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Thanks to Our Sponsors
AGENDA

8:00–9:00 AM  
REGISTRATION, CONTINENTAL BREAKFAST, POSTER SET-UP  
Please check in at the registration table on the ground floor, outside the Concourse. Poster set-up takes place in the Breslin Concourse. Breakfast is available in the North Auxiliary Gymnasium.

9:00–9:15 AM  
WELCOME  
Dr. Karen Klomparens, Dean, MSU Graduate School

9:15–10:45 AM  
FITCH H. BEACH RESEARCH AWARD NOMINEE PRESENTATIONS

10:45–11:00 AM  
BREAK

11:00–11:45 AM  
RESEARCH POSTER SESSION 1  
Authors will be available to discuss research posters from Biosystems Engineering, Chemical Engineering, Electrical Engineering, and Materials Science

11:45 AM–12:30 PM  
RESEARCH POSTER SESSION 2  
Authors will be available to discuss research posters from Civil Engineering, Environmental Engineering, Computer Science, and Mechanical Engineering

12:30–12:45 PM  
BREAK

12:45–2:15 PM  
NETWORKING LUNCH & AWARDS CEREMONY

2:15–2:45 PM  
KEYNOTE ADDRESS  
The “Accidental Career”? Lessons for Post-Graduate Life  
Dr. Brian M. Kent, Senior Scientist, ARA

2:45–5:00 PM  
CAREER CONNECTIONS  
Please join us for coffee and dessert and an opportunity to network with students, faculty, staff, and industry partners.
Fitch H. Beach Award Nominees

This endowed award recognizes the most outstanding graduate researchers within the College of Engineering. Each department nominates one PhD student, and awards are based on a review of students’ academic and professional records and on an oral presentation of their research. Awardees receive stipends, a certificate, and a medal to be worn at graduation.

The following students have been nominated by their departments for the Fitch H. Beach Award for Outstanding Graduate Research, and will present their research at the Symposium.

- **Keith Button (ME):** Footwear Design Affects Ankle Injury: Experimental and Computational Studies
- **Mohannad Z. Naser (CEE):** Response of Fire Exposed Steel Girders under Combined Effect of Flexure and Shear
- **Sean Woznicki (BAE):** Development of a Comprehensive Framework to Assess the Impacts of Climate Change on Stream Health
- **Jianguo Zhao (ECE):** Biologically Inspired Approach for Robot Design and Control
- **Yimu Zhao (CHEMS):** Transparent Solar Panel
- **Muhammad Shahzad (CSE):** Statistical and Learning Algorithms for the Design, Analysis, Measurement, and Modeling of Networking and Security Systems

MSUFCU Research Translation Award

This competition, funded by a grant from the MSU Federal Credit Union, seeks to inspire students to think about commercial applications of their research and develop research posters that clearly communicate this potential, and to spark conversations and make connections between students, projects, and potential industry collaborators. A committee of judges drawn from industry representatives will review research posters submitted to the Engineering Graduate Research Symposium and select two winners; the first-place awardee will receive $2,000 and the second-place awardee will receive $500.
Outstanding Graduate Student Awards

This award recognizes the most outstanding graduate student in each program, as selected by the faculty within the department. Recipients receive a stipend, certificate, and a medal to be worn at graduation. The 2014–15 Outstanding Graduate Students are listed below.

- Zhiguo Liu, Biosystems Engineering (Advisor: Yan “Susie” Liu)
- Yimu Zhao, Chemical Engineering (Advisor: Richard Lunt)
- Ajith Chakkedath, Materials Science (Advisor: Carl Boehlert)
- Nan Hu, Civil Engineering (Advisor: Rigoberto Burgueño)
- Mariya Munir, Environmental Engineering (Advisor: Irene Xagoraraki)
- Muhammad Shahzad, Computer Science (Advisor: Alex X. Liu)
- Jun Zhang, Electrical Engineering (Advisor: Xiaobo Tan)
- Christopher Cater, Engineering Mechanics (Advisor: Xinran “Sharon” Xiao)
- Brian Scott Strachan, Mechanical Engineering (Advisor: Steve Shaw)

The DewGood Public Service Technology Award

This competition, funded by a grant from Dewpoint, encourages students to think about the broader impacts of their research and develop posters that clearly communicate the potential of their research to serve the public good. A committee of judges drawn from industry representatives will review research posters submitted to the Engineering Graduate Research Symposium and select two winners; the first-place awardee will receive $350 and the second-place awardee will receive $150.
More than 210 graduate students, representing all nine programs in our six Engineering departments, will present research posters at the Symposium. This program lists poster titles, numbers, and authors by department; complete abstracts are available online and QR codes are provided for easy access to the abstracts from each program.

