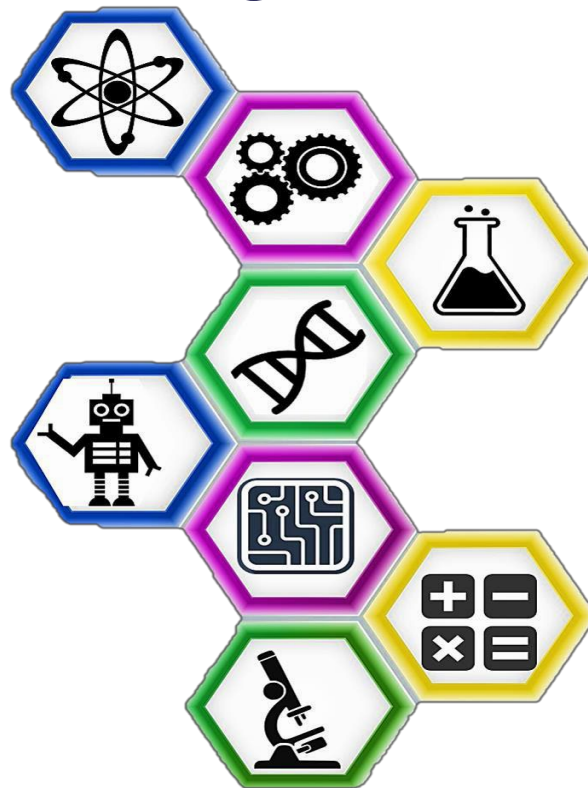


The 5<sup>th</sup>  
2019 Maryland Collegiate STEM  
Conference Program

**STEM Innovations:  
Building a Stronger Future Together**



**April 27, 2019**

Baltimore City Community College

**Abbreviations used for colleges/universities:**

AACC – Anne Arundel Community College  
ACM – Allegany College of Maryland  
BCCC – Baltimore City Community College  
CCBC – Community College of Baltimore County  
CCC – Carroll Community College  
FSU – Frostburg State University  
HagerstownCC – Hagerstown Community College  
HarfordCC – Harford Community College  
Hood – Hood College  
HowardCC – Howard Community College  
McDaniel – McDaniel College  
MC – Montgomery College  
Towson – Towson University  
UBalt – University of Baltimore  
UMBC – University of Maryland, Baltimore County  
UMB – University of Maryland, Baltimore  
UMD – University of Maryland, College Park  
Wor-Wic – Wor-Wic Community College



LARRY HOGAN  
GOVERNOR

STATE OF MARYLAND  
OFFICE OF THE GOVERNOR



April 27, 2019  
5th Annual Maryland Collegiate STEM Conference  
Baltimore, Maryland

**A Message from Governor Larry Hogan**

Dear Friends:

Welcome to the 5th Maryland Collegiate STEM Conference! I am delighted to provide this welcoming message to you.

The Annual Maryland Collegiate STEM Conference is an incredible collaborative event that works to advance the professional development of students, faculty, and staff in STEM related fields. This conference provides a great opportunity for those who study and work at Maryland's community colleges to experience and participate in professional development sessions. STEM fields continue to play a key role in our state and national economies, and your dedication to these disciplines makes me confident that Maryland and our country will continue to be able to compete globally, create jobs, and grow our economies. I hope you take advantage of the various information sessions throughout the duration of the conference.

I want to congratulate all of this year's hosts and participants for their remarkable achievements, and thank the contributors, event planners, and everyone else whose hard work and dedication have made this exceptional event possible.

Best wishes for a memorable conference and for continued success in the years to come.

Sincerely,

Larry Hogan  
Governor

STATE HOUSE, ANNAPOLIS, MARYLAND 21401  
(410) 974-3901 1-800-811-8336  
TTY USERS CALL VIA MD RELAY



**The Maryland Collegiate STEM Conference is excited to have Lt. Governor Boyd K. Rutherford open and provide brief remarks on the milestone 5<sup>th</sup> conference.**





# A Message from Dr. James H. Johnson, Jr.

Welcome,

Baltimore City Community College is proud to host the 5th annual Maryland Collegiate STEM Conference (MCSC). This collaborative effort is a fantastic opportunity for Maryland community college students, faculty and staff to showcase undergraduate research work, create awareness of educational opportunities in STEM fields, and network.

I want to welcome Lt. Governor Boyd Rutherford, who is a champion of STEM education and careers, and keynote speakers Professor Arthur Shapiro and Professor Ashley Hagler for sharing their experiences and insights.

Thank you for giving us the opportunity to host this exciting event and I hope you all enjoy your day at BCCC.



James H. Johnson, Jr., Ph.D., P.E.

Executive Consultant

Baltimore City Community College

## **Morning Keynote**

**Visual Illusions: Studying the Strange to Gain Insight on the Ordinary**



## **Professor Arthur Shapiro**

Professor of Psychology and Computer Science,  
American University  
Co-editor, Oxford Compendium of Visual Illusions  
Director, Laboratory for the Study of Perception  
Reality and Illusion (SPRI)  
Many international awards for visual illusions he has  
created.  
Media: Presenter for two series for  
CuriosityStream.com (Illusions; Illusions 2)  
Frequent contributor to NatGeo's Brain Games



Professor Arthur Shapiro is Professor of Psychology and Computer Science at American University in Washington D.C. He is co-editor of the Oxford Compendium of Visual Illusions (2017) and has won international awards for visual illusions he has created. His research primarily focuses on color and color contrast perception, motion perception, perceptual organization, and low-light-level vision but he is interested in any question that relates to how the brain constructs our perceptual world. He is actively involved in public engagement in science and is the presenter and scientific consultant for two seasons of shows on visual illusions produced by CuriosityStream.com. He received his undergraduate degree from University of California San Diego (Mathematics and Cognitive Science) and his Ph.D. from Columbia University. He was a post-doctoral fellow at the University of Chicago.

## **Afternoon Keynote**

## **Embrace Inquiry! Otherwise known as “Poke it with a Stick and See What Happens!”**

### **Professor Ashley Hagler**

Biology Faculty, Gaston College  
Director of Undergraduate Research, Gaston College  
SPARC3 Director, Gaston College  
Councilor, Council for Undergraduate Research (CUR)



Professor Hagler serves as a Biology faculty at Gaston College. Her work at the College as a Director of Undergraduate Research in developing undergraduate research work and promoting it at the state and national level was recognized and honored with the Faculty Member of the Year for the state of North Carolina at the community college level (Excellence in Teaching award) in 2017. Professor Ashley received the Southern Region Faculty Award from the Association of Community College Trustees last year. .

Professor Hagler led a team to partner with the Community College Undergraduate Research Initiative (CCURI) project, funded by the National Science Foundation, to work with faculty in the Arts and Sciences division, and across the nation to incorporate undergraduate research into the community college classroom. At the heart of her own teaching practices is an emphasis on inquiry-based instruction and course embedded undergraduate research. Additionally, Professor Hagler supervises the STEM Persistence and Retention via Curricula, Centralization, Cohorting, Collaboration, and Community initiative, better known as SPARC. SPARC is a comprehensive academic and holistic student support program at Gaston College, of which undergraduate research is a main pillar. The SPARC project has been honored nationally twice with certification by the Partnership for Undergraduate Life Science Education (PULSE) in 2015 and selection as the winner of the Bellwether Award for Instructional Programs and Services in January 2016. Due to the successes of SPARC, the program has been nominated for the 2019 Bellwether Legacy award.

Professor Hagler has served and continues to serve in a variety of executive capacities for both local and national organizations focused on STEM. In June 2014, she was elected to serve as Councilor for the Council for Undergraduate Research in the Program Directors Division. She is the first community college faculty member that has ever served as a Councilor for this division.



## **PROGRAM SNAPSHOT**

- 8:00 am – 9:00 am: Breakfast and Registration
- 8:00 am – 8:30 am: Poster Presentation to Lt. Gov. Boyd K. Rutherford
- 8:45 am – 8:50 am: Welcoming Remarks
- 8:50 am – 9:15 am: Remarks from Lt. Governor Boyd K. Rutherford
- 9:15 am – 10:00 am: Student Centered Keynote
- 10:10 am – 10:50 am: Breakout Session #1
- 11:00 am – 11:40 am: Breakout Session #2
- 11:50 pm – 1:50 pm: Lunch and Poster Sessions  
A – 11:50-12:50pm  
B – 12:50-1:50pm
- 2:00 pm – 3:00 pm: Faculty Centered Keynote
- 3:10 pm – 3:40 pm: Breakout Session #3
- 3:50 pm – 4:20 pm: Breakout Session #4

# Keynote Abstracts

## Morning Keynote

### **Visual Illusions: Studying the Strange to Gain Insight on the Ordinary**

#### **Keynote Abstract:**

Research concerning visual phenomena ("illusions") sits at the crossroads of many academic disciplines (neuroscience, psychology, math, physics, computer science, philosophy, and art). Visual phenomena are of such broad interest because they address a central question about our world: "What can we know to be true?" I will discuss one answer to this question--namely, that our perception of reality is a representation created by our brain. I will show why we believe this to be so, and how this understanding of the brain can inspire a sense of wonder and lead to tools that can drive commerce, improve health, and help humanity.

## Afternoon Keynote

### **Embrace Inquiry! Otherwise known as "Poke it with a Stick and See What Happens!"**

#### **Keynote Abstract:**

What happens when you allow students to take the reins in the classroom? What happens when you don't know the answer to their questions? What happens when you throw out the textbook? Authentic undergraduate research is what happens, and failure leads to success. This tool is incredibly powerful in the community college classroom, and benefits students and faculty in some expected and unexpected ways. Join me as we discuss the benefits and obstacles of embracing change by incorporating authentic research and inquiry in the community college environment.

# Conference Schedule

**8:00am – 9:00am Registration – PE Ctr. and Breakfast – Mini Conference Ctr.**

**8:00am-8:30am – Poster presentation to Lt. Gov. Rutherford – PE Ctr.**

**8:45am -- 8:50am – Welcoming remarks from the president of Baltimore City Community College – Fine Arts Theater**

**8:50am-9:15am – Official Opening Remarks, Lt. Governor Rutherford**

**9:15am-10:00am – Keynote – Professor Arthur Shapiro – Fine Arts Theater**

## **10:10 – 10:50am: First Breakout Session - LSB**

### **Student 10 Minute Presentations**

#### **LSB 237**

##### **Life Sciences**

- Caitlin Beckjord – HowardCC

*Long Term Monitoring of a Howard Community College Campus Stream* (see abstract #23 on page 31)

- Ayushi Dave and Hannah Dubois – HowardCC

*Gut Flora in Manduca sexta* (see abstract #21 on page 30)

- Jade Bucksell, Biniam Teferedegn, Matthew Arminio – HowardCC

*Neuropeptide F mRNA Expression in the Tobacco Hornworm* (see abstract #25 on page 31)

- Tameka R. Gongs and Azmain Faeque – HowardCC

*Feeding Inductions on Non-Solanaceous Plants in Larval Maduca sexta* (see abstract #27 on page 32)

#### **LSB 238**

##### **Engineering**

- Mikee Ibayan, Tzu Yang, Miguel Wimbish, Lawrence Alderton – BCCC

*Synthetic Diamond Based Golf Club* (see abstract #32 on page 40)

- Nathan Owonda, Damontez Wright, Lonitay Cherry, Marc Caballes – BCCC

*The Fabrication and Statistical Analysis of the Amaterasu Launcher* (see abstract #38 on page 41)

- Kirsten Toland, Emmanuel Lewis, Mammadou Bah – BCCC

*Constructing Buildings to Withstand Natural Disasters: Focusing on Seismic Waves and Hurricanes* (see abstract #40 on page 41)

## 40 Minute Presentations

### LSB 213

*Exploring the World of Actuarial Science*

William Shipley, faculty – BCCC

This presentation will review some typical tasks of an actuary, in various practice areas of actuarial science. The presentation will give suggested college courses to prepare for the actuarial work field, and explain the actuarial examination process. Several hypothetical examples in various actuarial science practice areas will be presented.

