TKR and the patients electing to undergo the surgery.

#54) Setting the Stage: Microglia Are a Key Orchestrator of Sex Differences

Brandon A. Johnson*, S. Marc Breedlove, and Cynthia L. Jordan

The development and organization of the brain is different in women and men. While sociological factors are likely involved, brain differences established early in development also contribute. These differences emerge during a critical period when androgens produced by the testes “masculinize” the brain by acting on specialized androgen receptors in cells. Microglia are immune cells that migrate into the brain from the periphery during development; these cells perform many functions, such as synaptic pruning, phagocytosis, and promoting cell growth, which leads to the development of sex differences in specific brain regions. Sex differences have been found in the morphology, number, and activity of microglia.

A spontaneous mutation that disrupts androgen receptor function occurs in both humans (Androgen Insensitivity Syndrome) and rodents. This gene mutation results in XY individuals that appear female rather than male. In the current project, I use a staining technique to visualize microglia in the brains of male, female, and androgen receptor mutant XY rats to determine whether sex differences in microglia in specific brain regions, the hypothalamus and the amygdala, require a functional androgen receptor. If androgen receptors play a critical role in organizing sex differences in the brain, future experiments will focus on understanding the molecular mechanisms for establishing sex differences in brain structure and function that mediate sex differences in behavior, health, and disease. I am particularly interested in understanding whether sex differences in microglia underlie sex differences in early life stress, which have lasting but distinctly different effects on males and females.

#55) Reliability of automated interpretation of computed tomography images in the management of acute stroke: A single-center analysis

Christopher Cenzer *, Jatin Ahluwalia, Lauren Ford, and Mathew Commet

Purpose: The study analyzes if artificial intelligence (AI) technology is a reliable and accurate screening tool for identifying patients who are candidates for endovascular thrombectomy (EVT) in the setting of acute ischemic stroke. The AI technology used in this study is called RAPID. This study also examines limitations of RAPID and aims to ascertain the degree to which RAPID can be used to triage patients for EVT in the emergent setting.

Materials and Methods: This is an IRB approved, retrospective analysis of 857 patients presenting to our institution from 1/1/2018 with symptoms of acute stroke. Inclusion criteria included patients who entered our institutional stroke protocol and underwent CT, CTA and CTP scans interpreted by both RAPID and a neuro-trained radiologist.

Results: RAPID CTP analysis showed significant sensitivity (90.7%), specificity (92.5%) and negative predictive value (98.2%) for identifying EVT-eligible patients. RAPID CTA showed significant specificity (95.9%) and negative predictive value (94.5%) as well. There was also a significant association between RAPID interpretation and neuroradiologist
interpretation of CTP and CTP studies.
Conclusions: The strong specificity and negative predictive value of RAPID analysis suggest that this technology may be reliable as a screening tool to rule out potential EVT candidates. Due to the acute nature of ischemic stroke, prompt identification of EVT candidates decreases patient morbidity and mortality and is associated with improved patient outcomes. Overall, RAPID can improve patient care as a reliable and consistent screening tool for EVT.

#56) The Effect of Solutionizing and Ageing Temperature on the Microstructural Evolution of Allvac 718Plus
Geeta Kumari*, Carl Boehlert, M. Sundararaman, and S. Sankaran

Alloy Allvac 718Plus is a relatively new superalloy developed to improve the properties of the widely-used superalloy Inconel 718 (IN 718). The strength of IN 718 significantly decreases at temperatures of 650°C and above due to the transformation of the metastable, γ'' (tetragonal, D022 structure) phase into the δ phase (orthorhombic, D0a structure). Allvac 718Plus, which was designed to address this issue exhibits service temperature up to 704°C (55°C more than that for IN 718). Allvac 718Plus has γ’ (ordered FCC) precipitate as a major strengthening phase. Because the elevated-temperature microstructural stability influences both the mechanical properties and service life of Ni-based superalloys, it is important to understand the microstructural evolution during heat-treatment or temperature exposure. The volume fraction of the γ’ phase can be controlled by solution treatment followed by aging treatment. In the present work, the solutionizing temperature was optimized and then further aging treatment was performed to develop a bi-modal distribution of the γ’ phase. The effect of the heat-treatment on the evolution of microstructure was investigated and the corresponding hardness was calculated. The results obtained were compared with the existing data, which helped in understanding the dependency of time and temperature on the microstructural changes and mechanical properties of Allvac 718Plus.

