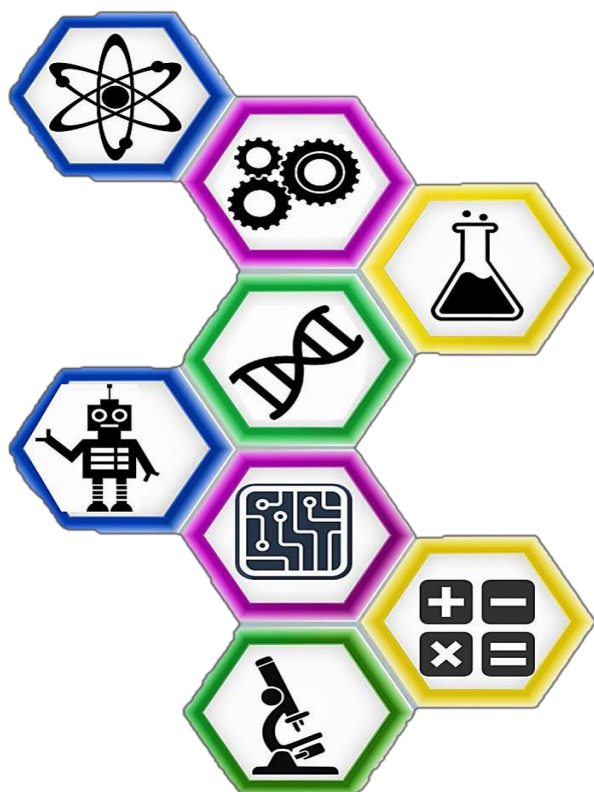




**The 6<sup>th</sup> Annual  
2021 Maryland Collegiate STEM  
Conference Program**

**STEM Innovations:**

**Building a Stronger Future Together**



**May 1, 2021**

Hosted by SpatialChat

**Abbreviations used for colleges/universities:**

AACC – Anne Arundel Community College

Allegany – Allegany College of Maryland

BCCC – Baltimore City Community College

CSMD – College of Southern Maryland

CCBC – Community College of Baltimore County

CarrollCC – Carroll Community College

HagerstownCC – Hagerstown Community College

HarfordCC – Harford Community College

Hood – Hood College

HowardCC – Howard Community College

MC – Montgomery College

Prince George's Community College – PGCC

UBalt – University of Baltimore

UMBC – University of Maryland, Baltimore County

UMD – University of Maryland, College Park

# Morning Keynote

## STEM Fields: Making Connections across Academic Fields and Interest

### Dr. Christine Royce

Professor

Teacher Education and Co-Director, MAT in STEM Education

Shippensburg University



Dr. Christine Anne Royce is a Professor in the Department of Teacher Education and Co-Directs the MAT in STEM Education Program at Shippensburg University (PA). While at Shippensburg, she served three consecutive terms as the chair of the teacher education department and has guided and managed the development of a graduate certificate in Online Instructional Learning Environments. She is past President for the National Science Teaching Association which is the world's largest association for science educators which promotes innovation and excellence in science teaching and learning for all. She has served as an NSF panel judge and chair for the Presidential Awards for Excellence in Science Teaching.

During her K-12 teaching experience, Dr. Royce focused on helping students make real world connections to their environment and interest them in how science is found within all aspects of their daily lives. During this time, Royce was named a 1997 Presidential Awardee for Excellence in Science Teaching where the design of her application focused on how the career and technical fields utilized science. She is the recipient of the NSTA's Fellow Award (2016), Pennsylvania Association of Colleges and Teacher Educators' Teacher Educator of the Year Award (2010). Her research interest focus around the integration of digital tools and technology into classrooms for sensemaking, the inclusion of children's literature in elementary science classrooms, and STEM integration. Connect with her on Twitter @caroyce.