Within the Breslin Concourse, posters are arranged by department, starting from the ticket lobby entrance. See map for more details.
Speakers

**Dr. Karen L. Klomparens** has served as Dean of the Graduate School and Associate Provost for Graduate Education at Michigan State University since 1997. She is a professor of Plant Biology and was on leave as director of MSU’s Center for Advanced Microscopy. Prior to becoming Assistant Dean for Graduate Student Welfare in 1994, Dr. Klomparens was on a Fulbright-supported sabbatical at the University of Cambridge studying the ultrastructure of fungal spore development. In the Graduate School, she and her colleagues developed a program on “Setting Expectations and Resolving Conflicts in Graduate Education” that is the topic of a 2008 Council of Graduate Schools’ monograph. Dean Klomparens served a two-year term as the Chair of the Big Ten (CIC) graduate deans group, three years on the Executive Committee and five years on the Board of Directors for the Council of Graduate Schools, two years on the Professional Science Master’s Board of Directors, two years on the GRE Board, two years on the Executive Committee of the Association of Graduate Schools (AAU) and two years on the Advisory Committee for NSF’s Education and Human Resources Directorate. Her focus was on externally funded (nearly $5M) initiatives that support career and professional development for graduate students and postdocs, responsible conduct of research, Ph.D. student completion, diversity and inclusion in graduate education, and use of technology to increase transparency of the graduate education process.

**Dr. Brian M. Kent** joined ARA in 2014 as Senior Scientist and S&T lead for Electromagnetics, Radio Frequency, and Sensing Systems. He is an internationally recognized, principal engineering professional with superb technical, organizational, mentoring, and communications skills. He is responsible for coordinating internal S&T technology efforts in his field while providing ARA with opportunities for external collaboration across government, industry, and academia.
Dr. Kent joined ARA having retired from the United States Air Force after 37 years of public service. He previously served as the Chief Technology Officer of the United States Air Force Research Laboratory (AFRL), and Chief Scientist of the AFRL Sensors Directorate. Between 2011–2014 he twice led the overall technical direction of AFRL’s $2.1B Science and Technology (S&T) Program employing 6,500 scientists and engineers. He also executed technical oversight on four diverse technical disciplines including active and passive radar sensing, passive and active electro-optic sensing, electronic warfare and signature reduction technologies, and advanced processing, exploitation, and dissemination technologies associated with intelligence, reconnaissance, and surveillance applications.

Between 2003–2008 Dr. Kent was detailed to NASA, first serving on the Columbia Accident Investigation Board (CAIB) Technical Staff where he led and executed an independent analysis of “accident root cause” related to a piece of flight hardware which came off of the Columbia on orbit during flight day 2. He remained with NASA’s return to flight program, executing a critical electromagnetic compatibility test on Shuttle Orbiter Discovery to certify the vehicle for safe flight in 2005. He co-led radar ascent debris analysis of orbiter safety during four operational Shuttle missions (STS 114/115/116/121). Prior to 2008, he served for 20 years as a principal research fellow of Low Observable Technology, where he planned, designed, and executed the construction of a world-class $20M low observable anechoic chamber known as the USAF “Advanced Compact Range.” He also conceived and executed an evolving series of in situ electromagnetic scattering diagnostic measurement systems that reduced maintenance man hours per flight hours on the USAF B-2, F-117, and F-22. Dr. Kent is a Fellow of the Institute of Electrical and Electronics Engineers, an international IEEE Distinguished Lecturer, a Fellow of the Antenna Measurement Techniques Association, and a Fellow of AFRL. He also won the prestigious Meritorious Presidential Rank Award in 2009.
With 38+ years’ experience as an engineer for the US Air Force and private sector, mentees often ask me to reveal the “secret skills for engineering success.” My answers are usually short and obvious: never knowingly break a commitment, always act with total integrity, under-promise and over-deliver, be the best at what you know, and don’t be afraid to ask for help if you don’t know something.

While these are critical, the most important post-graduate skill to master is the ability to convey extremely complex multi-disciplinary engineering subjects to non-engineers—who, by the way, compose 99.8+% of the world’s population. Lawyers, accountants, non-engineering managers simply don’t know your subjects. Senior policy decision makers (in government and the private sector) certainly won’t know your subject. If the President of the United States dropped by your laboratory to talk about your project for 5 minutes, would you really go into the details of why gold-plated nanowires in a mixed medium of cyano-based polymer fluids produces better high-temperature, low-viscosity lubricants for nuclear power reactor emergency shutdown valves?