#57) Endometriosis prevalence, incidence and severity between 1989-2019
Marzieh Ghiasi*, Madhavi Kulkarni, and Stacey Missmer

Estimates of endometriosis prevalence and incidence are highly variable, leading to uncertainty regarding changes over time. This review examined the prevalence, incidence and severity of endometriosis worldwide as reported over the past 30 years. We conducted a systematic search using PubMed, Web of Science, EMBASE, and CINAHL to identify literature published between 1989-2019. Of 846 records identified, 69 studies met the inclusion criteria. 26 studies were from the general population, 16 of which were from regional/national hospital or insurance claims systems. The other 43 studies were in clinical or hospital settings. Meta-regression for prevalence evaluating sources of heterogeneity was conducted and described. The prevalence reported among national or regional population-based studies ranged from 0.7% to 8.6% and for clinic or hospital-based studies from 0.2% to 71.4%. Endometriosis staging at diagnosis, a proxy for assessing severity, was reported in only 26 of 69 studies, 77% of which were hospital-based. Heterogeneity of diagnostic criteria and selection bias overwhelmingly account for variability in endometriosis prevalence estimated in the literature. The highest quality data—from inclusive longitudinal population-based studies are sparse. Thus, it is difficult to conclude if the lack of observed change in frequency and distribution of endometriosis over the past 30 years is valid.

#58) Lignin based Flexible Polyurethane Foam for Automotive Application
Akash Gondaliya* and Mojgan Nejad

Lignin is the second most abundant natural polymer produced as byproduct of pulp and paper and bioethanol industries. Lignin contains both aliphatic and aromatic hydroxyl groups which makes it a suitable natural polymer to replace petroleum-based polyol in formulation of polyurethanes. Previous studies have shown that incorporation of lignin in PU rigid foams increased flame retardancy, antimicrobial properties and the lignin-containing PU foams exhibited better physical and mechanical properties. This study was focused on evaluating suitability of a wide range of lignins in replacing 20 wt% of petroleum-based polyol in PU flexible foam formulations. The emphasis was to study effect of lignin incorporation on the structural, mechanical and thermal properties of foam. Additionally, we were interested to model correlation between lignin properties and performance of lignin-based PU foams to identify the best lignin for flexible PU foam applications. The results showed that lignin addition increased compression strength, tear propagation strength and
support factor of the foams, and among tested lignins, lignins isolated through organosolv process were better for PU flexible foam applications.

#59) Will biological control of swallow-worts prevent lethal oviposition of monarch butterflies?
Brianna Alred*, D. Landis, N. Haan, and M. Szucs

Previous studies have found that monarch butterflies lay up to 25% of their eggs on the invasive vines, black and pale swallow-worts (Vincetoxicum spp.), which may serve as an oviposition sink for monarch butterflies since their larvae cannot develop on these plants. As swallow-worts continue to spread throughout the eastern and midwestern United States, it may contribute to the monarch population declines. Hypena opulenta, a defoliating moth, has recently been approved for release as a biological control agent against swallow-worts. We tested whether the presence of H. opulenta on swallow-worts would deter oviposition by monarchs given the presence of another leaf feeder on the plants. In experiments where we placed milkweed plants as a control and swallow-wort plants with and without H. opulenta at 6 field sites, we found that monarchs laid a similar number of eggs on both swallow-wort treatments. In laboratory choice and no choice tests, monarchs laid no eggs on any swallow-wort plants. Our data do not suggest that monarch oviposition is influenced by the presence of H. opulenta.