Disclaimer: The opinions or views expressed in this presentation are the opinions or views of the presenter only, and do not represent the opinions or views of any employer, any other person, any educational institution, or any other entity. This presentation is solely for educational purposes, and should not be considered actuarial advice.

### LSB 304

*The Complete Math Undergraduate Research Experience: Through the Eyes of the Mentor and Mentee*

Mike Long, Administrator – HowardCC and Russell Schwartz, Student – UMD

In this session, a mentor and mentee explore the entire mathematics undergraduate research process from the invitation to begin research at a community college to continuing mathematics research at a four year institution after transfer. We begin by describing the invitation to the research process followed by a discussion of problems that can launch undergraduate research projects. From there we turn briefly to the process and then do a little math as we focus on the results of one particular project. Finally, we look at how the research process continues post transfer.

### LSB 255

*Demystifying graduate school, is it for me?*

Dr. Brendan Diamond, faculty – HowardCC hosting a panel of Alumni from several graduate schools

It seems so far in the future it's easy to ignore what you'll do after you get your Bachelor's degree. For many in academia the next step is graduate school. But what exactly does that mean and should you do it? How much will it cost? How would you pick one anyway? These and many more questions will be discussed by a panel of Alumni from a variety of disciplines who have attended graduate schools throughout the United States. Come get the basics about what it means to get secondary degrees and the benefits and pitfalls of life as a graduate student.

### LSB 240

*Promoting Green Chemistry through Club Outreach*

Catelyn Middlebrooks, Simone DeSouza, Shawn Serafin, Clarrisa Mullen, students – AACC

Throughout the last few centuries, many technological advances have made it able for society to function as smoothly as it does today, however, all of these advances have caused detrimental effects to our environment. The AACC Chemistry Club's focus is Green Chemistry; specifically, on how to use different chemistry principles to help educate our fellow students about the environment. This year, we've been able to participate in outreach events to promote interest in chemistry and other STEM related activities, fundraising, and a water bottle giveaway for Earth Day to promote the use of less plastic to our peers. These events have been used to help promote the club and principles of Green Chemistry across campus. As a club, we will be discussing some of the lessons learned about overcoming the challenges of being a club at a community college as well as sharing some of methods we have employed to raise awareness about Green Chemistry.



### **LSB 120**

*From Community College to Diverse Career Pathways*

Amrita Madabushi, faculty – BCCC

Student panelists: Djeneba Sidibe, Louison Kougang, Lian Jackson

Student alumni successfully graduated from BCCC's AAS/ Certificate programs (Biotechnology focus) will be coming together as panel members to discuss how community college education led to their diverse successful career pathways. These alumni have since transitioned to jobs in a company, research institute and/or transferred to university for Bachelor degree. Panel members (comprising of local and international students) will provide invaluable advice on how they successfully completed college degree and have since transitioned to their next step. The panel members will be engaged in an interactive discussion with audience throughout the session where the audience can ask questions and get tips on being successful in their discipline and proceed towards their career goals.

### **LSB 306**

*Preparing Students for Today's Biotech Industry*

Annica Wayman, Associate Dean for Shady Grove Affairs in the College of Natural and Mathematical Sciences – UMBC

Do you desire a career where you can tailor your biology background to develop innovative biotechnology solutions to complex health issues like cancer or Alzheimer's? Or one where you can reduce environmental impact from agriculture by developing pest-resistant crops? The possibilities exist, but the interesting scientific challenge comes in translating those cutting-edge innovations to usable solutions which is called translational science. UMBC's Bachelor of Science in Translational Life Science Technology (TLST) is a unique degree designed for students who want to be competitive in the biotechnology industry. This degree program combines the theory of a traditional life science degree with hands-on, real-world application of the processes that turn scientific discoveries into life-saving solutions. Specifically, the TLST degree is for students looking to apply their skills and interest in the life sciences to create innovative biotechnology solutions that will ultimately transform the health, agriculture, and environment sectors. Come find out how at B.S. in TLST can provide you with the tools necessary to succeed in the modern era of life sciences where scientific discoveries are translated from "bench-to-bedside." Scholarship opportunities are available!

### **LSB 241**

*Gear up for your future: Learn about Career Pathways with PhD vs PharmD*

Kolaleh Hassan, faculty – BCCC and RJ Peroutka, faculty – UMB

This info session is geared towards providing students information on two educational pathways leading to different career opportunities: PhD and PharmD. Graduating with a PhD degree allows students access to careers in various industries within the private and public sector. Similarly, graduates with the PharmD degree also have access to rewarding careers as pharmacists in public or private pharmacies. Although both degrees produce graduates in professional careers, students entering these degree programs have very different experiences. In addition, graduates of both PhD and PharmD degrees have different types of careers, salaries and expectations. Learn about these pathways and the opportunities they create in our session and ask questions relevant to these.

## 11:00-11:40am – Second Breakout Session – LSB

### Student 10 Minute Presentations

#### LSB 306

##### Physical/Life Sciences

- Hamza Umar and Natalie Paley– HowardCC

*A Study in Chaos* (see abstract #8 on page 36)

- Parsa Samadani, William Jeffreys, Joseph Hinchey –HowardCC

*Fantastic Exoplanets and Where to Find Them* (see abstract #6 on page 35)

- Kathleen Hamilton-Campos – UMD

*RF Confinement Using an Induction Cell in UMER* (see abstract #29 on page 32)

- Ayushi Dave, Abdelaziz Abdelrahman, Leya Engdaw – HowardCC

*How Effective are Different Legumes at Inhibiting Salivary Alpha-amylase Activity?* (see abstract #10 on page 36)

#### LSB 237

*Journey of CyberSecurity, Engineering and Mathematics Majors as Undergraduate Researchers Cohort*  
Phillip Crum, Joshua Lorentson, Skylar Luo, Michael McCreary, and Payton Stoneberger, students –  
CCC

Mentor: Raza Khan, faculty – CCC

Five students from different majors (one in cybersecurity, three in engineering and one in mathematics) will share their journey of the two year STEM Scholars program at Carroll Community College. They will share how students from three differently unique majors came together to work as undergraduate researchers on two projects. They will convince you as to why there are no defined boundaries in STEM fields and how collaborative working is the most effective approach for an undergraduate research experience.

### 40 Minute Presentations

#### LSB 238

*Engineering Your Future: A. James Clark School of Engineering Transfer Student Admission & Scholarship Information*

Shannon Hayes<sup>1</sup>, Keeley Meier<sup>2</sup> and Nicole Roop<sup>3</sup> – UMD

The purpose of this presentation is to provide students with an introduction to the A. James Clark School of Engineering with a focus on 1) the admission process and 2) scholarship opportunities. The proposed audience for this presentation is prospective students, as well as advisors and faculty at the community college level. A brief overview of each academic department will be provided as well as information on the gateway coursework required, application materials, support programs, student services, and scholarships. In discussing scholarship opportunities, we intend to focus on the Clark Opportunity Transfer Scholars Program. This scholarship program, provided through the Building Together Gift, is for engineering transfer students from community colleges in Maryland. The scholarship program eligibility requirements, application process, and programmatic opportunities and support will be discussed.

<sup>1</sup>Assistant Director Transfer Student Advising & Admissions, <sup>2</sup>Coordinator for Recruitment, <sup>3</sup>Assistant Director of Keystone

### **LSB 213**

*The Mathematics of Voting, in the Classroom and in America*

Prasad Senesi, faculty – The Catholic University of America

In this talk, I will give an elementary introduction to the mathematical foundations of social choice theory, or voting theory. By using some real-time mock elections with the audience, we will discuss how the ranking of three or more candidates in an election introduces some unusual paradoxical behavior. We will also talk about recent real-world implementations of ranked voting, and some of the possible consequences of these changes in our democracy.

### **LSB 241**

*A National Network for Biotechnology Education*

Sandra Porter, Digital World Biology LLC

For twenty years, the Bio-Link national center has worked to advance biotechnology workforce education across the US. By connecting faculty and industry representatives, and creating a national program database (Bio-Link.org), and a national industry database with career information (Biotech-Careers.org), Bio-Link has been able to identify emerging trends and define core sets of skills that biotechnicians should know. The center has worked to raise the profile of two-year colleges that offer biotech programs, highlight their success, and help connect college programs with high schools. This talk will describe resources in biotech education, emerging trends in the biotech industry such as cell-based therapies and algal culture, and new trends in biotech education such as credentialing, equipment depots, and work-based learning. Lastly, we will discuss how you can participate in this national biotech network with A Bridge to Bio-Link's Future (NSF ATE 1764225), and ATE project, and its partners, the AC2 Bio-Link Regional Center (NSF ATE 1501207) and the Northeast Biomanufacturing Center and Collaborative (NSF ATE 1501631).

### **LSB 240**

*Career Opportunities in Laboratory Animal and Veterinary Sciences*

Kierra Stephens, faculty – BCCC, Andrew Marshall – Loyola University and Amrita Madabushi, faculty – BCCC,

The education and diverse career pathways that lead to jobs in laboratory animal and veterinary sciences will be discussed in this session. Laboratory animal science is a very important area of biomedical research that specializes in the care and study of animals used in medical research, testing, and teaching. The teams of caretakers, technicians, veterinarians, researchers, behaviorists, and managers all play an important role in ensuring that animals are treated humanely, compassionately, and in accordance with the laws, regulations, and protocols that oversee their use. We will be providing information on BCCC's Lab Animal Science Certificate program that is one-of a kind in the state of Maryland. The program successfully incorporates hybrid/online and weekend classes with an internship component. This allows different kinds of students including regular, working, career changing students alike to complete the certificate and transition successfully to careers in laboratory animal science. The many careers available in this field vary in the educational, certification, and experience requirements and will be a part of the discussion.

### **LSB 356**

*Maryland's Historical Mines, with a Hands on Look at the Ores and Minerals as found in Baltimore, Carroll, Howard and Montgomery Counties*

Fred Paraskevoudakis, faculty – BCCC

There are 570 mineral deposits on record for Maryland. This is due to the occurrence of contact zones which intruded into the diverse rock types that constitute our state. Most of these sites were small scale mines or quarries that have long ago been exploited and are gone due to development. There are a few very large quarries still in operation. This presentation will give a brief overview of some of the historical mine sites found in Baltimore and the surrounding region. The discussion will include the ores and dimension stone that were mined and their commercial/ economic value, as well as some of the interesting minerals found in their association. The presentation will be interactive and many mineral samples from numerous sites will be displayed and available for attendees to examine. Besides looking at some of the main ores commercially exploited such as iron, chromite, copper, even gold and cobalt there will be examples of interesting and attractive gangue minerals like epidote, malachite, actinolite, chrysocolla and kammerite.

### **LSB 120**

*Journeys in the STEM Field*

Denise Holland, faculty – BCCC, Raza Khan, faculty – CCC, Kiersten Newtoff and Aubrey Smith, both faculty – MC

Four community college professors from different disciplines (1 cyber, 1 chemistry, 2 biology) lead a panel discussion about their experiences in their respective fields through college and beyond. Come learn about the conventional and unconventional jobs, internships, educational programs that led these faculty to where they are today. Ask questions to get advice on your own journey and how to prepare for the next step.

### **LSB 304**

*The McDaniel Engineering Initiative*

Shabbir Mian, faculty – McDaniel and Jeff Marx, faculty – McDaniel

Each year, we receive inquiries from many students who are interested in engineering but want to start their college education in a smaller setting. The McDaniel Engineering Initiative is a robust two-pronged approach designed to help these bright students achieve their dreams of becoming an engineer while giving them a strong foundation in the liberal arts. First, we will be offering a specialization in engineering within the physics major beginning Fall 2019, which will include core courses typical of many undergraduate engineering degrees. Students will receive a BA in Physics—Specialization in Engineering. To guide and strengthen our engineering specialization, the Department of Physics just hired a new faculty member who has a PhD in microelectronics, an MS, and a BS in mechanical engineering, and several years of industrial experience. This new specialization will open exciting engineering internship and research opportunities for our students! Second, we will be offering a dual-degree option for those students who want to receive a bachelor's degree in physics and a second degree (bachelor's or master's) in engineering. We have partnered with Washington University in St. Louis for this purpose. Through this partnership, we aim to produce high-quality, broadly-educated engineers.