# Afternoon Keynote

## Strategies for Deep Learning in STEM Courses

### Dr. Todd Zakrajsek

Associate Professor & Associate Director of Fellowship Programs

Department of Family Medicine

University of North Carolina at Chapel Hill



Dr. Todd D. Zakrajsek, Ph.D. is an Associate Professor in the Department of Family Medicine at UNC - Chapel Hill. Todd was a tenured associate professor of psychology and built faculty development efforts at the three universities before joining UNC School of Medicine. In addition to his work at UNC providing resources for faculty on various topics related to teaching/learning, leadership, and scholarly activity, Dr. Zakrajsek is the founding President of the International Teaching-Learning Cooperative (ITLC), an organization dedicated to bringing together faculty members in higher education in order to enhance learning opportunities for college and university students.

In addition, Dr. Zakrajsek serves on many educationally-related boards and work groups. Journal of Excellence in College Teaching, International Journal for the Scholarship of Teaching and Learning, College Teaching, Education in the Health Professions. He has consulted with organizations such as The American Council on Education (ACE), Lenovo Computer, Microsoft, Harvard, and the Gates Foundation. He has delivered keynote addresses and campus workshops at over 300 conferences and university campuses. Todd's recently co-authored books include *Advancing Online Learning* (2021); *The New Science of Learning* (2nd Ed) (2019); *Dynamic Lecturing* (2017); and *Teaching for Learning* (2015). Follow and connect with Todd on Twitter @toddzakrajsek and LinkedIn.

## Program Snapshot

8:30 am – 9:00 am: Welcome Lobby open

9:00 am – 10:15 am: Welcoming Remarks and Student Centered Keynote

10:20 am – 10:50 am: Breakout Session #1

10:55 am – 11:25 am: Breakout Session #2

11:30 am – 12:45 pm: Poster Sessions (15 minute break inbetween sessions)

A – 11:30 am – 12:00 pm

B – 12:15 pm – 12:45 pm

1:00 pm – 2:00 pm: Faculty Centered Keynote

1:00 pm – 3:00 pm: Community College Fair

1:00 pm – 3:00 pm: College Transfer Fair

2:00 pm: Student Give-away Announcements\*

2:05 pm – 2:35 pm: Breakout Session #3

2:40 pm – 3:10 pm: Breakout Session #4

3:15 pm – 3:30 pm Concluding remarks and faculty give-away announcements\*

**\*To qualify for winning giveaways, attendees must complete surveys  
after presentations**

# Keynote Abstracts

## Morning Keynote

**Dr. Christine Royce: student-focused presentation**

*STEM Fields: Making Connections across Academic Fields and Interests*

We live in an amazing time! If we consider the last year alone, Integrative STEM fields have provided information, hope, and collaboration. While each individual STEM subject content is important in that it provides a solid foundation for understanding, the opportunities presented to solve problems when those subjects are integrated grows exponentially. This foundational information can be used to answer questions such as “what virus was overtaking populations” whereas collaboration brought together experts across these fields to answer questions such as “how do we stop it?” and people in these fields bring the hope of getting back to “normal.” If we stop for a moment and consider where and how all of these connections occur, we recognize that every field, every subject, and people across every continent helped in this endeavor. There is a need to make these connections, to seek out opportunities to collaborate, to find areas of interest and pursue them, and ultimately to use these connections to advance human understanding. This session will focus on those connections as we stop and take an opportunity to recognize the S- T- E- M fields and then take the opportunity to celebrate the idea that long before our pandemic year, those in the STEM fields were some of the first to say “we are in this together.”

## Afternoon Keynote

**Dr. Todd Zakrajsek: Faculty-Focused Presentation**

*Strategies for Deep Learning in STEM Courses*

Within educational psychology, a distinction is made between “surface” and “deep” learning. It is important for both faculty and students to know the difference between surface and deep learning, and when to take which approach. Surface learning involves students taking a reproduction approach to learning. We frequently see this type of learning when students study to reproduce that information on an exam, quiz, class project, or presentation. When it comes to assessment, surface learners are focused on learning to get as many points as possible. A totally different type of learning is in play when students take an understanding approach to learning. Although deep learners may well be concerned with grades, learning is not focused on scoring well on exams. These learners actively interact with new material by reflecting and integrating new information with previously learned information. In this session, we will look at evidence-based teaching strategies that promote and support deep learning. We will also look at strategies that we can easily teach to students to help them develop deep learning strategies and also see the value of taking an understanding approach to learning.