#60) Investigating Reactivity of Different Lignins Toward Isocyanate
Mona Alinejad

Polyurethane is a polymer made from polyol and isocyanate. Due to its superior properties, it has variety of applications such as adhesives, coatings, elastomers and foams. However, polyurethane formulations used in industry are made with petroleum-based raw materials. Nowadays, limitation of petroleum sources, oil price fluctuations and pollutions, hugely demand to replace petroleum-based components of polyurethane with green renewable bioproducts. Lignin is one of the most suitable candidates to replace polyol in polyurethane synthesis. Depending on source and isolation method, lignin properties varies significantly. The goal of this study was to measure the reactivity of different lignins with number of commonly used isocyanates in polyurethane formulation to choose the most suitable lignins for replacing polyol in PU applications. Twenty different lignin samples from different resources and isolation processes were characterized and their reactivity with isocyanates such as methylene diphenyl diisocyanate (MDI), toluene diisocyanate (TDI), polymeric MDI (pMDI) and phenyl isocyanate were measured using Fourier Transform Infrared Spectroscopy in Attenuated Total Reflectance mode (FTIR-ATR), Titration, Differential Scanning Calorimetry (DSC) and Phosphorus- nuclear magnetic resonance spectroscopy (31P NMR) . The results showed that lignins which had higher aliphatic hydroxyl content and sodium content had higher reactivity with isocyanate.

#61) An inquiry into collecting recyclable cans as a livelihood activity at football tailgates.
Noleen R. Chikowore* and John M. Kerr

The deposit refund program for returns of beverage containers in some US states has led to informal recycling activities being a livelihood activity. Michigan’s 10- cent bottle and can refund which is the highest in the US, makes it possible to earn income from collecting recyclables. This is an important activity at MSU football tailgating. I used a modified Sustainable Rural Livelihoods Framework to examine people’s ability to benefit from this livelihood opportunity. The qualitative study explored the motivation behind their choices and the factors that enable or disenable activities of people collecting cans for income (known to each other as “canners”) at MSU’s football tailgates. Canners have low and or irregular income which motivates them to engage in canning to supplement their existing earnings. Combining social networks, physical strength and intelligence allows canners to maximize their ability to engage in canning activities. Redemption centers limit the number of cans that can be redeemed and access to public transportation are some of the policies and practices that limit canning activities. This study is important to highlight the impact of bottle bill laws on people’s well-being.
#62) Augmentative releases of Trissolcus japonicus for the biological control of Halyomorpha halys in Michigan
Olivia Simaz*, John Pote, Larry Gut, Julianna Wilson, and Marianna Szucs

The invasive landscape pest Halyomorpha halys (Hemiptera; Pentatomidae) has been a problem in Michigan since it arrived in 2010. It has since been followed in other states by its coevolved parasitoid Trissolcus japonicus (Hymenoptera; Scelionidae), which was finally found in Michigan in fall of 2018. T. japonicus was mass reared in a lab over the winter and was mass released across Lower Michigan apple orchards in the summer of 2019. Persistence of the wasp was monitored for the remainder of the summer by the use of sentinel egg masses put out in the orchards every other week for three days at a time, as well as H. halys number with pyramid traps. We caught no T. japonicus in the summer of 2019 but many other parasitoids of the stink bug were recovered. This could be caused by T. japonicus is dispersing immediately after releases, as has been the case at times in the past. There was more parasitism by more wasp species than originally thought, which when combined with low H. halys numbers overall that summer, may have reduced the ability of T. japonicus to establish successfully.

#63) Characterization of the mechanisms of leaf-associated microbe-microbe interactions.
Rosalane Kithan*, Tao Chen, Xiufang Xin and Shen-Yang He

In plant innate immunity, the first line of microbial recognition relies on the pattern-recognition receptors (PRRs) to detect pathogen-associated molecular patterns (PAMPs) and initiate PAMP-triggered immunity (PTI). PTI is found to be a principal component of the plant genetic network maintaining the leaf microbiome. An Arabidopsis thaliana mutant disrupted in both PTI signaling and the AtMIN7 gene (mbbc) showed an excessive proliferation of bacterial endophytes. Interestingly, 16s rRNA sequencing analysis showed that proteobacteria dominated the leaf microbial community in the mutant and firmicutes, which were present in abundance in wild type (Columbia-0) leaves, were nearly eliminated. This suggests that PTI signaling and the AtMIN7 gene are two important components of a host barrier that controls the level of commensal and possibly beneficial microbiota from excessive proliferation in the phyllosphere, crucial for optimal plant health. Furthermore, the mbbc mutant leaves showed tissue chlorosis and/or necrosis when shifted to high humidity. We hypothesize that PTI and AtMIN7 are required for mediating the proteobacteria-firmicute interactions on the leaf and in the absence of these components ‘opportunist’ proteobacteria are able to proliferate at the expense of firmicutes. Perhaps to sustain a high population level, proteobacteria antagonize firmicutes by secreting antimicrobial, secondary metabolites as a means for their survival and persistence. To characterize the metabolites responsible for the antagonism, we will employ a dual approach: (i) a functional genomic approach involving the use of antiSMASH (antibiotic & Secondary Metabolite Analysis Shell) and (ii) bioassay-guided metabolite fractionation. The main goal of this project is to study the molecular basis of the proteobacteria-firmicute interactions and to understand the mechanism by which plants control the leaf microbiota to benefit plant health.