## **11:50am – 1:50pm Poster Sessions and Lunch – PE Ctr.**

**Poster Session A – 11:50am-12:50pm**

**Odd numbered posters (see pages 27-34 for listing of Poster Abstracts)**

**Poster Session B – 12:50am-1:50pm**

**Even numbered posters (see pages 35-41 for listing of Poster Abstracts)**

## **Showcase Session – 11:50am-1:50pm - LSB**

### **PE Center- Exhibit**

**21st Century with STEM Innovation** (abstract A on page 26)

### **PE Center - Exhibit**

**Brain-Drone Interface** (abstract B on page 26)

### **LSB 418 – Robotics Lab.**

**Robotics Demonstration** (abstract C on page 26 )

## **2:00 – 3:00pm Faculty Centered Keynote – Fine Arts Theater**

**Keynote Address: Professor Ashley Hagler**

## **3:10 – 3:40pm Third Breakout Session – LSB**

### **LSB 240**

*Accessible Teaching and Learning in the Undergraduate Science Course for Blind/ Low-vision Students*  
Alfred D'Agostino, faculty – CCBC

Symbolic, spatial and visual representations of information (equations, graphs and diagrams), which are significant in natural and physical sciences, are not accessible to blind/ Low-Vision (BLV) students in the science (chemistry) class room and laboratory via conventional means (print, image and physical forms). Appropriate teaching methods can be used to include these differently-abled students in the learning process while also enhancing the learning outcomes of a diverse student population. By considering learning modes, universal design practices and utilizing adapted teaching approaches, collaborative learning, non-visual assistive technologies and equipment, chemistry classroom/ laboratory work for BLV students can be transform from a passive experience to an active one. An authentic experience in the laboratory can be created by providing proper tools in the least restrictive learning environment, enabling BLV students to become independent workers. Modification of instructional technique will not burden faculty and will make a positive impact on their teaching. Adjustment of instructional practices in science curricula will open a gateway to higher education in STEM for this underrepresented population. Non-visual ways (i.e. speech-enabled LabQuest and equipment, tactile graphics and physical artifacts, auditory and text to speech output) by which BLV students can conduct their work will be shown/ discussed.

### **LSB 255**

*The Power of OER: Implementing Low Cost, Highly Effective Math Courses*

Jamison Miller, Lumenlearning and Deborah Fries, faculty – Wor-Wic

As math faculty refine the design of math courses, open educational resources (OER) offer unprecedented flexibility to shape the learning experience, test its effectiveness, and make improvements to better support students and learning. OER in mathematics education include not only open textbooks, but also extensive video content and online homework systems with massive teacher-created question banks and algorithmically-generated problem sets.

This session will include a demonstration and a summary of the experiences in adopting OER for College Algebra at Wor-Wic Community College. See how far math OER has come, thanks to a vibrant open education math community. Bring your questions about customizable OER course design, LMS integration, learning outcome alignment, courseware support, and other topics.

### **LSB 304**

*Introduction of 3D Bioprinting, the Future of Personalized Medicine, at Hagerstown Community College*

Savita Prabhakar, faculty - HagerstownCC

Learn about how 3D bioprinting can be introduced at your community college. The presenters will explain how one form of bioprinting can be made affordable and easy to use within an existing cell culture facility. The Freeform Reversible Embedding of Suspended Hydrogels (FRESH) bioprinting technique was developed in recent years by researchers at the Department of Biomedical Engineering at Carnegie Mellon University. We will present our results of applying the FRESH technique to print small disks that supported the growth of African green monkey (Vero) epithelial cells.

### **LSB 120**

*Professional Tips for New STEM Faculty*

Ewa Gorski and Sean McNamara, faculty – CCBC

In this presentation, a new and senior science faculty will share techniques and strategies that are aimed to help new STEM instructors. The presenters will discuss personal experiences and research covering a variety of topics that have helped them teach science to a diverse student population. The importance of time management will be discussed. This includes classroom time management during lecture and labs as well as the relationship between work/life balance and productivity. Student engagement techniques such as incorporating student's experiences with lecture material will also be discussed, in relation to how it can build student interest and facilitate the retention of lecture topics.

### **LSB 238**

*Using Manipulatives to Teach Complex Concepts in Chemistry*

Robert Carp, faculty – AACC and Liz Ward, staff – AACC

One of the challenges students face in chemistry is relating observations in the lab involving chemical reactions to what is occurring on the atomic scale. Using images, videos, or computer simulations can aid in bridging this gap, but are often limited in how students can engage with the material. We developed a set of interactive activities for students using interlocking plastic (LEGO) bricks, which allow them to explore, through a hands on approach, complex concepts related to chemical reactions. The manipulative activities help students to gain a better understanding of limiting reactants, theoretical yield, thermodynamics, and kinetics of reactions in solutions with varying concentrations. The activities increase student engagement, improve their confidence in the material, and can be integrated into two semester general chemistry sequence courses or a general, organic, and biochemistry combination course.

### **LSB 241**

#### *Student Outcomes in a CURE Course Using Simple Model Organisms to Characterize Host-Pathogen Interactions*

Michelle Snyder, faculty – Towson University and Amy Trauth, faculty – University of Delaware, anare@udel.edu

Students who participate in undergraduate research report increased self-efficacy, interest and enthusiasm toward research. Course-based undergraduate research experiences (CUREs) increase inclusivity of scientific research by providing greater numbers of research opportunities, and by breaking down barriers associated with student confidence in seeking research experiences and faculty biases in selecting student researchers. We developed a CURE course using the social amoeba *Dictyostelium discoideum* and its bacterial prey *Escherichia coli* as a model for host-pathogen interactions. Our CURE course focuses on characterization of genes potentially associated with resistance to phagocytic killing, which were identified in a screen for mutant *E. coli* strains with enhanced survival upon *D. discoideum* phagocytosis. Students use bioinformatics to characterize mutated genes, and work with strains deficient for the mutated genes, characterizing bacterial phenotypes and *D. discoideum* responses to these strains. Using pre- and post-tests, interviews and the SURE survey to assess student outcomes, we found significant gains in student knowledge and skills, as well as student-reported gains in knowledge of the research process, interpretation of results, and confidence in working in a research team. Our CURE course was used as a model for implementation of the TU-Research Enhancement Program (TU-REP), funded by the HHMI Inclusive Excellence initiative.

### **LSB 213**

#### Creating Equity in adult learners by encouraging a Growth Mindset Anil Malaki and Kathleen Berlyn, faculty – BCCC

Baltimore City Community College (BCCC) serves a diverse student population, including age. The average age is 26 with a range of 17-70+ years of age. Students who have a growth mindset will be more successful than those with a fixed mindset. A common stereotype amongst students is that learning is more difficult for older students. These two factors may contribute to reduced success in older students which can impact retention and completion. We investigated whether students enrolled in Anatomy & Physiology and Microbiology courses in the Spring 2018 were at risk for stereotype threat related to age and they took a survey to assess mindset. The data demonstrated that the majority of students were between ages 25-44. Younger students tend to believe that learning is easier for them because of their age while older students are more likely to report the belief that learning was more difficult for them because of their age. This belief negatively impacts older learners. All students in the selected sections were given a Mindset survey to determine whether they had a growth mindset. They were then assigned videos to watch on neuroplasticity. Students repeated the Mindset survey to determine whether the videos had made a difference in their beliefs about mindset. The majority of students reported an increase in their score which indicated movement towards a growth mindset. This is encouraging as a growth mindset is essential to dispel negative stereotypes related to age and learning.

This work was the capstone project for the NAPE (National Alliance for Partnerships in Equity) Education Foundation - EESTEM (Educators Equity in Science Technology Engineering and Mathematics) Academy, 2017.

### **LSB 306**

*Who Takes a Precalculus with Trigonometry Class?*

Sylvia Sorkin, faculty – CCBC

Precalculus with trigonometry is a course that often has a low success rate and a high withdrawal rate. This session takes an in-depth look at the academic characteristics of students who register for Precalculus with trigonometry. What was their initial college mathematics course? Have they completed an Intermediate Algebra/College Algebra accelerated course pair? Did they have initial developmental mathematics placement? Are they repeating Precalculus? How could these characteristics be affected by the adoption of new multiple measures placement guidelines? Having a better understanding of students' mathematics backgrounds and major programs can be used to improve classroom pedagogy and instructional methods and to motivate and inspire student success.

### **LSB 237**

*Noyce STEM Teacher Education Partnership: A Partnership between Hood College and Frederick Community College to Prepare STEM Teachers*

Christopher Stromberg, faculty – Hood and Perry Wood, faculty – FCC

Recruiting, preparing, and retaining excellent STEM secondary education teachers is challenging, but having excellent STEM teachers at the middle school and high school level is critical to training the next generation of STEM professionals. Hood's Noyce STEM Teacher Education Partnership is a National Science Foundation-funded program that provides scholarship support and educational opportunities for students preparing to become STEM teachers at the secondary level. Educational opportunities include professional development workshops, field trips to area schools, and opportunities to conduct research in a scholar's STEM discipline. Scholars are also encouraged to present at both disciplinary and educational conferences.

Scholarship support covers the final two years of a scholar's STEM secondary education program. At Hood, this includes biology, chemistry, and mathematics secondary education majors. Scholarships average \$18,000 per year, in addition to any other financial aid provided.

The NSTEP program includes a partnership with Frederick Community College to recruit and provide scholarships to community college transfer students. Educational opportunities are provided at both campuses, and at least one scholarship per year is reserved for a transfer student from FCC.

## **3:50 – 4:20pm Fourth Breakout Session – LSB**

### **LSB 255**

*Using Personalized Learning with OER to Improve Student Outcomes in STEM*

Jamison Miller, Lumenlearning and Malathi Radhakrishnan, faculty – BCCC

To date the Open Educational Resources (OER) "movement" has been focused primarily on saving students money by reducing textbook costs. More recently, work in this space has begun to shift to combining OER with personalized learning technologies as a means to reduce costs while at the same time improve student academic success. This presentation will share examples, impact data, and student survey responses from OER implementation in the Principles of Biology course at Baltimore City Community College through the Maryland Open Source Textbook (M.O.S.T.) initiative. Lumen Learning's Waymaker courseware will be demonstrated and initial student impact research findings shared with Q&A to follow.



### **LSB 240**

*Enhancing Problem-solving Skills through Face-to-Face and Online Group Collaborative Learning*  
Alfred D'Agostino, faculty – CCBC

Group learning activities were used to help students develop their analytical/ critical thinking and scientific/ quantitative reasoning skills. In a chemistry course for non-science majors, Face-to-face team-based guided activities were used to direct students in analyzing and evaluating Web information, in formulating a solution to an environmental problem and in articulating and justifying in writing, a proposed remediation plan. Students assessed team results using a rubric. In an introductory chemistry course, students completed online small-group discussion board activities that guided them in proposing, reviewing and applying problem-solving procedures. Students analyzed word problems requiring a numerical result and outlined the steps needed to arrive at a solution. Peer evaluation of member outlines was accomplished in a 'round-robin' format through discussion board posts. The desired outcome was to have students demonstrate that they could formulate a comprehensive problem-solving strategy and use it to successfully solve a quantitative word problem. Discussion Board information, data from group learning activities, rubrics and selected problems on successive exams were used to assess student progress. Summative assessments included: course Common Graded Assignment and select quantitative problem on common Final Exam. One of the principal findings was that the intervention enabled lower-performing students to improve problem-solving skills.

### **LSB 241**

*How did we Overcome the Challenges of OER Adoption?*  
Sithy Maharroof and Joyce Davis, faculty - CarrollCC

Adopting an OER (Open Educational Resource) may seem like a daunting task. Although challenges may arise with this transition, there are many benefits to both instructor and students. In this session, we will discuss what prompted our decision to switch from a traditional publisher text to an OER in our Microbiology and Physic courses. The presentation will highlight our experiences of transitioning to OER. We will share student responses to using an OER verses a traditional text.

