

## Message from the Chair

### Widening the UA BME Network

This Summer’s newsletter highlights activities that extend well beyond the UA campus in Akron.

- This fall we will have the privilege of hosting seminar speakers from neighboring institutions as well as from out-of-state (page 2),
- The incoming freshman class includes students from Florida, Illinois, Indiana, Minnesota, New York, and Pennsylvania (page 4).
- Our “Conquer Chiari” conference on July 21st has attracted visitors from 19 US states (page 9)
- Two scientists - one from Lithuania and one from Brazil will be conducting research in BME during 2018 and 2019 (pages 7 and 11).
- We continue to reach out to medical device and life science companies in Germany, Italy, India, Israel and other countries — with the goal of creating “win-win” situations for both Akron and companies looking for a presence in the USA.
- Our faculty and students actively participate in international conferences (page 12).

Looking ahead, we have been approached by Ukrainian-based agencies seeking assistance with the design of affordable wheelchairs that match the specific needs of individuals in the Ukraine. This request is almost certainly going to lead to one or more BME Capstone Design projects. It features two aspects that our students seek: (i) relevance to patients, and (ii) projects that are technically challenging!

If anyone reading this newsletter (local, out-of-state, or international) wishes to engage with BME, please do not hesitate to contact us. We are always eager to expand our network!

**B.L. Davis, Ph.D**  
 Professor and Department Chair  
[bdavis3@uakron.edu](mailto:bdavis3@uakron.edu)

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Our mission is to provide quality education and applied learning at the interface of engineering and medicine, improve health outcomes through interdisciplinary scientific discovery, and engage the community through partnerships and outreach.

## BEST Medicine 2018

In March, UA hosted the 8th “BEST Medicine” Engineering Fair. Thanks to generous support from the Martha Holden Jennings Foundation, Procter & Gamble’s Higher Education Grant Program, and numerous companies in NE Ohio, this year’s event was able to reach out to new public schools in Ohio.

Top prizes for this year’s event went to Daniel Anand (Overall winner), Shruthi Ravichandran (Learning to Detect Malignant Skin Lesions from Photographic Images Using Deep Neural Networks), and Kei Kojima (Project: An Artificial EMG Generation Model for the Related Application of Prosthetic Arm Control).

Information on next year’s event will be posted at [www.uakron.edu/bestmedicine](http://www.uakron.edu/bestmedicine).



*(Above) 2018 BEST Medicine participant, Ca'Marea Snipes-Thomas, describing his project, “Reducing CO<sub>2</sub> Emissions by Using Special Filtering Systems”.*

## Fall Seminar Series

Note: Seminars are held in the Auburn Science and Engineering Center, Room 223/224 from noon to 1pm.

Date	Speaker	Title
8/31/2018	David M. Bastidas, Ph.D, The University of Akron	Copper IUD Contraceptives Corrosion in Simulated Uterine Fluid
9/14/2018	Thomas J. Hund, Ph.D., The Ohio State University	Novel pathways for regulation of cardiac electrical and mechanical function
9/28/2018	Rebecca German, Ph.D, NEOMED	Sensorimotor Integration in Swallowing: Lessons from Nerve Lesions in Animal Models
10/12/2018	Janna Andronowski, Ph.D, The University of Akron	Virtual Histology at the Canadian Light Source
10/26/2018	Jonathan Naft, CPO, Geauga Rehab. Engineering	Current trends in Orthotics and Prosthetics. An overview of the science, business, and trends affecting the space of O&P
11/2/2018	Claude F. Burgoyne, MD, Devers Eye Institute	From Biomechanics to Proteomics - Toward the Mechanisms of Axonal Insult in Glaucoma
11/16/2018	Chandrasekhar R Kothapalli, Ph.D, Cleveland State University	Microenvironment-induced mechanotransduction in neural and retinal cells
11/30/2018	John Clark, MD, Akron Children's Hospital	Need for Innovation in Pediatric Cardiac Care

## Paxton Hemberger's Fishing Rod

Paxton Hemberger is a 6-year old boy who has cerebral palsy that affects his arms and legs, and makes daily activities very challenging. In January 2018, a group of BME Design Team students met with mentors from the Inclusioneers group ([www.http://inclusioneers.org/](http://inclusioneers.org/)) to discuss how to design and build a fishing pole that would allow Paxton to fish near his home in Ravenna. Students who participated in this meeting were Walid Abahashim (team lead), Ally Chamberlin, Emily Popio, Elizabeth Scheatch, Jalal Jwayyed and Jake Eshelman.