Outside academia and technical conferences, you will spend the rest of your career explaining engineering to non-engineers. Mastering this skill will propel you through progressively more difficult engineering and societal problem assignments leading your career towards professional success and personal satisfaction.
Engineering at the Tropics: Reclaiming Water through Constructed Treatment Wetlands

**BAE-01** Ronald Aguilar, Juan Rojas, Alberto Miranda, Carlos Benavides, Dawn Reinhold

Design of a Foldable Fresnel Lens Solar Thermal Collector for Power Generation

**BAE-02** Mauricio Bustamante Roman, Wei Liao

Woody Biomass Feedstock Harvesting from a Hybrid Poplar Plantation in Escanaba, Michigan: A Case Study

**BAE-03** Zach Carter, Fei Pan, Yingqian Lin

Observation Method of Hydraulic Flow with Different Organic Loadings on a Drain Field

**BAE-04** Younsuk Dong, Steven Safferman

Lignin to Liquid Fuels Using Fast Pyrolysis and Electrocatalytic Upgrading

**BAE-05** Mahlet Garedew, Aaron Gordon, Bruno Pasquini-Pivesso, Stephen Wilson, Leonardo Sousa, James E. Jackson, Christopher M. Saffron

Assessment of the Applicability of Benford’s Law to Detection of Data Mishandling in Wastewater Treatment Plant Self-Reported Discharge Data

**BAE-06** Pouyan Hatami Bahman Beiglou, Jade Mitchell

Tissue Specific Fractionation, Extraction, and Characterization of Energy Sorghum and the Development of a Counter-Current Extraction and Alkaline Pretreatment for High-Titer Mixed Sugar Production

**BAE-07** Muyang Li, Dan Williams, Guilong Yan, Lisaura Maldonado, Alicia Martinez, David Hodge

Comparing the Effect of Product Structure on Thermal Resistance of *Salmonella Enteritidis* PT30 on/in Almond and Wheat Products

**BAE-08** Pichamon Limcharoenchat, Bradley Marks, Michael James, Nicole Hall
A Strategy to Optimize Woody Biomass Feedstock Storage in the Supply Chain

BAE-09  Yingqian Lin, Fei Pan

Integrating Electrocoagulation (EC) and Biological Routes to Convert Organic Residues into Value-Added Chemicals

BAE-10  Zhiguo Liu, Wei Liao, Yan Liu

Feasibility of Utilizing Sugar Beet Residues to Produce Chitosan as a Value-Added Product for Food and Agricultural Applications

BAE-11  Pat Sheridan, Yan Liu

Decision Support Tool Development for Michigan-Based Renewable Energy

BAE-12  Jason Smith, Steve Saffereman, Younsuk Dong, Michael Thomas, David Binkley

Multiple-Stage Cultivation to Enhance Motierella Isabellina Lipid Production from Lignocellulosic Materials

BAE-13  Yingkui Zhong, Yan Liu

A Self-Sustaining Advanced Lignocellulosic Biofuel Production by Integration of Anaerobic Digestion and Aerobic Fungal Fermentation

BAE-14  Yuan Zhong, Zhenhua Ruan, Yingkui Zhong, Steven Archer, Yan Liu, Wei Liao

CHEMICAL ENGINEERING

Determinants of siRNA Functional Asymmetry

CHE-01  Phillip A. Angart, Daniel B. Vocelle, Christina Chan, S. Patrick Walton

Development of an Association-Based Model for Bio-Derived Chemicals

CHE-02  Aseel Bala-Ahmed, Carl T. Lira

The Impact of Precursor Solution Additive Choice on Average Infiltrate Oxide Particle Size Nano-Composite Solid Oxide Fuel Cell Cathodes

CHE-03  Theodore E. Burye, Hongjie Tang, Jason D. Nicholas
Impact of Xylan O-Acetylation in *Arabidopsis Thaliana* on Cell Wall Porosity and Response to Alkaline and Liquid Hot Water Pretreatment  
**CHE-04** Jacob Crowe, Henry Pan, David Hodge

Thermodynamics and First Principles–Based Approach to Develop Silver-Free Braze Alloy for Solid Oxide Fuel Cell (SOFC) Application  
**CHE-05** Tridip Das, Jason Nicholas, Tom Bieler, Yue Qi

Optimized Fiber-Reinforced Polymer Composites for Lightweighting: Toughening of Aromatic Epoxy Polymers via Aliphatic Epoxy Copolymers  
**CHE-06** Markus A. Downey, Lawrence T. Drzal