### **LSB 120**

*Engaging Large Classes in Science with Technology and at a Personal Level*  
Encarni Trueba and Kelley Hovis, faculty – CCBC

Sometimes it is challenging to do group work or to engage large classes of over 40 students. With these larger classes, it is also more difficult to get to know each student early in the semester and provide ample opportunities to interact with each throughout the semester. This presentation will cover two main ways to interact with and engage students in large science courses: engagement with technology and engagement at a personal level by getting to know your students. With free available technology, you can do group or individual quizzes and get instant feedback all while engaging the students in the topic. Additionally, taking the time to learn about your students and each of his/her interests during the first weeks of the semester provides the tools you need to incorporate their questions ahead of time into the discussion topics planned throughout the semester and to define the relationships between these topics and their intended careers. This presentation will demonstrate how easy it is to set up and create interactive activities. By getting to know your students better, you will provide a learning environment that is tailored to interest, meet the needs of, and engage the individual students within a large class.

### **LSB 306**

*Using Rectangular Domains for Double and Triple Integrals to Facilitate the Study of Classical Integral Theorems*

Timothy Myers, faculty – AACC

Most vector calculus textbooks initially define double and triple integrals on rectangular domains, then extend this definition to integrals defined on more general closed sets of type I and/or type II.

Beginning with rectangular domains can be an effective way to introduce all of the major integration topics for functions of several variables. Specifically, in this talk we will discuss how to likewise start with rectangular domains of integration when developing each of the following important definitions and theorems involving multivariate integration: Fubini's Theorem, The Change in Variables Theorem, The Fundamental Theorem for Line Integrals, oriented surface integrals, and the classical vector theorems of Green, Gauss, and Stokes. We will discuss the pedagogical advantages of this approach. In particular, we will emphasize the ways in which it makes the concept of multi-variate integration more tractable to students, and how it can help instructors cover the course syllabus more efficiently.

### **LSB 304**

*Digital Lab Notebooks: Moving the STEM Laboratory Online*

Natalie Stringer, Director of Content Development and Resident Professor – LabArchives

The laboratory notebook is the cornerstone of any STEM course. Students develop documentation and scientific communication skills while mastering scientific concepts. The use of digital lab notebooks for documentation has become the standard for data management in industry and academic labs. The National Institutes of Health, University of Maryland College Park, and more use these cloud-based solutions.

Instructors using digital notebooks in their courses reported a significant increase in student engagement. Students spend more time in the laboratory and their technical communication scores improved. Furthermore, faculty found that students arrive better prepared and grading is simplified.

This session will focus on a web-based tool used in more than 2,200 courses at community colleges and universities. After a brief introduction, our resident professor will present impacts on student engagement and scientific communication as well as best practices for implementation.

### **LSB 237**

*A Fortuitous Weekend Deal (To Increase Retention and Student Success Rates)*

Radhakrishnan Palaniswamy and Adugna Kebede, faculty – CCBC

As a faculty we are encountered with the challenge of increasing student success and retention rates always. Many of our supervisors and administrators want us (faculty) to participate in increasing retention, especially when there is a decline in enrollment. Though we know the problem, most of the times, we don't know the solution and we become silent spectators to watch the decline in enrollment resulting in cancellation of classes which has a direct impact on our adjuncts, immediately. Our part time adjuncts, who teach approximately 60% of our classes, become the victims of low enrollment and if this situation continues, college will be forced to implement furloughs, terminations and other cost saving measures. I welcome you all to attend my session at MCSC to find out how, as a faculty, we can increase both retention and student success by making a deal with students. Let me walk you through the faculty driven and proven model.

### **LSB 238**

*Establishing Community College Dual Enrollment Certificate Program in High School*

Amrita Madabushi and James Epres, faculty – BCCC

Community colleges and school districts are collaborating more than ever to increase dual enrollment or early college access programs. According to American Association of Community Colleges (AACC), thirty percent of community college students are in dual-enrollment programs. Dual enrollment programs also derive considerable support from national initiatives, like Achieving the Dream. They provide an important opportunity for high school students to experience college courses in a familiar environment, obtain college credits and explore career options while benefiting community college enrollment statistics. In this session, we will be sharing how we established Baltimore City Community College's Biotechnology Certificate programs at Edmondson Westside High School, a high need school of Baltimore City Public School System. Students will be doing course work followed by an internship component where they will work in Biotech labs in companies and universities. The program also received Career and Technology Education (CTE) Innovations grant from Maryland State Department of Education supporting the initiative. The details of establishing the program, logistics and grant will be discussed to help the audience get an overall view.

### **LSB 311 – Conference Room**

STEM Supervisors' Meeting

Supervisors from STEM fields will meet and discuss ideas of collaboration among community colleges in Maryland to help run program courses that are suffering from low enrollment. Supervisors from all areas of Sciences, Biotechnology, Technology (including but not limited to CAD, CIS, Cybersecurity, Digital Fabrication), Engineering and Engineering Technology, Mathematics and other related STEM fields will be in attendance. This session is open to the supervisors who have been invited to attend. **By Invitation Only**

## SHOWCASE ABSTRACTS

### **A. *21st Century with STEM Innovation* - PE Center Exhibit**

Charise Hayes, faculty - BCCC and Thomas Hayes, Board Chair/Partnership Coordinator,  
board@all4onetutoring.com

According to Ed week Market Trends (2017), school districts are tasked with teaching students relevant skills for a changing workforce, career, and technical education which have seen a surge in national popularity and attention from state policymakers, and current research suggest that K-12 systems are increasingly looking for equipment and curricula to modernize career and technical education. We'll exhibit DEILAB, an innovation lab, which delivers STEM programming to students and provides creative professional development in both academic, nonprofit, and corporate settings. We'll also exhibit Honeycomb innovative kits. Honeycomb specializes in STEAM education and is dedicated to designing and producing excellent electronic building blocks (and coding) and related toy kits. We'll walk through how these innovations support after school enrichment, summer camps, professional development, team building, and curriculum development.

### **B. *Brain-Drone Interface* PE Center Exhibit**

Ciaran Eli Dorland, Student Lab Technician, LASR@AACC Program – AACC

Over the course of the Fall 2018 semester, I developed a program which allows users to fly a small quadcopter drone using only their thoughts via a mobile EEG headset. The user trains the computer to execute specific commands based on distinct brainwave patterns, and can then use those trained mental commands to control either a flight simulator or a real, physical drone. I would like to display an information poster and offer visitors the chance to try the flight simulator, as well as giving a demonstration flight.

### **C. *Robotics Demonstration* LSB 418 – Robotics Lab.**

Ye Liu, faculty – BCCC

There will be a demonstration of a Lego robot, smooth line tracking; a Lab-Volt robot, picking and dropping a block; a two-way traffic lights controlled by a Programmable Logic Controller (PLC); an mMS system, a simulation of a factory packing system.

# POSTER ABSTRACTS

## Session A – odd numbered abstracts

### **1. *Quantification of Hyperintensities on T2-weighted Magnetic Resonance Image Sequences before, during and after Exposure to Aeromedical Evacuation-relevant Hypobaria Following Rat Traumatic Brain Injury***

Brianna Holmes, student – UMD/BCCC

Mentor: Boris Piskoun, Julie Proctor, and Gary Fiskum, faculty – University of Maryland School of Medicine

Traumatic brain injury (TBI) is considered the signature wound in military populations. The military uses aeromedical evacuations (AE) to safely transport wounded soldiers to safer echelons of care. A potential danger with AE is that soldiers who have had a TBI may have a higher risk of secondary injury from exposure to low atmospheric pressure (hypobaria).

AE conditions were simulated with male Sprague Dawley rats under normobaric (sea level) or hypobaric (8000 ft) pressures under normoxic (30-40% O<sub>2</sub>) or hyperoxic (100% O<sub>2</sub>) conditions for 6 hours beginning at 24 hours post TBI induced by a CCI. Cortical hyperintensities near the impact site were quantified from a series of T2 weighted images captured with MRI before during and after simulated AE. Although lesion volumes dramatically improved by 14 days after injury in all groups, rats exposed to hyperoxia at 24 hours after injury had more hyperintense areas. The interaction of pressure and oxygen during AE was examined in order to improve the safety and efficiency of transportation of people with TBI.

### **3. *How Long HSV-2 Survives on Plastic Party Cups***

Michael Dabney, student - BCCC

Mentor: Barry Margulies, faculty – Towson

There are nine human herpes viruses, all of which are capable of causing severe disease in people. The subset of these in alpha herpes virus group, herpes simplex virus-1 (HSV-1), herpes simplex virus-2 (HSV-2), and varicella zoster virus (VZV) can cause painful recurrent lesions on the skin and mucosal surfaces. Our research focuses on HSV-2, which is typically associated with genital lesions; this virus is spread from person to person through direct contact, most obviously when an individual is having an outbreak. Individuals may deposit live virus during one of these outbreaks onto inanimate objects, called fomites. The purpose of this project was to observe how long HSV-2 survived outside of the body on fomites. Through standard plaque assays of samples allowed to dry on plastic cups, we found that there is no appreciable decrease in virus titer after one hour of incubation at room temperature. However, that titer decreased about 3 logs after 24 hours, and was no longer detectable at 48 hours after drying. Our findings support the theory that HSV-2 easily loses considerable viability over a short period of time.

### **5. *Impact of Moderate Hyperoxia on the Brain after Cardiac Arrest***

Himsheela Karki, student – BCCC

Mentors: Julie Proctor, Boris Piskoum, Pratistha Tamrakar, Molly Goodfellow, Robert Rosenthal and Gary Fiskum – UMB, School of Medicine

Global cerebral ischemic injury (GCI) is a leading cause of long-term disability in cardiac arrest (CA) survivors. To counteract the ischemia, supplemental oxygen (FiO<sub>2</sub>) is routinely provided after resuscitation but high levels of oxygen (100%; extreme hyperoxia) have been shown to worsen brain injury. In this experiment we use a large animal (canine) CA model to determine if moderate hyperoxia (50% FiO<sub>2</sub>) is beneficial or harmful relative to normoxia (21% FiO<sub>2</sub>).

Animals were anesthetized, and CA was induced for 10 minutes followed by 3 minutes of resuscitation at 100% FiO<sub>2</sub>. The FiO<sub>2</sub> was adjusted to 50% or 21% for a 30 minute ‘transit phase’ followed by a 4 hour ‘hospital phase’ at 21%. The brain was collected and Western blot was done to measure markers of oxidative stress and inflammation (Nrf2, HO-1) in the hippocampus and cortex.

### **7. *Evaluation of Anticancer Drugs on Human Lung 3-D spheroids***

Anna Jackson and Tasheca Sinclair, students – BCCC

Mentor: Amrita Madabushi, faculty – BCCC

Non-small cell lung cancer (NSCLC) represents 85% of all lung cancers. A549 is the one of the most common NSCLC cell line used for modelling the alveolar region of the lung cells. The goal of this study is to grow A549 lung cancer cells 3-dimensional spheroid form in vitro to mimic tumor like conditions in lung cancer. Detailed analysis was performed to optimize conditions of A549 cell spheroid formation. Anti-cancer drugs, Crizotinib and Erlotinib were added to determine cellular response in 3D conditions. Crizotinib is a tyrosine kinase inhibitor that works by blocking an enzyme ALK while, Erlotinib is a reversible tyrosine kinase inhibitor that targets EGFR. Both the drugs have been approved by the FDA in the USA and are used for as First-Line lung cancer therapy for specific patients. We aim to utilize this model to compare the efficacy of these chemotherapeutic agents on A549 cells in 2D monolayer versus 3D spheroid models.

Acknowledgements: Naheed Hansraj, student – BCCC

### **9. *A Love for Bitter May Be in Your Genes***

Amarachi Emma-Ajali, Samuel Ekwere, Abimbola Oladele, and Denise Allen, students – BCCC

Mentor: Amrita Madabushi, faculty – BCCC

The inability to taste certain compounds has long been believed to be due to simple recessive Mendelian inheritance. It has been reported that a region on chromosome 7 has strong linkage to PTC taste sensitivity. In this project, students investigate the association between taste sensitivity to the bitter compound phenylthiocarbamide (PTC) and single nucleotide polymorphisms (SNPs) in the PTC bitter taste receptor gene (PTC); also known as TAS2R38, for taste receptor, type 2, member 38 in chromosome 7). In Biotech program classes and Biotech club led workshops, participants did genomic DNA extraction. The samples were then processed to conduct PCR and restriction digest to identify if the responsible SNP was present.