The students worked with Inclusioneers founder Mike Firtha and mentor engineers Heather Demor and Bernie Shocklee. By June they had designed

an adaptive fishing pole for Paxton. It included a method for mounting the pole, a battery-powered motor, an activation switch that would allow Paxton to reel in the line, circuitry and various 3D-printed enclosures. What was remarkable was that Paxton reeled in a fish on his first outing! As Walid subsequently mentioned, *"The whole project has been a great experience where I was applying what I learned in class, BME tools and BME design, to help people and solve problems in the outside world"*.

Kudos to Mike Firtha and his fellow mentors from Inclusioneers and the BME Design Team for another successful project!



(Above) Paxton Hemberger with the first he caught! Photo courtesy Haylee DeSonne, Summit DD Inclusion Specialist.



## BME Recognized with Multiple LIFE Awards

The LIFE (legacy, integrity, fellowship, excellence) Awards are held annually, honoring students, faculty, and campus organizations that have demonstrated the LIFE values. Each year multiple individuals and Biomedical Engineering teams have been recognized — but 2018 seems to be a “banner year” in terms of recognition:

The BME Design Team was recognized with three awards (shown on right):

- Outstanding Civic Engagement
- Creativity
- Diversity Award (through Office of Multicultural Development)



**Doctoral Scholar Award:** Ramila Joshi

**Alumni Association Student Recognition Award:** Travis Pero

**Top Ten Senior Award:** Carlisle DeJulius

**Outstanding Campus Advisor Award:** Dr. Mary Verstraete

**Faculty Engagement Award:** Dr. Becky Willits



(Top) LIFE Awards received by the BME Design Team.  
(Above) Sofiya Rakovska led the team from 2017-18.



(Left) BME had a large number of students graduating with Honors in 2018. Students receiving this honor included Marianne Brown, Tyler Cindea, Victor Collins, Carlisle DeJulius, Ebenezer DeOliviera, Paul Ealy, Alexandria Elghanayan, Brendan Fuller, Kyle Glascott, Rachel Grimm, Alyssa Haase, Benjamin Hanna, Daniel Hawk, Jessica Kloehn, Aubrey Kozer, Claire Langenderfer, Kaitlyn Mangus, Collin Maples, Travis Pero, Elyse Petak, Olivia Powell, Sara Salem, Jaclyn Siefring, Matthew Wojcik

## New BME grants

### **In-vivo assessment of human iris mechanical properties (Brightfocus Foundation)**

Dr. Amini has been awarded \$150,000 to examine if, why, and how the iris becomes stiffer and consequently becomes abnormally deformed in the eyes of certain groups of patients who suffer from angle-closure glaucoma. The shape of the iris and its response to light are important factors for understanding the mechanism of angle-closure glaucoma.



*(Above) Dr. Rouzbeh Amini with Kara Summers from the Brightfocus Foundation.*

### **Professional Preparation of Underrepresented Minority PhD's and Post-Docs for a Career in Engineering Academia (NSF)**

This project provides intensive professional preparation for PhD and postdoctoral students through a series of 2-week intensive summer professional courses in conjunction with year-long activities. These provide hands-on training in the areas of teaching and research. The \$216,908 award is led by Drs. Cutright and Willits.

### **Modeling Treatment-Induced Drug Resistance of Colon Cancer Cells and Treatment Strategies (NIH)**

Dr. Tavana's research has focused on the use of spheroids to: (i) address the influence of stromal fibroblasts and immune cells within a tumor microenvironment, (ii) study cancer stem cells, and (iii) facilitate compound screening in the drug discovery process. The new award for \$467,312 from the National Cancer Institute allows his team to further examine the issue of cancer cells' resistance to drugs.