# Conference Schedule

9:00 am -- 10:15 am – Welcoming remarks – Keynote – Dr. Christine Royce

## 10:20 – 10:50am: First Breakout Session

### Student 15 Minute Presentations

#### Presentation Room A

##### Life Sciences

- Pilar Thomas and Mary Lenahan, HowardCC  
*Species-Specific and Generalized Inductions of Preference in Manduca sexta*  
(see abstract on page 17)
- Mary Green and Jennifer Jun, HowardCC  
*Molecular Mechanisms for Circadian Rhythms in the Tobacco Hornworm (Manduca sexta)*  
(see abstract #5 on page 22)

#### Presentation Room B

##### Life Sciences

- Aditi Madabushi, UMBC  
*Increasing Triacylglycerol (Tag) Production with Gene Mining Techniques in Various Algal Species* (see abstract on page 17)
- Jacob Funk, CCBC  
*Unpacking a Genome: Building the Foundation for Future Discoveries* (see abstract on page 17)

#### Presentation Room C

##### Mathematics

- Joshua Thomas, MC  
*Reimagining the Complex Plane* (see abstract on page 18)
- Koray Bailey, MC  
*A Look at Early Graph Theory and Minimum Spanning Trees* (see abstract on page 18)

### 30 Minute Presentations

#### Presentation Room D

*Sea Level Past, Present, and Future*  
Dr. Emil Petruncio – faculty, AACC

Paleo sea level records and contemporary measurements indicate that over the past century, global sea level has risen faster than it has over the past 2800 years, and it is at its highest since the last interglacial period 125,000 years ago. Sea level rise poses an existential threat to populations, infrastructure, and ecosystems of low-lying areas such as estuaries, river deltas, and tropical islands, but further research is required in order to better understand how drivers of sea level – especially the retreat and/or collapse of the Greenland and Antarctic ice sheets – will affect the rate and extent of future sea level rise. This talk will discuss historical and current sea level change, scenarios for future sea level rise (with a focus on Annapolis, Maryland), and grand challenges being addressed by the international research community to reduce uncertainty in sea level prediction.

### Presentation Room E

#### *Telling Your Story in the Transfer Admissions Application*

Bailey Jackelen and Juan de la Rosa Dias – Admissions, JHU

You are an individual with your own path and journey through higher education. Your academic passions, educational growth, future aspirations, and unique perspective all play important roles in the admissions process. How can you best tell your personal narrative through the transfer admissions process?

In this interactive student-centered session, an experienced admissions officer and transfer admissions coordinator for the Johns Hopkins University Office of Undergraduate Admission will explore the holistic admissions review of transfer applications and how transfer admissions officers consider the individual academic, professional, and personal context of an applicant when evaluating their application for admission.

This program for transfer students focuses on how to tell an authentic and cohesive story within their transfer application. Through a review of case-study profiles, this workshop will discuss how a student's story can be highlighted across the student-submitted elements of a transfer application and how applicants can leverage portions of their application in telling their own unique narrative.

### Presentation Room F

#### *Climate Change and Species Decline*

Dr. Malathi Radhakrishnan, Mildred Rodman and Frederick Paraskevoudakis – faculty, BCCC

\*This is a 60 minute presentation – please stay in the room for both sessions

This presentation will focus on cause & effect relationships between climate change and biodiversity. Recent studies have shown large declines in plant and butterfly populations across the country. Numerous factors have been considered as reasons for these trends and climate change has emerged as a major contributor. To assess climate change as a mitigating factor in declining populations, large regions are required for observations and sampling. Using a combination of large numbers of Community Scientists, volunteer observations and expert collected data, valid assessments of decline can be made in areas where warming and drying trends are occurring. This presentation will elucidate how students can contribute significantly with field data collection through collaborative organizations.