Acknowledgements: Chris Davis, Ameleset Kidanemariam and Destiny Howard, students – BCCC

**11. Noyce STEM Teacher Education Partnership: Preparing Secondary Education STEM Teachers**

Riley Smith, student – Hood

Perry Wood, faculty – FCC and Christopher J. Stromberg, faculty – Hood

STEM educators serve a critical role in preparing the next generation of professionals in STEM fields, especially at the secondary education level. Teachers at the high school and middle school levels can have a profound impact on whether students persevere in STEM disciplines or not. Thus, training excellent STEM teachers is absolutely essential.

The NSTEP (Noyce STEM Teacher Education Partnership) program at Hood College provides scholarships and additional educational experiences intended to support future STEM educators. The program offers significant scholarship support averaging \$18,000 per year for the last two years of a STEM secondary education program, on top of other financial aid received. In addition, the program offers educational opportunities such as professional development workshops, field trips to area schools to see STEM teaching in a variety of contexts, and opportunities to conduct research in a scholar's particular discipline.

Since the scholarship covers the last two years of a STEM secondary education program, transfer students from community colleges are welcome and encouraged to apply.

This poster will provide more information on Hood's NSTEP program, both from a faculty and a student perspective.

**Note: This poster will also be presented during the B session**

**13. Effect of Salinity on Aerobic Respiration of Germinating Garden Pea Seeds (*Pisum sativum*)**

Jessica Farrell, student – ACM

Mentor: Emmanuel Atta-Obeng, faculty – ACM

All living organisms carry out cellular respiration. During respiration, organic compounds (food) are broken down in the presence of oxygen (aerobic) via a series of enzyme catalyzed reactions resulting in the production of adenosine triphosphate (ATP), which is the primary energy compound for cellular work. In this experiment, we determined the effect of increasing salt concentration (salinity) on the rate of cellular respiration in germinating pea seeds. Seeds were germinated in petri plates on filter paper using solutions of the respective treatment at 25° C for 48 hours. The germinated seeds were collected and their respiration rates were determined by measuring the amounts of CO<sub>2</sub> (a product of respiration) they produced. Treated seeds showed a decrease in rates of CO<sub>2</sub> produced with increasing salinity. We believe increased salinity disrupts the activities of the many enzymes involved in the metabolic pathway of respiration. These enzymes work best in optimum conditions.

**15. Measuring Fats using an NMR**

Mariame Soumah, student – ACM

A lot of the foods that we consume contain fats, specifically saturated and unsaturated fats. Studies show that consuming too much saturated fats can lead to health problems. In this experiment, I used an NMR to measure the amount of saturated and unsaturated fats extracted from different foods, such as chocolate Oreo cookies, and Lays potato chips. The original experiment was done using a 300 MHz NMR. I used a 60 MHz NMR instead of the original one and compared the results. Those results will be illustrated on my poster, which will show the similarities and differences.

### **17. *The Effects Man-Made Sound on Marine Life***

Krysta Anderson, student – ACM

Mentor: Michael Hands, faculty – ACM

Anthropogenic noises are a growing issue in aquatic environments around the world. Although there has been progress in regulating the range of frequencies that can be used in the ocean, there are still gaps in data regarding the effects on daily life of marine animals. It is important to identify the potential causes of short-term and long-term damage due to man-made noise in aquatic environments, such as power drilling, explosions, and seismic surveys (for short-term causes) and vessels, offshore wind farming and coastal activities (for long-term). Even with the gap in data on free swimming fish, farmed fish have shown an increased stress related abnormality due to man-made sounds.

The results that will be shown on the poster observed how sound exposure effects goldfish. The sound exposure took place in intervals of three per day varying at intensity. This experiment's objective was to emulate the sounds the animal would hear if it were in its natural aquatic environment and observe how it would be impacted by the sounds.

### **19. *Design and Synthesis of Novel Low-Complexity Non-steroidal Selective Androgen Receptor Modulator***

Denton Unger, student – ACM

Mentor: Michael Hands, faculty – ACM

Cachexia and sarcopenia are strongly associated with poor prognoses in numerous chronic conditions including cancer. Dietary amino acids and androgenic-anabolic steroids have been implicated in the development of treatment protocols for degenerative diseases. While positive results have been reported for each class of anabolic, spectrum of activity, contraindications, and long-term side effects may restrict usage. For example, intramuscular administration of testosterone may exacerbate hormone-sensitive cancers and may be an independent risk factor for hormonal carcinogenesis in otherwise healthy recipients. Other notable adverse effects include infertility, hypogonadotropic hypogonadism, cognitive impairment, and myocardial hypertrophy.

An emerging paradigm of non-steroidal selective androgen receptor modulators promises to attenuate—if not eliminate—these risks. In light of this progressing class of pharmaceuticals, researchers generated a group of androgen receptor agonists and incrementally improved them in terms of binding affinity, tissue selectivity, and blood-brain partitioning. In this project, a candidate structure was selected based on synthetic simplicity using computational modeling as the screening process, where after a synthetic route was proposed and carried out.

### **21. *Gut Flora in *Manduca sexta****

Ayushi Dave and Hannah Dubois, students – HowardCC

Mentor: William Straube, faculty – HowardCC

The mechanism enforcing food preference of *Manduca sexta*, the tobacco hornworm, is being studied at HCC. One factor that might control this preference is gut flora. If gut flora were adapted to one plant type, they may be unable to process a different type of plant material, which could in turn make the animal unwilling to consume it. This study seeks to characterize the gut flora of fifth instar *Manduca sexta* raised on either solanaceous or non-solanaceous plants using culture techniques. Preliminary results have been highly variable, but notably show very low numbers of bacteria and extremely low diversity in gut contents.



### **23. Long Term Monitoring of a Howard Community College Campus Stream**

Caitlin Beckjord, student – HowardCC

Mentor: William Straube – HowardCC

Streams located on Howard Community College campus were monitored from the fall 2017 semester into the spring 2019 semester. The purpose of this study was to better understand the impacts of anthropogenic activities on the health of fresh water streams in Howard County, MD. Nitrate, phosphate, pH, conductivity, chloride concentrations, dissolved oxygen, and air and water temperatures were tested. The data collected were compared to previous data that were collected on campus and elsewhere in Howard County by the Maryland Stream Waders, a Maryland Department of Natural Resources program. Most parameters were within normal levels; however, nitrate was occasionally elevated upstream but remained low downstream. Conductivity levels in campus streams, which are mainly fed by parking lot runoff, were found to be extremely elevated, with a non-winter average of 2211  $\mu\text{S}/\text{cm}$ . Additionally, all measured conductivity levels were higher than sites previously tested by the Stream Waders. This suggests high levels of local anthropogenic inputs, possibly due to road salt use or calcium dissolved from concrete surfaces. Overall, Howard County streams have been rated as “very poor” by the Department of Natural Resources Stream Waders program but are now trending toward being rated as “poor.”

### **25. Neuropeptide F mRNA Expression in the Tobacco Hornworm**

Jade Bucksell, Biniam Teferedegn and Matthew Arminio, students – HowardCC

Mentor: Heather Lemko and Hannah Pie, faculty – HowardCC

The tobacco hornworm, the larval form of tobacco hawkmoth *Manduca sexta*, is a common pest to plants of the family Solanaceae which includes tobacco, tomato, and eggplant. The molecular mechanisms underlying the feeding behaviors and plant preferences of *M. sexta* are not understood. Neuropeptide Y (NPY) is one the most important regulators of food intake in the brains of many animals. In rats, mice, and humans increased expression of this gene is associated with motivation to eat and an increase in meal size. Insects such as the fruit fly, *Drosophila melanogaster*, express an analog gene to NPY known as neuropeptide F (NPF). The aim of our study was to determine if NPF signaling may contribute to the feeding behavior of *M. sexta* on their preferred plants. We first generated primers for the *M. sexta* NPF gene and used them to amplify a portion of the NPF gene from DNA extracted from the caterpillars. We then generated new sets of primers to target the mRNA sequences of NPF and actin in *M. sexta*. We extracted RNA from caterpillars which were newly hatched and never fed, mature caterpillars raised on tomato plants but started for 48-hr, mature caterpillars recently fed on tomato plants, and mature caterpillars recently fed on turnip plants (a non-preferred plant). We then used the RNA from the gut of each caterpillar to run a reverse transcription followed by quantitative PCR. Our results demonstrated amplification of both actin (a housekeeping gene) and NPF mRNA in each sample but we were unable to quantify the relative amounts of each mRNA. Further, we observed contamination in our assays, indicating that we will need to re-do the assays with new reagents and more careful technique to continue our study of NPF expression in *M. sexta* caterpillars.

### **27. *Feeding Inductions on Non-Solanaceous Plants in Larval *Manduca sexta****

Tameka R. Gongs and Azmain Faeque, students – HowardCC

Mentor: William C. Gretes

*Manduca sexta*, commonly known as the tobacco hornworm, is an oligophagous insect that only feeds on plants from the solanaceous family in nature. There has been some debate regarding whether the feeding behaviors of this caterpillar are innate — larvae are born with a strong preference for solanaceous plants — ; or induced — they prefer solanaceous plants after being exposed to them. The purpose of this research project is to provide insight into this ongoing debate by determining if diet inductions enhance the palatability of only the rearing plant, or if they extend to other closely-related plants.

Larvae were reared to the 5th instar on one of the non-solanaceous plants (cabbage, cowpea, corkscrew vine, soybean, turnip, kale, or rapeseed) or a solanaceous plant (tomato). During this time, survivorship of the larvae was monitored and recorded. Freshly-molted 5th instar larvae were tested on one of the eight plants to measure consumption over time. Results showed that not all non-solanaceous plants are equally suitable for larval survival. When tested as 5th instars, larvae appeared to feed faster on plants closely related to their rearing plant when compared to those less related. However, no additional increases in the acceptability of the rearing plant alone were noticed.

### **29. *RF Confinement Using an Induction Cell in UMER***

Kathleen Hamilton-Campos, student – UMD

Mentor: Brian Beaudoin, faculty – UMD

UMER investigates the physics of high-intensity charged particle beams. Advancing the capabilities of the longitudinal confinement system paves the way for electron multi-bunch confinement, allowing UMER to increase its performance and modes of operation for various experiments on longitudinal dynamics. Previously, electron bunches without confinement would expand, creating a head and tail that eventually overlapped each other. UMER has been using ear fields to combat this, but they can only confine once every few turns. This research tested an induction cell and radiofrequency (RF) amplifier, working around UMER's design barriers to traditional RF cavity confinement. By applying sinusoidal wave bursts at the revolution frequency, we can confine an electron beam in the wave's linear regions. To additionally combat particle loss, we calculated the separatrices – the areas of phase space within which the beam is longitudinally confined – with a central synchronous particle.

### **31. *Merging Sustainability and Technology: Building an Urban Indoors Farm***

Wolf Pecher and Giovanni Vincenti, faculty – UBalt

Access to fresh food in underserved urban communities has become a major concern. By maximizing space usage to increase food supply, urban farming and indoors agriculture have gained increasing prominence in implementing environmentally sustainable solutions to this challenge.

Using urban farming as an example, our project aims to prepare our students to address real world problems by exposing them to the inner workings and challenges of such endeavor. In a two pronged approach Environmental Sustainability (ES) and Applied Information Technology (AIT) students were guided through the process of building an indoor farm. The collaboration between the two groups aims at simulating a real-life scenario where experts of two different domains collaborate to create a final product, in this case a mini urban farm.

ES students begun the course by learning basics of computer scripting, while AIT students learned about plant biology. ES students then focused on the design and operation of soil-free agriculture systems (hydroponics in this case), while AIT students implemented a solution that utilizes client-server communications, sensor inputs, digital outputs, and temporal data storage. The final outcome is a modular system that allows students to explore ways to maximize crop yields and minimize energy consumption using technology.

### **33. *Augmented Reality in the Classroom: an Experience Out of this World***

Giovanni Vincenti, faculty – UBalt

Augmented Reality (AR) exists when we integrate technology solutions into real-life environments, when the real and the virtual coexist and collaborate. As this form of computing is easily visible, yet complex in its nature, it becomes a useful form of educational tool. Students can visualize their hard work in ways that are extremely clear and direct.