### **3D Tumor Model Microtechnology for High Throughput Drug Screening (NSF)**

This Phase 1 SBIR for \$225,000 has been awarded to Dr. Stephanie Ham (a UA graduate) working in conjunction with BME to further develop technology for screening anti-cancer drugs.

### **Soluble Effects of Sphingosine-1-phosphate Signaling from Mechanically Unloaded Osteocytes on Osteoclast Precursor Migration (NSF)**

Sharon Truesdale received a 5-year NSF Fellowship (up to \$230,000) for her doctoral studies. Her work is being performed in Dr. Marnie Saunders's laboratory.

### **Gait Assessment in Chiari Malformation (Conquer Chiari Foundation)**

Dr. Brian Davis received \$6,000 to conduct a pilot study to characterize gait and postural stability in patients who have Chiari malformation (a condition in which brain tissue extends into the spinal canal).

### **BEST Mentoring Program (Martha Holden Jennings Foundation)**

This award for \$14,125 supports mentoring efforts that enable students in the Akron Public School system to participate in the "Bridging Engineering, Science and Technology in Medicine" fair held each spring.

### **Stress Riser Effect at the Interface of a Total Knee Arthroplasty and Intramedullary Nail (Summa)**

This is a collaborative project between Drs. Jonard and Weiner (Summa) and Dr. Davis (UA) that examines the relationship between implant locations and risk of peri-prosthetic fracture. The Rice-Kepley fund is providing \$50,000 to support both computer simulation and experimental validation.

## Santander Universities Scholarship Recipient

Gustavo da Silva Andrade, a graduate student of the Postgraduate Program in Biotechnology at the Catholic University of Don Bosco (UCDB) in Brazil, was one of the students approved by the Santander Universities scholarship to visit the U.S.A.

Within UA's BME Department, Gustavo will have the opportunity to test a project he developed at the home institution, to identify neonatal jaundice in newborns. "It is a device made up of hardware and software capable of optimizing the process of identifying the disease and making it accessible to anyone, whether in hospitals or for women who choose to deliver at home," he explains.

Although his background is in Computer Engineering, Gustavo is committed to creating biomedical technologies. He previously designed an exoskeleton to aid in the recovery of those have impaired movement.

As he explains, "When it comes to the use of engineering to solve health problems, there is a wide range of possibilities and, with this project, I do not think differently. I believe that research can evolve and that from it we can automate other medical equipment such as maternal beds with artificial intelligence, capable of assessing the child's behavior and possible diseases."

Gustavo's R & D will be overseen by Dr. Jim Keszenheimer, an expert in optical-based instrumentation. Dr. Keszenheimer also has extensive experience translating new technologies to clinical practice. Gustavo believes that contact with the University of Akron can open doors for new studies. "With my going to Akron, we believe that new opportunities may arise for teachers and other academics to also develop future projects with the University," he said.



*(Far top) Gustavo da Silva Andrade, from the Program in Biotechnology at the Catholic University of Don Bosco*

*(Above) Dr. Jim Keszenheimer will provide guidance on testing the neonatal jaundice device originally developed in Brazil.*

## Dr. Verstraete: Latest BME Emeritus Professor

For Dr. Mary Verstraete, this summer marked 30 years of service at UA! Pending approval by the Board of Trustees, she is the department's latest Emeritus Professor. Her accomplishments include, (i) creating the undergraduate program in Biomedical Engineering, (ii) mentoring and shaping the career paths of every BME undergraduate student who enrolled at UA since 2000, (iii) being selected by The University of Akron's for their Outstanding Teacher/Mentor award (2013), (iv) receiving the American Society for Engineering Education (ASEE) North Central Section teaching award (2014), (v) being further honored with ASEE's National Outstanding Teaching Award (2016), and (vi) achieving Fellowship status within the Society of Women Engineers.

Congratulations to Dr. Verstraete for a distinguished career and well-deserved retirement!

*(Right). Dr. Verstraete and BME Chair, Dr. Davis, at her retirement celebration.*



## National Biomechanics Day

Each year for the past three years, the University of Akron has participated in National Biomechanics Day. This year on April 19th, students and teachers from the Akron Public School System visited the Department of Biomedical Engineering to learn about applications of biomechanics to human locomotion and cardiovascular stent design. Students rotated through three separate labs and ended an enjoyable day with lunch at Rob's cafeteria!