Soil biodiversity is emerging as a key factor in climate change. Soil scientists are in high demand for a wide array of professional positions with public agencies or private firms. This presentation will instruct students in cutting edge methodologies which can be easily employed to achieve greater soil biodiversity. Applying these techniques to restore key ecosystems in urban and rural areas will help to keep up with the growing demands on soils for food, energy production, environmental protection, and climate change mitigation through soil carbon sequestration.



### Presentation Room G

*Biocomputational Engineering, University of Maryland's New Degree Program*

Bill Churma – Associate Director, Academic & Student Affairs and Lan Ma – Assistant Director, Biocomputational Engineering Program, Fischell Dept. of Bioengineering, UMD

The UMD A. James Clark School of Engineering's new bachelor of science in biocomputational engineering is one of the first degrees of its kind. Set to launch fall 2021 at the Universities at Shady Grove, this program will address the rapidly growing demand for engineers with expertise in both the biological sciences and computational methods. The bachelor of science in Biocomputational Engineering will provide students with a breadth of fundamentals in biology and quantitative problem solving while developing skills in computation and data science. Students will apply these skills to the modeling of complex biological systems and the analysis of complex biological data sets in order to create new knowledge from the molecular to organ to system levels. The synthesis of bioengineering, computation, and data science gives the graduates unique capabilities to solve existing and emerging challenges of the modern medical world.

This program is geared toward transfer students from community colleges or four-year institutions. The curriculum offers junior- and senior-level courses within the new state-of-the-art Biomedical Sciences and Engineering (BSE) education facility at the Universities at Shady Grove. Graduates of this program will receive a B.S. degree in biocomputational engineering from the University of Maryland, College Park.

## 10:55-11:25am – Second Breakout Session

### Student 15 Minute Presentations

#### Presentation Room A

##### Physical Sciences

- Vincent Carmody, HowardCC  
*Surface Water Quality for Cu and Mn around the HCC Campus* (see abstract #3 on page 21)
- Angel Obiorah, CCBC  
*Effects of Changing Rainfall Patterns on Livelihood in Tanzania* (see abstract on page 18)

#### Presentation Room B

##### Life Sciences

- Matthew Allen, MC  
*Wound Healing: Analysis of two in vitro models of murine fibroblasts using ImageJ*  
(see abstract #8 on page 25)
- Piper Fair, MC  
*When Polycythemia Vera is JAK2-Negative: an Investigation of Non-Driver Mutations*  
(see abstract on page 19)

#### Presentation Room C

##### Life Sciences/Mathematics

- Tiziano Russo, MC  
*Comparison between Availability of Organic Matter and Chemical Indicators in Burnt and Unburnt Soil from Black Hill Regional Park* (see abstract on page 19)
- Teresa Doley, MC  
*The Relationship Between Race/Ethnicity and Suicide Deaths in New York Between 2003-2017* (see abstract on page 20)

## Presentation Room E

### Computer Science

- Zobia Khan and Alexandar Jones, HowardCC  
*Reducing Error in Quantum Computing With Improved Circuit Design Methods*  
(see abstract on page 20)

## 30 Minute Presentations

### Presentation Room D

*A New Age of Ocean Exploration: Revealing Secrets of the Deep*

Dr. Emil Petruncio – faculty, AACC

We are at the dawn of a new age of ocean exploration which involves the mapping and characterization of the seafloor and water column of the U.S. Exclusive Economic Zone and other high priority areas, and obtaining new knowledge in the areas of climate science, energy and minerals, human health, ocean health, and marine archeology. Discoveries in these areas will be aided by the convergence of several key technologies: seafloor mapping with multibeam sonar, exploration of the deep sea with remotely operated and autonomous underwater vehicles, and telepresence through fiber optic and satellite links between ship and shore. Examples of these technologies and their applications will be drawn from expeditions of the Exploration Vessel Nautilus, which is operated by Dr. Robert Ballard and the Ocean Exploration Trust. Special topics will include deep sea hydrothermal vents, methane seeps, deep water corals and sponges, and seafloor minerals. This student-centered presentation will also include information on science and engineering internships aboard E/V Nautilus available to undergraduate and graduate students.