In particular, the Applied Information Technology program at the University of Baltimore (UB) focuses on a comprehensive approach to helping the students develop skills. Since AR offers such a direct form of interaction with a computer system, we decided to experiment its adoption into the program, giving students a sandbox where they can develop a multitude of skills.

Over the last year, a group of students at UB has been working on the NASA SUITS challenge (Spacesuit User Interface Technologies for Students). This experience includes informal learning, teamwork, and capstone experiences, creating a genuinely multifaceted approach to preparing the students for their future careers in industry or academia. This poster showcases the pedagogical approaches used in this experience and an overview of the different systems that the students have implemented for this project.

### **35. *Manipulation of Gene Expression in *Drosophila melanogaster* Affects Migration Patterns of Border Cells.***

Brittney Webber and Ava Porter, students – AACC

Mentor: Michelle Starz-Gaiano, faculty – UMBC

Genetic similarities between humans and fruit flies are the cornerstone for research into a variety of diseases in humans. For example, the migration of border cells, found in the ovaries of *Drosophila melanogaster*, models ovarian cancer metastasis in humans. The steroid hormone ecdysone affects the migration of border cells by signaling the cells to move. Determining the effects that specific genes have on this migration pattern may help us to better understand how similar genes affect the movement of ovarian cancer cells.

Transgenic strains were crossed to establish F1 generation females, which express receptors mutant for ecdysone signaling in border cells. The F1 generation ovaries were dissected and fluorescent antibody staining was used to recognize specific markers to visualize border cell migration by fluorescent microscopy. Border cells expressing the UAS-EcR-W650AII dominant negative mutant had slower overall progression to their final position at the oocyte compared to the *slbo-gal4-UAS-GFP/CyO* control. This finding suggests that mutating the ecdysone receptor has a direct effect on the timing of border cell migration. An understanding of the importance of ecdysone signaling in this migration process provides valuable insights that can direct future research into the effects of similar genes on ovarian cancer cell metastasis.

### **37. Understanding the Role of *Fusobacterium nucleatum* in Colorectal Cancer**

Leah Kline, student – HagerstownCC

Mentor: Savita Prabhakar, faculty – HagerstownCC

Microbiome of the gut has been associated with a number of diseases including colorectal cancer, which is the second most prevalent cancers in the world. Metagenomic studies using sequencing have indicated the association of a gut commensal *Fusobacterium nucleatum* (FN) with colon cancer and it has been shown that the number of these bacteria in stool samples from patients with colorectal adenomas is higher when compared to healthy controls. In this study we have characterized antibodies against FN raised in chicken. Total IgY was isolated from egg yolks PEG 6000 technique. The antibodies were analyzed for specificity using ELISA and western blot assays. The antibodies were found to react specifically with FN bacteria and did not show cross reactivity to other related bacteria in the gut. Studies to further characterize the antibody in growth inhibition assays are underway. The fully characterized FN IgY antibodies could serve as a useful tool to completely understand the role of FN in the progression of colorectal cancer.

### **39. Introduction of 3D Bioprinting at Hagerstown Community College**

Ethan Varney and Dan Culver, students – HagerstownCC

Mentors: Savita Prabhakar and Cynthia Dove, faculty – HagerstownCC; Thomas Stein – HagerstownCC and Trivance Design LLC

Bioprinting is the generation of 3-dimensional structures that contain live cells. An additive bioprinting approach combines cells, media and polymers to form a bioink that is deposited layer-by-layer to create 3-dimensional structures that mimic natural tissues. This technology has a number of applications in fields of regenerative medicine and bio-engineering. In this study we have demonstrated how a popular 3D printer, designed for use with thermoplastics, can be modified for bioprinting. We selected to use Freeform Reversible Embedding of Suspended Hydrogels (FRESH), a bioprinting technique developed by researchers at the Department of Biomedical Engineering at Carnegie Mellon University. The published protocols were modified slightly to allow aseptic printing. We used African green monkey kidney epithelial cells mixed with 1% alginate as a bioink and showed that the Vero cells were able to proliferate and remain viable in 8mm-diameter disks for more than 3 weeks. Further standardization of the technique will make 3D bioprinting research possible without investing in expensive printing equipment.

### **41. Development for Real Time PCR Assay for *Clostridium difficile* Diagnosis**

Viviana Wamiru, student – HagerstownCC

Mentor: Savita Prabhakar, faculty – HagerstownCC

*Peptoclostridium (Clostridium) difficile* (*C. difficile*) is a spore-forming obligate anaerobe responsible for nosocomial infections in humans. Anyone suffering from diarrhea who has taken antibiotics within the past 2 months or when diarrhea develops a few days after hospitalization, could be infected with *C. difficile*. Toxins produced by *C. difficile*, present in patient stools are used for diagnosis. In this study we designed primers for 16s rRNA gene which is one of the molecular markers for identification of bacterial species. The primers were designed using the genomic DNA sequences from multiple strain of *C. difficile*. The PCR assay was optimized and tested using genomic DNA from 10 related strains of bacteria found in the gut. The results showed that the assay is specific to *C. difficile*. The PCR product was cloned in a vector and both plasmid and genomic DNA was used to develop a real time PCR sensitivity assay. Based on this preliminary performance, a broader screening of a large number of samples could prove the usefulness of the assay to determine *C. difficile* load in gut fluids.

## Session B – even numbered abstracts

### 2. *Variations on Pascal's Triangle*

Travis Prillar, student – HowardCC

Mentor: Mike Long, faculty – HowardCC

Pascal's Triangle provides the bases for continued mathematical explorations. When examining Katie's Triangle, a derivation of Pascal's Triangle, a major question arises: what characteristics does Katie's Triangle have in common with Pascal's Triangle? A particular property, the flower petal property involving perfect squares, yields much to be discussed. When this is applied to Katie's Triangle, a familiar pattern of perfect squares arises along with the tetrahedral numbers. Along with these sequences, interesting geometric patterns also emerge when the surface plots are observed. When exploring Katie's Triangle for properties, questions about the three dimensional analogue of Pascal's Triangle, Pascal's Pyramid, emerge. Specifically, which properties that have already been discussed exist in Pascal's Pyramid and are there new properties that exist?

Acknowledgements: Andrew Kastner, student – FSU

### 4. *Analysis Of Playing Levels In The Board Game Dungeon*

Anna Yaroslaski, student – HowardCC

The developers of the board game Dungeon! suggest levels of play for each character. This project tested whether their recommendations are mathematically supported by determining the probabilities of defeating the monsters by every character at each dungeon level. Using these probabilities, I further calculated the average probability of successfully completing a room and the subsequent expected value in gold pieces to determine an ideal strategy for each character to win the game. Although elements of the suggested ranges were reasonable, I found that some variation on the suggested levels led to a possibly faster winning strategy.

### 6. *Fantastic Exoplanets and Where to Find Them*

Parsa Samadani, William Jeffries and Joseph Hinchey, students – HowardCC

Mentor: Brendon Diamond, faculty – HowardCC

An exoplanet is any planet outside of our solar system, and our research team wanted to demonstrate that Howard Community College (HCC) has the ability to detect them. By observing the drop in a host star's brightness as an exoplanet orbits around it, and in front of our field of view, the exoplanet's size and inclination can be determined with some knowledge about its host star. A Planewave 14" telescope and peripheral equipment was assembled and used on HCC's campus to take a sequence of images before, during, and after the predicted transit. A known exoplanet was selected with a promising, predicted transit to measure its properties and demonstrate the capability of the new equipment. Data is shared from an observed transit on November 4th, 2018, of exoplanet WASP-50b. During the 1.8 hour transit, a 1.6% ( $\pm 0.1\%$ ) drop in brightness was observed. Inputting the change in brightness with time into a common model, we inferred the existence of an exoplanet with a diameter 16% ( $\pm 1\%$ ) larger than Jupiter with an orbital inclination of  $86^\circ$  ( $\pm 2^\circ$ ) which is consistent with published values. The long-term goal of the project is to contribute to the field of astronomy through collaboration with the recently launched Transiting Exoplanet Survey Satellite (TESS).

### **8. *A Study in Chaos***

Natalie Paley and Hamza Umar, students – HowardCC

Mentor: Alexander Barr, faculty – HowardCC

The onset of chaos is defined as the point where a system exhibits divergent behaviors when there are very small changes in initial conditions. For our experiment exploring the onset of chaos, we released a double pendulum from various initial angles. We used video recording equipment and software to accurately track the pendulum's trajectory in each trial. Using these recordings, we measured the angular velocity of the bottom leg after five oscillations to determine the dependence of angular velocity on the initial release angle. A MATLAB simulation of our system was also used for similar trials. With the MATLAB data, we calculated the exponential increase in separation of trajectories between adjacent initial angles. In the experiment we determined that chaos first appears at initial angles above 50 degrees. The simulation showed an onset of chaos at a range of 50 to 53 degrees. The simulation and experimental results support the same onset of chaos in this double pendulum system.

### **10. *How Effective are Different Legumes at Inhibiting Salivary Alpha-amylase Activity?***

Ayushi Dave, Abdelaziz Abdelrahman, and Leya Engdaw students – HowardCC

Mentor: Hannah Pie – HowardCC

Alpha-amylase is an essential digestive enzyme found in humans. In our bodies, it is responsible for starch hydrolysis within saliva and small intestines into dextrins and eventually maltose. Maltase then hydrolyzes maltose into glucose that can be utilized by cells. The functionality and reaction rate of alpha-amylase like all other proteins is related to pH, temperature, and initial concentration of substrate. In the body, an additional factor to consider is the presence of inhibitors that prevent enzymes from binding with their substrates. Various legumes have been shown to include compounds that inhibit alpha-amylase activity by preventing the hydrolysis of starch and limiting the release of glucose. This study seeks to examine the inhibiting activity of various legumes on human salivary alpha-amylase utilizing a starch-iodine detection test. The inhibitory compounds of the following legumes; black beans, kidney beans, chickpeas and white beans, will be extracted using ethanol fractionation and tested to determine which type of legume has the most inhibitory effect. Based on previous research in human pancreatic alpha-amylase, we expect kidney beans to have the highest inhibitory effect on human salivary alpha-amylase. The results of this experiment would be beneficial to individuals seeking alternative diet plans.

Acknowledgements: Roshae Roberts, student – HowardCC

### **12. *Assessing the Impact of a Regenerative Step Pool Storm Conveyance (SPSC) on Stream Stability and Water Quality***

Chase Hearn, student – AACC

Mentor: Maureen Sherer, faculty – AACC

Anne Arundel County Department of Public Works constructed a Step Pool Storm Conveyance (SPSC) to address the parking lot runoff into Dividing Creek at Anne Arundel Community College. This investigation focuses on documenting the geomorphology of the stream as well as monitoring water quality indicators, such as total suspended solids (TSS), pH and others. Stream sampling is conducted in the constructed pools as well as upstream and downstream of the SPSC. A goal of the project is to develop a stream characterization over time with a view to contributing to the design of restoration projects. Preliminary results suggest that rain events have only a moderate effect on water quality, perhaps indicating some benefit from the SPSC.

(This is an ongoing project of chemistry service learning students.)

#### **14. *The Dust Connection between Active Galactic Nuclei and Star Formation***

Kenneth Arnold, student – AACC

Mentor: Marcio Melendez – AACC

An Active Galactic Nucleus (AGN) is a compacted region at the center of unusually luminous galaxies. These luminous cores are due to the energy release by a supermassive black hole surrounded by an accreting disk at the center of their host galaxy. An analysis of an AGN's electromagnetic spectrum can indicate a link between star formation in the host galaxy and their active nuclei. When AGN's are viewed in wavelengths of the far infrared, they resemble HII regions or Starburst galaxies. Infrared views in dormant galaxies, i.e., non active, do not show these similarities of luminosity distribution. By using a combination of dusty images in the far-infrared from the Herschel Space observatory and optical images from the Hubble space telescope, I have made a morphological comparison of galaxies in order to find a link between star formation and the active galaxy intrinsic power. To account for selection biases I used a hard X-ray selected sample of active galaxies from the Neil Gehrels Swift Observatory to ultimately obtain information about galaxy evolution as a function of the active nuclei luminosity.