*(Right). Students from Kenmore Garfield High School engaging in activities that included (from left) energy-efficient locomotion with K'Nex, (ii) gait analysis (led by Visar Berki), and (iii) cardiovascular stent design.*



# Conquer Chiari Research Center **OPEN HOUSE**



July 21st, 2018  
9:00 am - 6:00 pm  
The University of Akron



C Blake McDowell Law Center | 150 University Ave | Akron, OH 44325

## Who Should Attend?

*Everyone with an interest in Chiari is welcome! Patients, Parents, Families, Supporters, Donors, Students, & Medical Professionals*

To attend, please register at [www.conquerchiari.org](http://www.conquerchiari.org)

Questions? Contact Dorothy Loth: [dloth@uakron.edu](mailto:dloth@uakron.edu) | (330) 972-5714

## Schedule

- 9:00 - 9:30** Registration | Posters
- 9:30 - 10:00** Welcome | Introductions | Key Findings
- 10:00 - 10:45** Research Presentations Session 1
- 10:45 - 11:00** Break | Posters
- 11:00 - 11:45** Research Presentations Session 2
- 11:45 - 1:00** Lunch | Posters | Lab Visits | Research
- 1:00 - 1:45** Behind the Scar: A Story of Strength | Research
- 1:45 - 2:00** Posters
- 2:00 - 2:45** Research Presentations Session 3
- 2:45 - 3:00** Break | Posters
- 3:00 - 3:45** Research Presentations Session 4
- 3:45 - 4:00** Break | Posters
- 4:00 - 5:00** Workshops | Lab Visits | Research
- 5:00 - 6:00** Posters | Lab Visits | Research

[WWW.CONQUERCHIARI.ORG](http://WWW.CONQUERCHIARI.ORG)

## BME Passion

This spring, Dr. Willits was recognized by UA's Omicron Delta Kappa (ODK), the National Leadership Honor Society, with a "Passion Award". This award was bestowed on five faculty across campus, covering math, accountancy, speech language pathology, arts, and (in the case of Dr. Willits) engineering. Students who nominated Dr. Willits reflected on the manner in which she goes "above and beyond" what it typically expected, how she strives for a positive college experience, and her focus on the relevance of coursework to both the BME degree as well as to careers after graduation.



(Above): Dr. Becky Willits addressing the audience at the ODK "Passion Award" dinner in March.

## New BME Patent for Dr. Tavana

Congratulations to Dr. Tavana and his team for another patent! US # 9,974,552 was granted this spring. It describes methods of preparing a cellular spheroid in an aqueous two-phase system as well as methods of screening a drug with a cellular spheroid in an aqueous two-phase system.



US009874552B2

(12) **United States Patent**  
**Tavana et al.**

(10) **Patent No.:** **US 9,874,552 B2**  
(45) **Date of Patent:** **Jan. 23, 2018**

(54) **ENGINEERING INDIVIDUALLY ADDRESSABLE CELLULAR SPHEROIDS USING AQUEOUS TWO-PHASE SYSTEMS**

(52) **U.S. Cl.**  
CPC ..... *G01N 33/5011* (2013.01); *C12N 5/0062* (2013.01); *C12N 11/10* (2013.01); *G01N 33/5008* (2013.01); *G01N 33/5073* (2013.01); *C12N 2500/50* (2013.01); *G01N 2500/10* (2013.01)

(71) Applicants: **Hossein Tavana**, Hudson, OH (US);  
**Ehsan Atefi**, Akron, OH (US);  
**Stephanie Lemmo Ham**, Akron, OH (US)

(58) **Field of Classification Search**  
None  
See application file for complete search history.

(72) Inventors: **Hossein Tavana**, Hudson, OH (US);  
**Ehsan Atefi**, Akron, OH (US);  
**Stephanie Lemmo Ham**, Akron, OH (US)

(56) **References Cited**

(73) Assignee: **The University of Akron**, Akron, OH (US)

FOREIGN PATENT DOCUMENTS

WO 2010027590 A2 3/2010  
WO 2011116256 A2 9/2011

(Above): Patent issued to Drs. Tavana, Atefi and Ham.