Processing Methods of High-Density Polyethylene–Exfoliated Graphene Nanoplatelet Nanocomposites for Automotive Fuel Tank Applications  
**CHE-07** Keith T. Honaker, Frederic Vautard, Lawrence T. Drzal

Computationally Analyzing Oxygen Vacancies in Li$_2$MnO$_3$–Delta  
**CHE-08** Christine James, Yue Qi

Condensed Phase Ethanol Conversion to Higher Alcohols  
**CHE-09** Tyler Jordison, Dennis J. Miller, Carl Lira

Block Copolymers as Toughening Agents for Epoxy Resins  
**CHE-10** Nicholas T. Kamar, Lawrence T. Drzal

Non-Precious Metal Catalyst for Oxygen Reduction  
**CHE-11** Nathaniel Leonard, Cenk Gumeci, Scott Calabrese Barton

Silylated Soybean Oil for Industrial Coating Application  
**CHE-12** Chetan Tambe, Daniel Graiver, Ramani Narayan

Engineering Delivery Vehicles for siRNA Therapeutics  
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Exploring Sequence–Specificity Determinants of Enzymes Through Deep Mutational Scanning  
**CHE-14** Emily Wrenbeck, Tim Whitehead
Synthesis, Characterization, and Assessment of a Fibrous MnOx Catalytic Film Formed on FTO by Dual-Session Cyclic Voltammetry
CHE-15 Hao Yuan, Robert Y. Ofoli

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Influence of Temperature-Induced Bond Degradation on Capacity of Fire Exposed Reinforced Concrete Beams
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An Evolutionary Computational Approach for Damage Detection Using Self-Powered Wireless Sensor Data
CE-02 Amir H. Alavi, Hassene Hasni, Nizar Lajnef, Karim Chatti

A Data Interpretation Algorithm for Structural Damage Detection
CE-03 Amir H. Alavi, Hassene Hasni, Nizar Lajnef, Karim Chatti

Experimental Analysis of Damage Progression Using Self-Powered Wireless Sensors
CE-04 Amir H. Alavi, Hassene Hasni, Nizar Lajnef, Karim Chatti

Effect of High-Temperature Creep on Response of Concrete Columns Exposed to Fire
CE-05 Saleh Alogla, Venkatesh Kodur

New Displacement-Based Design Procedure for Ductile Reinforced Concrete Bridge Pier-Walls
CE-06 Mansour Alturki, Rigoberto Burgueño

Response of Fire Exposed Steel Bridge Girders
CE-07 Esam Aziz, Venkatesh Kodur

Closed-Form Solution to P-Delta Effects on the Nonlinear Response of Slender Reinforced Concrete Bridge Columns
CE-08 Ata Babazadeh, Rigoberto Burgueño
Finite Element Modeling of Temperature and Stress Development in Ultra-High-Performance Concrete During Early Stages of Curing  
**CE-09** Pratik Bhatt, Venkatesh Kodur

Local Calibration of the Rigid Pavement Performance Prediction Models Using Different Resampling Methods  
**CE-10** Wouter Brink, Syed W. Haider, Neeraj Buch

Local Calibration of the Rutting Model in the MEPDG  
**CE-11** Wouter Brink, Syed W. Haider, Neeraj Buch

Effect of Diamond Grinding on Rigid Pavement Performance  
**CE-12** Ronell Joseph Eisma, Syed Waqar Haider, Karim Chatti

Impact of Site Factors on the Effectiveness of Flexible Pavement Preservation Treatments  
**CE-13** Ronell Joseph Eisma, Syed Waqar Haider, Karim Chatti

Advanced Rapid Non-Destructive Test Method to Determine Chemical Composition of Concrete Materials in the Field  
**CE-14** Iman Harsini, Parviz Soroushian

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Controlling the Postbuckling Response of Cylindrical Shells under Axial Compression for Applications in Smart Structures  
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Geopolymer Concrete: A Sustainable Alternative to Portland Cement Concrete  
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BlueEar: A Low-Cost Eavesdropping System for Sniffing Bluetooth Traffic

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MSU Jump Robot to Cover Maximum Area in Wireless Mobile Network with Minimum Energy

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Stepped Waveguide Technique for the Extraction of Electromagnetic Parameters of Conductor-Backed Absorbers.

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An Adaptive Transfer Function for Deriving the Central Blood Pressure Waveform from a Peripheral Blood Pressure Waveform: Evaluation in Patients


Exploration of Inverse Depth Visual SLAM with Single Camera

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