#### **16. *Establishing an Earth Science Club at AACC***

Veronica Somers, student – AACC

Mentor: Dan Fernandez – AACC

Establishing an Earth Science Club at Anne Arundel Community College has provided students from all backgrounds and majors, a way to gain valuable insight into the fascinating geological, oceanographic, and meteorological concepts behind our world. Thanks to the commitment of the lead faculty advisor, Professor Anthony Santorelli, in only the second year of this club's existence, students who have interests in the Earth Sciences, can share innovative and fun learning experiences through numerous collaborations and activities on campus and in the surrounding community. Club members are able to apply their knowledge of Earth Science, build professional relationships, increase exposure to career opportunities, gain important skills, and ultimately be surrounded by encouraging and engaging students and faculty. Come explore our progress so far and share your thoughts on how we all can further encourage students to have fun and discover the many interesting topics connected to Earth Science!

#### **18. *Role of Sema6A in Autism Spectrum Disorder during Brain Development***

Serena Edwards, student – CCBC

Mentor: Celine Plachez – Hussman Institute of Autism

During brain development, neurons form complex networks. In Autism Spectrum Disorder (ASD) this neuronal connectivity is being altered. Semaphorins have been shown to play an important role in neuronal circuit formation. Recent work has shown their implication in the etiology of ASD. This study focuses on the role of Sema6A and we investigate how Sema6A mutation affects neuronal connectivity in ASD. Since Sema6A is involved in cell migration, we hypothesized that during brain development the migration of GABAergic interneuron is affected by the loss of Sema6A gene. Our major findings using genetic manipulations are as follow: 1. Loss of Sema6A gene leads to a dramatic overall GABAergic cell loss in several brain areas. To our knowledge this is the first study reporting a GABAergic interneuron loss in a brain area involved in attention. 2. Analysis of the subpopulations of inhibitory neurons revealed that Parvalbumin are the only GABAergic interneurons affected by the Sema6A mutation. 3. Parvalbumin interneuron cell loss starts as early as the first postnatal week. Taken together, these findings reveal the importance of Sema6A in the formation neuronal networks and provide insight into the molecular pathways that may lead to altered neuronal connectivity in ASD.

## **20. Effects of 400 Hz Vibrations on Biofilms of *Pseudomonas fluorescens***

Michelle Ramsahoye, student – HarfordCC

Mentors: Jaclyn Madden and Lee Ann Anderson, faculty – HarfordCC

Biomass formation is dependent on quorum sensing, a method of bacterial communication that regulates gene expression. The use of audible acoustic vibration therapy to influence quorum sensing within biofilms has not been extensively researched.

Samples were developed using set suspensions of *P. fluorescens* transferred to a microplate. The plates were exposed to 400 Hz vibrations for 10 minutes and incubated overnight. Serial plating was performed with a subset of samples to determine CFU compared to a control. Crystal violet staining of another subset of treated/untreated samples was used to determine the remaining biomass.

Treated samples from both trials demonstrated statistically insignificant decreased biomass compared to the control ( $p = 0.098$  and  $p=0.198$ , respectively). Growth at dilutions of 1:10, 1:100, and 1:200 were all too numerous to count, as was growth for the 1:1000 control plate. Treated 1:1000 plates had an average of  $1.69 \times 10^5$  colonies (27.8 colonies/1mm<sup>2</sup> area) and  $1.52 \times 10^5$  colonies (25 colonies/1mm<sup>2</sup> area), for trials 1 and 2.

Biofilms are a persistent threat to health. It is possible that exposure to vibrations may contribute to decreased biomass for *P. fluorescens* biofilms, but this needs to be confirmed with additional trials.

## **22. Campus Smart Room**

Phillip Crum, Skylar Luo, Joshua Lorentson, Michael McCreary, and Payton Stoneberger, students – CCC

Mentor: Raza Khan, faculty – CCC

In this research project, Raspberry Pis are used to create a smart room atmosphere at the Honors Research and Collaboration Center at the College. Two Raspberry Pi3 were used to sense the temperature, humidity, and pressure and to lock or unlock a box and take pictures that belongs to the STEM Scholars in the Center. Two Raspberry Pi Zeros are used for facial recognition and voice recognition. They are used to identify the person that is trying to send the commands through voice recognition. All equipment communicates through Message Queuing Telemetry Transport (MQTT). This smart room atmosphere provides and monitors detailed information of the Center on campus, and control the room electronically. The data recorded in room can be utilized as an environmental control. The so-named Lock Pi's, Vision Pi's, and Voice Pi's functionalities can be adapted in order to secure privacy of personal belongings and monitor the room. The undergraduate researchers have been collaborating with a NASA engineer who serves as an external consultant to the group. The research group will present its findings at the Conference.

## **24. SMART Accessory Unit for Washer and Dryer**

Phillip Crum, Joshua Lorentson, Skylar Luo, Michael McCreary, and Payton Stoneberger, students – CCC

Mentor: Raza Khan, faculty – CCC

Many consumers wish for a way to know if their washer or dryer have finished their cycle before going to their basement to check on the status. To that effort, the STEM Scholars undergraduate researchers, with the help of a NASA engineer who serves as the consultant to the group, developed a method to monitor the running of a washer or dryer from one's home. In this research project, Raspberry Pis are used to record and transmit data from a washer or dryer. A Raspberry Pi3 is used to sense the temperature and humidity within the room, as well as the running of the washer or dryer itself, along with the information of time the unit has been running. This data is then sent to an application on an Android device, allowing a user to see if the washer or dryer has finished its cycle. The research group will present its findings at the Conference.



## **26. *Non-Conventional Means of Flying a Drone***

Phillip Crum, Joshua Lorentson, Skylar Luo, Michael McCreary, and Payton Stoneberger, students – CCC

Mentor: Raza Khan, faculty – CCC

In this research project, a Tello drone will be controlled by hand gestures and brain signals. Raspberry Pi is used to sense the hand gestures to give the corresponding command to the drone; handsets, ganglion board, and another Raspberry Pi are used to sense the brain signals and transfer the data to the corresponding command to the drone. The collaborative communication between the hand gestures and brain to the drone is done through Message Queuing Telemetry Transport (MQTT). These ways of controlling the drone can be utilized to have more versatile control over the drone compared to the traditional remote. The technology can be controlled by nature movements of human, which allows the users to be more connected to the technology. The primary challenges of this project are to develop the Raspberry Pi to detect hand gestures, learn to detect and interpret thoughts and complete control of brain waves, detect and interpret brain waves, and to communicate between commands and the drone. The undergraduate researchers have been collaborating with a NASA engineer who serves as an external consultant to the group. The research group will present its findings at the Conference.

## **28. *Biological Odorants Eliciting Attraction in Crickets***

Tsion Demissie, student – Towson

Mentor: Vonnie Shields, faculty – Towson

Olfaction is a necessary component of vertebrate and invertebrate physiology. Many animals use their sense of smell in food finding, oviposition, and mate choice. The insect olfactory system is a prominent model in neuroscience for addressing how animals detect, encode, and process olfactory stimuli. The present study investigated the effect of biological odorants in eliciting attraction in the house cricket, *Acheta domesticus*. These crickets are omnivorous scavengers and their diet selection parallels that of humans. Subsequently, these insects can contaminate foods with their feces. This raises concerns about resulting foodborne illnesses associated with microbial pathogens or food contaminants, creating serious health concerns. In this study, we determined if selected naturally occurring odorants elicited walking behavior in crickets toward the odorant source (i.e., anemotaxis). We tested the behavior of adult crickets using dead cricket extracts collected at various time periods, post-death from males, females, or a combination of both sexes. This research will be helpful in interpreting if these odorants can serve as olfactory attractants in the development of insect traps to prevent pest infestation.

## **30. *A Simple 3D Model of Skin used to Test Compounds or Methods to Improve Wound Healing***

Niloufar Hassan Tehrani, student – MC

Mentor: Victoria Virador, faculty – MC

Based on our previous studies with mouse NIH 3T3 fibroblasts growing attached to a tissue culture dish in two dimensions (2D), we transitioned to the use of spheroids, in-vitro three-dimensional models (3D). Spheroid aggregates resemble tissue organization and are more physiologically relevant than 2D models. Our goal is to demonstrate that this model can be used to test for methods that would improve wound healing. To this effect, we tested various approaches to measure cell viability and assess spheroid growth. The MTT assay to measure mitochondrial activity gave reasonable results in agreement with published studies. We optimized parameters of spheroid growth, such as time, size and number of cells in culture. In parallel, we optimized the MTT assay to see if it correlated with spheroid growth. Once consistent data was obtained, we tested this protocol with hydrogen peroxide, as it is known to be an apoptosis inducer. Another compound tested was Manuka Honey, which has been shown to be effective in wound healing without scarring and possesses antimicrobial activity. Our results suggest that this spheroid model has potential to test natural compounds that might be effective in wound healing.

### **32. *Synthetic Diamond Based Golf Club***

Tzu Yang, Miguel Wimbish, and Lawrence Alderton, students – BCCC

Mentor: Curtis Jones, faculty – BCCC

Golf is a sport with a field of fixed distance for every player. As golfers get around the age of 60 and above, the ability to hit the ball to travel a further distance lessens. Therefore, to increase that distance, a synthetic diamond-based golf club driver can be developed. Since synthetic diamonds have similar characteristics of a real diamond such as hardness and strength, it would give older golfers the needed boost and accuracy to achieve a further distance. Moreover, due to the strength synthetic diamonds have, it is more resistant to scratches and damages compared to softer materials. In this presentation, we will use the concepts of physics, dynamics, chemistry, and statistics to estimate the distance that can be travelled by the golf ball after colliding with a synthetic diamond-based golf driver compared to a regular golf driver.

Acknowledgements: Mikee Ibayán, student – BCCC

### **34. *Terrific Teacher Task-Bot (T3)***

Ryan Haynes, Isaiah Jones, and Jonathan McKetney, students – BCCC

Mentor: Yun Liu and Curtis Jones, faculty – BCCC

Educational systems are arguably one of the most crucial programs a country needs to be economically and globally successful. At the forefront of this topic lies the educators. Educators are faced with countless tasks and problems that can prevent them from being their best for students. Some of these problems include organization, accountability, and student integrity during assignments. Since 2014, academic dishonesty has increased 3.5%. We believe that The Terrific Teacher Task-Bot, or T3, is a compact and affordable teacher aid that can help decrease academic dishonesty. The T3 can adapt and integrate with a campus database for easy access. We will show that with the T3, teachers will have another “set of eyes” to ensure student integrity during proctored assessments. The T3 will also be able to efficiently organize and allocate student assignments by class; timestamp assignments, upload them to the schools database (i.e. Canvas), as well as send confirmation receipts for the uploaded assignments. Students are our future leaders, after all, and they must be groomed as such. In this age of technology, integrity through efficiency should be the standard, not the exception. The T3 will help make this a reality.

### **36. *Comparing the Structural Rigidity of Bridge Designs***

Chinwendu Uche, student – BCCC

Mentor: Curtis Jones

Models have been used for decades to show how an object will work in real-life; demonstrating the factors that make the design unique. We made multiple bridge models to differentiate how different designs might break when faced with a heavy downward force. To accomplish this, we first made a 2D version of our models on Fusion 360 and found out what stress points it would have. We then went on to hypothesize where our bridge would break and how much weight it would be able to handle. Following this, we went on to build our model bridges out of popsicle sticks and glue and tested them with weights until they lost their structural rigidity. By doing these tests, we were able to analyze the weak point of our model and compare it to our hypothesis. Finally, we made improvements to our initial design and identified other designs that would work better.