#64) Monitoring and Removal of Saxitoxins for Drinking Water Treatment
Shardula Gawankar* and Rebecca H. Lahr

Lake Erie has been affected for decades by harmful algal blooms which have caused tap water shutoffs in Toledo in 2014, when toxic cyanotoxins were found in treated drinking water. Such occurrences are becoming more common across the globe and are triggering a need for research in toxin removal from drinking water. Water treatment plants on Lake Erie are currently focused on microcystins, the most common form of cyanotoxin, but climate change is predicted to increase the occurrence of other types of cyanotoxins, like saxitoxin. Saxitoxin, the paralytic shellfish toxin (PST), is a neurotoxin that is produced by marine dinoflagellates and freshwater cyanobacteria, typically in tropical regions. In addition to climate change, agricultural runoff makes Lake Erie a potential hub for saxitoxin production in the future. Saxitoxin is not regulated for monitoring or for removal by drinking water treatment plants. Hence, we are developing a detection method that uses hydrophilic interaction liquid chromatography – mass spectrometry (HILIC-MS) coupled with a weak cation exchange solid-phase extraction, which could be used for the quantification of saxitoxins. Also, there is currently no oxidation process that a water treatment plant can implement to simultaneously remove all the cyanotoxins (microcystin, saxitoxin, cylindrospermopsin, and anatoxin) from drinking water. Conventional oxidation treatments like chlorination, ozonation, and oxidation by potassium permanganate are not effective in the removal of all cyanotoxins.
We propose to use catalytic ozone membrane filtration, which uses hydroxyl ions for degradation, as a treatment method for all cyanotoxins.

#65) Utilizing RNAi via Spray-Induced Gene Silencing to Manage Fusarium Head Blight in Barley
Tara Watkins* and Frances Trail

Fusarium graminearum is a fungal pathogen and the primary causal agent of Fusarium Head Blight (FHB) in cereal crops. FHB is difficult to control and results in mycotoxin contamination of grain and yield loss. This disease is currently managed using carefully-timed fungicide application(s) and planting cultivars with partial genetic resistance. Because there are limited means of controlling FHB in hosts, novel management strategies should be explored. An emerging technology, RNA-interference (RNAi), uses post-transcriptional gene silencing via sequence-specific mRNA degradation. This project focuses on the use of RNAi to manage FHB in barley through a spray-induced gene silencing (SIGS) approach across all stages of barley production. SIGS is accomplished by spraying long double-stranded RNA (dsRNA), which is sequence-complementary to fungal gene(s) of interest, directly onto living tissue. dsRNA is taken up by the pathogen and host, processed into small RNAs, and results in knockdown of the target gene transcripts. In vitro assays and in planta assays are being performed. For all assays, transcript levels will be measured using real time quantitative PCR. Target genes of interest critical for conidial germination have been identified from previously generated RNA-seq data, and genes critical for other stages, such as DON biosynthesis, hydrophobin production, and perithecium development, will also be targets for study. This work is significant because it is a novel strategy not only useful for managing FHB in barley, but can be implemented across other cropping systems and fungal organisms.