## Baltic-American Freedom Foundation Supports Research at UA

The Baltic-American Freedom Foundation (BAFF) mission is to strengthen ties between the United States and Estonia, Latvia and Lithuania through programs of education and exchange. Their “Research Scholar” program promotes international collaboration and research efforts.

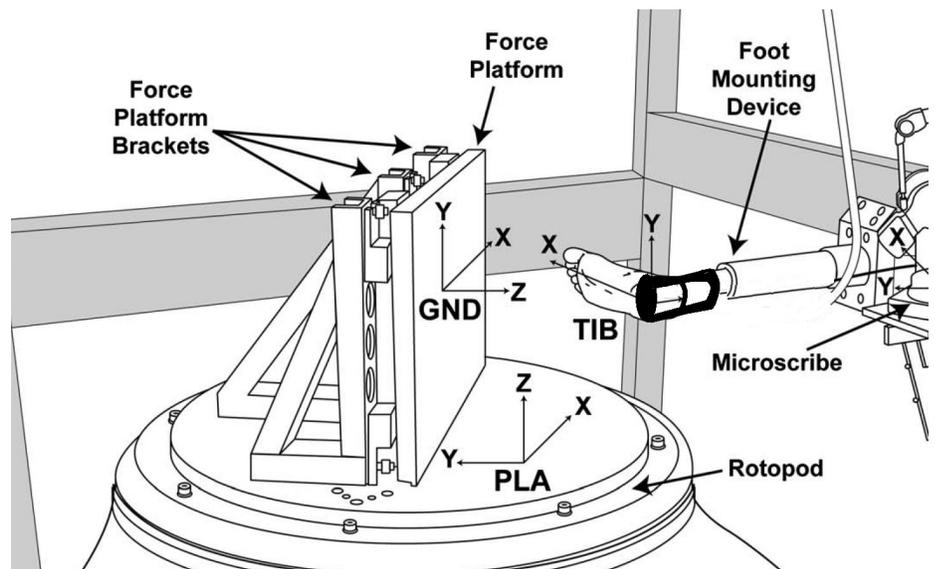
This semester, Dr. Marius Gudauskis was selected as a BAFF Research Scholar and given the opportunity to spend 12 months at The University of Akron. Dr. Gudauskis has a background in mechatronics and Informatics Engineering. For the past 4 years he has been a researcher at Kaunas University of Technology (Institute of Mechatronics). Previously he focused on developing augmented reality systems for blind and partially blind people in Lithuania.

Dr. Gudauskis’s research at UA will largely center on robotics. He will work closely with Drs. Brian Davis and Larry Noble on technical issues related to interfacing two 6-degree-of-freedom robots; one being an articulated design and the other being a parallel robotic platform. Together these robots will allow for research in exoskeletons used for rehabilitation purposes.



(Above) Dr. Marius Gudauskis from Kaunas University of Technology in Lithuania.

(Right) Part of the proposed robotic system for conducting rehabilitation research at UA.



235 Carroll Street  
 Auburn Science and  
 Engineering Center  
 West Tower Room 275  
 Phone: 330-972-6650  
 Fax: 330-972-3939  
 Website: bme.uakron.edu

## BME Out and About -- with an International Flavor!

*(Right). Prof. Dr. Thomas Schuelke (Vice President of Fraunhofer USA) speaking with Dr. Brian Davis (on right) at a "Technology-to-Market" event at Michigan State University.*



*(Above). Dr. Marius Gudauskis from Lithuania is spending one year at UA pursuing research in robotics and biomechanics..*



*(Above). Dr. Frank Loth discussing cardiovascular research with Dr. Philip George from India.*



*(Left) Former UA BME graduates with Dr. Rouzbeh Amini at the World Congress of Biomechanics in Dublin, Ireland. From left: Christina Webber (now at Mayo Clinic), Dr. Amini, Melissa Boswell (now at Stanford) and Marissa Papp (now at University of Southern California). All three UA graduates are pursuing their doctoral studies in biomechanics..*