Acknowledgements: Yitzchuk Rosenblat, student – BCCC

**38. *The Fabrication and Statistical Analysis of the Amaterasu Launcher***

Nathan Owhonda, Damontez Wright, Lonnitay Cherry and Marc A. Caballes, students – BCCC

Mentor: Marc J Louise O. Cabelles, faculty – BCCC

The fabrication of the Amaterasu Launcher was inspired by the Holman Projector, one of the greatest inventions of Wheezers and Dodgers or commonly known as the Department of Miscellaneous Weapons Development (DMWD) during World War II. Thus, before it became a T-shirt tossing sensation, this launcher was born to fight Nazis. The intention of this research project was not only to fabricate, but also to find out the heat distribution inside the launcher's combustion chamber by the use of ANSYS Fluent software, the interaction between the ignition mechanism and its propellant, and the significant factors involved to predict where the ammunition will land. Throughout the experiment, two influential factors were considered that affect the launcher's speed which was: (1) the initial angle of the launcher when fired in relative to the ground and (2) the effect of the potato's weight when used as ammunition. Afterward, data were collected after three trials and been statistically analyzed using the Analysis of Variance (ANOVA) method to know the significant difference of each factor. A contour and surface plot were also made in order to visually represent the statistical results. Lastly, Fisher's method was also used to examine and analyze the significance of the contingency between significant factors.

**40. *Constructing Buildings to Withstand Natural Disasters: Focusing on Seismic Waves and Hurricanes***

Kirsten Toland, Emmanuel Lewis, and Mammadou Bah, students – BCCC

Mentor: Curtis Jones, faculty – BCCC

Engineers use various materials to ensure the structural stability and integrity of buildings in the event of an earthquake. We calculated the tensile strengths of concrete, aluminum, and steel to see which material was best to make environmentally strong buildings. The results of our findings will be discussed in this presentation.



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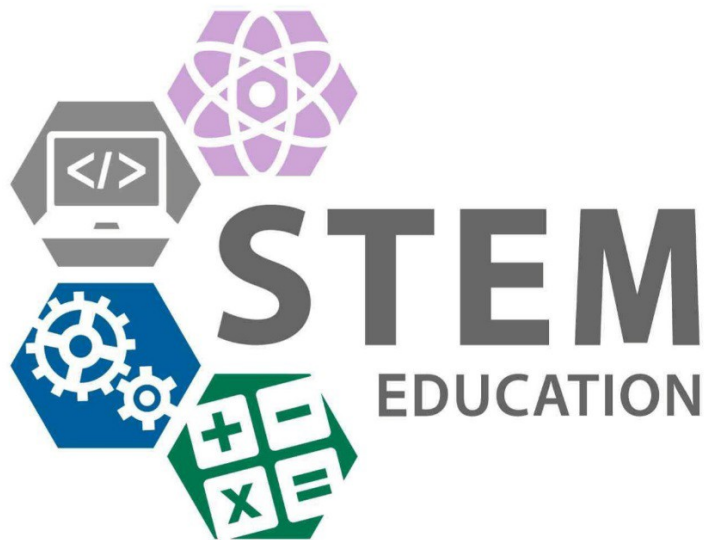
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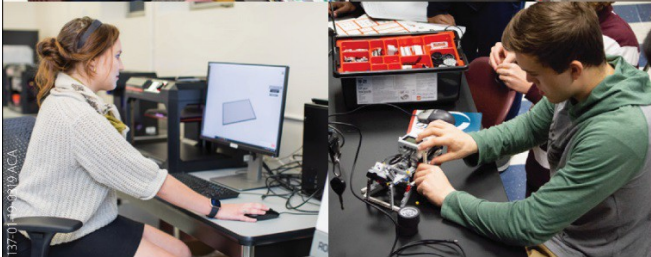
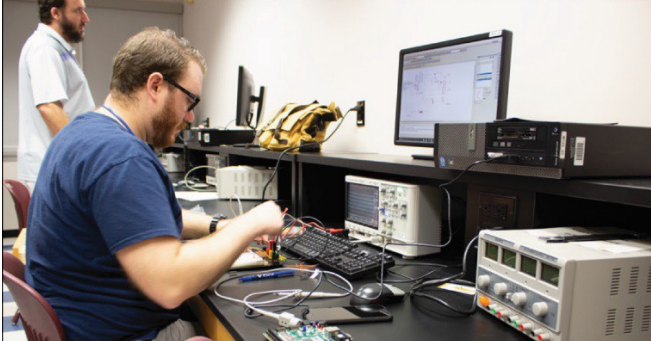
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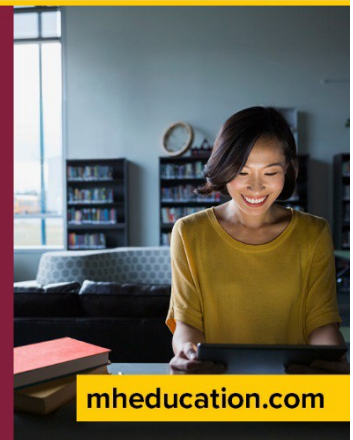
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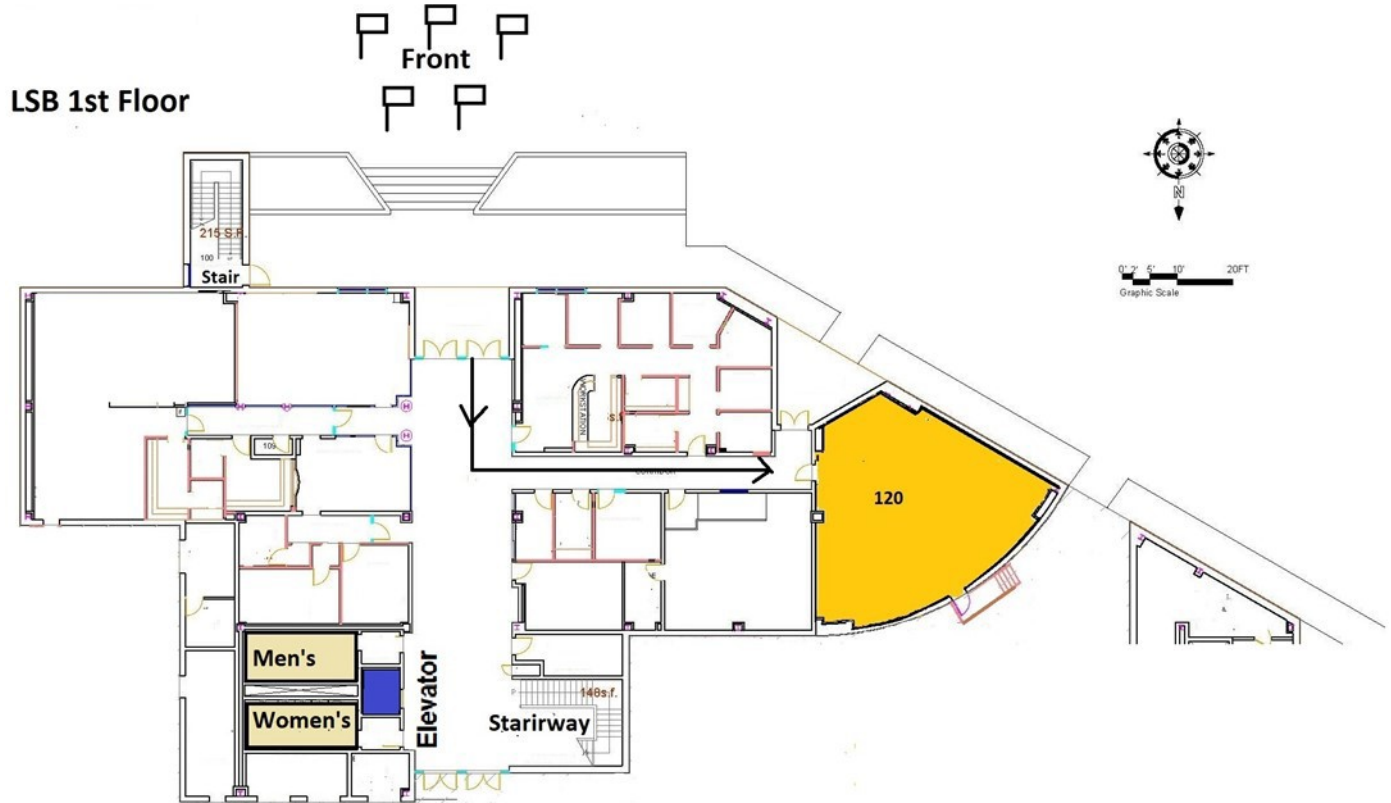
## Figure Legend

1. PE Center : Registration, Posters and Lunch
2. Mini Conference Center : Breakfast
3. Fine Arts Theater : Keynote Speech
4. Life Sciences Building (LSB): Break Out Sessions  
VIP Parking next to LSB
5. Admin Main Building

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# Building Plans

## Life Sciences Building (LSB) 1<sup>st</sup> floor



# Life Sciences Building (LSB) 2<sup>nd</sup> floor

LSB 2nd Floor



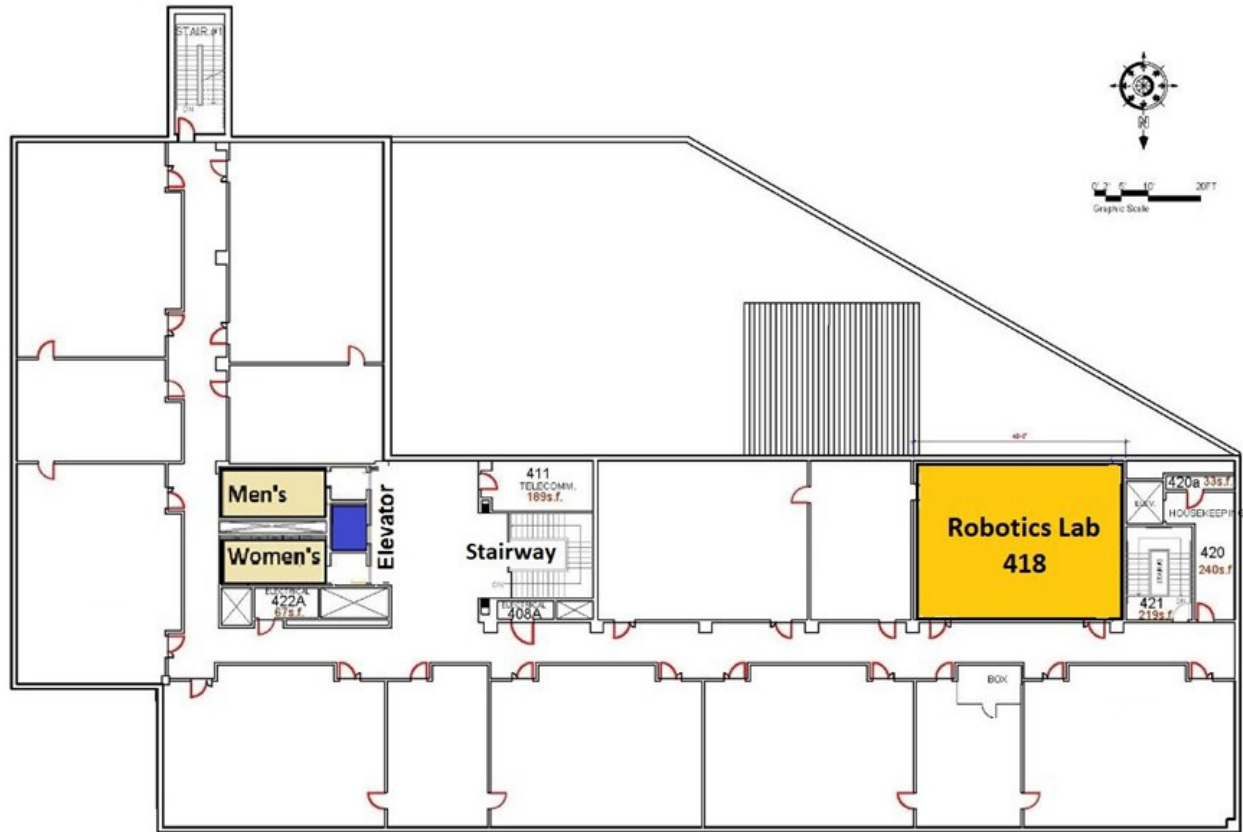
# Life Sciences Building (LSB) 3<sup>rd</sup> floor

LSB 3rd Floor



# Life Sciences Building (LSB) 4<sup>th</sup> floor

LSB 4th Floor



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