#66) Methodological techniques used to assess impacts of on-water recreation in marine protected areas
Tatiana A. Iretkskaia

The purpose of this study was to explore the latest techniques that are used worldwide to assess the impacts of on-water recreation (main emphasis being put on scuba diving and snorkeling) and present their advantages and limitations, as well as to come up with recommendations for future researchers and protected areas practitioners. An understanding of the positive and negative impacts of on-water recreation on the marine protected areas is crucial for providing for the informed management and decision-making in both the marine protected areas (including the Thunder Bay National Marine Sanctuary located on Lake Huron) and the surrounding communities. Globally, the methods used to study on-water tourism and recreation impacts can be subdivided into three groups: direct observations (physically going underwater to observe tourists), traditional mixed method approaches (administering questionnaires and conducting guided interviews), and remote online surveys. Direct observations are the most time- and effort-consuming techniques with the obvious limitations being the need for researchers to be proficient scuba divers or snorkelers themselves and to have a sufficient level of training. Direct observations are particularly useful in gathering information about the type and scope of damage that recreational divers and snorkelers exercise on the resource. Online surveys represent the other end of the spectrum related to efficiency. Challenges here are potential low response rates and the inability to verify the perceived versus actual behaviors and experiences of the respondents. The last method combines administering questionnaires and conducting semi-structured interviews, with interviewees identified using purposive and/or snowball sampling.

#67) Integrating Bayesian Analysis in Assessing Stable and Labile Carbon Pools on Malawi Smallholder Farm Soils
Xinyi Tu*, Sieglinde Snapp, Han Wang, and Frederi Viens

Soil degradation is a critical problem for African countries in the tropics and subtropics where people depend heavily on agricultural production and often have limited resources or access to inputs. Smallholder farmers’ managed lands are critical to food security in Africa. There is a strong theoretical understanding of soil forming factors and consequences for soil organic matter pools, yet there are almost no studies of labile carbon pool across tropical agricultural landscapes and overall limited understanding of carbon pools on smallholder farms in Africa. Investigating the main environmental and anthropogenic drivers for spatial variation of SOC in crop fields at regional scale will require detailed studies that
document not only the climate and edaphic properties, but also anthropogenic factors on smallholder farms. The main goal of this research is to evaluate the labile and stable carbon pools in Central and Southern Malawi smallholder farm soils, which provides updated information on soil degradation situation in Africa. We collected soil samples from 1312 sites in Central and Southern Malawi smallholder farms as well as corresponding surveys of management practices at each field. To better understand drivers for variation of stable and labile carbon pool, we integrated Bayesian statistical models to analyses the climate-induced and management-induced variables. The Bayesian approach fills the gap of identifying the sensitive drivers as this method accommodates the domain specialist’s expectation of uncertainty levels.

#68) Accelerated Convergence in Large Scale Networks of Nonlinear Agents
Dhrubajit Chowdhury* and Hassan Khalil

Networked systems have been immensely popular since the last two decades as they effectively represent real-world models such as vehicle platoons, and power systems. Distributed algorithms are designed for these networks to achieve global objectives like synchronization. However, with an increase in network size the convergence rate of these algorithms becomes slow. We consider the synchronization problem in the leader-follower framework with a single leader in the network. The agents in the network are required to synchronize to the trajectories of the leader. We propose a scalable distributed algorithm using the relative position and its derivative using observers. It is shown that using this Proportional Derivative Derivate (PDD) controller the convergence rate to achieve synchronization is almost invariant of the network size.

#69) Towards wireless optical communication for underwater robots.
Pratap Bhanu Solanki*, Xiaobo Tan, and Shaunak D Bopardikar

Efficient wireless communication technology for underwater systems is still in its immature phase of development. Due to the attenuation of radio-frequency signals underwater, at present acoustic communication is the only industry standard. However, it suffers from shortcomings such as low bandwidth, latency, and high power consumption. Free space LED optical communication is becoming a promising technology to address the communication requirement between underwater systems. The fundamental challenge associated with the wireless optical communication systems is the requirement of line-of-sight (LOS) between the communicating robots due to the high directionality of the optical signals. We propose an optical tracking approach that uses average signal strength measurement from the system's receiver photodiode to align the pointing direction towards maximum light intensity. Using this approach on both of the robots results in a near LOS configuration between the two robots. Simulation and experimental results demonstrate the efficacy of the proposed approach.
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