### Presentation Room G

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

Dr. Shannon Hayes Buenaflor and Dr. Nicole Roop – staff, 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 (COTS) and those scholarships awarded by the Clark School and its academic programs. The COTS scholarship program, provided through the Building Together Gift, is for engineering transfer students from community colleges in Maryland. The scholarship program's eligibility requirements, application process, and programmatic opportunities and support will be discussed.

## 11:30 am – 12:45 pm Poster Sessions

**Poster Session A – 11:30 am-12:00 pm**  
**Odd numbered posters (Pages 21 to 24)**

**Poster Session B – 12:15 pm-12:45 pm**  
**Even numbered posters (Pages 24-26)**

## **1:00 pm – 2:00 pm Faculty Centered Keynote**

**Keynote Address: Dr. Todd Zakrajsek**

## **1:00 pm – 3:00 pm Community College and Transfer Fairs**

### **Community College Fair Room A**

- Harford Community College
- Montgomery College

### **Community College Fair Room B**

- Frederick Community College
- Carroll Community College
- Anne Arundel Community College

### **Transfer College Fair Room A**

- University of Maryland Baltimore County (UMBC)
- Capital Technology University

### **Transfer College Fair Room B**

- University of Maryland College Park – Embedded Systems and Internet of Things (ESIOT) engineering, Information Studies
- University of Maryland Shady Grove – Engineering, Biocomputational Engineering

## **2:05 pm – 2:35 pm Third Breakout Session**

### **Presentation Room D**

*Telepresence and Science Communication in the New Age of Ocean Exploration*

Dr. Emil Petruncio – faculty, AACC

We are at the dawn of a new age of ocean exploration which involves the mapping and characterization of the seafloor and water column of the U.S. Exclusive Economic Zone and other high priority areas, and obtaining new knowledge in the areas of climate science, energy and minerals, human health, ocean health, and marine archeology. Discoveries in these areas will be aided by the convergence of several key technologies: seafloor mapping with multibeam sonar, exploration of the deep sea with remotely operated and autonomous underwater vehicles, and telepresence through fiber optic and satellite links between ship and shore. Examples of these technologies and their applications will be drawn from expeditions of the Exploration Vessel Nautilus, which is operated by Dr. Robert Ballard and the Ocean Exploration Trust. Special topics will include hydrothermal vents, methane seeps, deep water corals and sponges, and seafloor minerals. This faculty-centered presentation will also include information on Science Communication Fellowships aboard E/V Nautilus available to formal and informal educators.

### Presentation Room A

*Communicating in Equations and Formulas: Symbolic Representations and Challenges in the Online Course*

Dr. Alfred D'Agostino – faculty, CCBC

Teaching and comprehending physical and biological sciences, mathematics, engineering, rely on accurate communication of equations and formulas. In the online course, transmission of symbolic representations in documents and text fields will require student and instructor to use special techniques and tools. The equations and formulas displayed in posts, assignments, quizzes, exams and feedback should be correct and readable. For simple expressions, the LMS text editor or word Processor will suffice; HTML may be needed for special characters. Native math editors, such as MathType may be used if more detailed/ complex equations/ formulas are needed. If substantial composition and formatting is needed, expressions may be typed using LaTeX. LaTeX is a mathematical typesetting program; code is typed into a text file, then compiled into a document with standard mathematical notations. When MathType is interfaced with Microsoft Word, LaTeX code is automatically converted into mathematical symbols and notations. Accessible equations may be embedded in Microsoft Office, Google Docs, Mac Office Software using the MathType add-in. Creating equations using MathType, puts them into MathML format that can render directly in web browsers, where they can be read correctly by Jaws, NVDA, Read Aloud, Voice Over screen readers.

### Presentation Room B

*Global Project Development- Health Concerns in a Dynamic Human Population*

Lakshmi Rajkumar – faculty, CCBC

My presentation is about incorporating CCBC's intention to inspire our students to be global citizens within my coursework. Every year, the 'Community Book Connection' members at CCBC choose an important global issue and recommend a book for its faculty, staff and students to read and discuss. Last year the book that was chosen for this purpose was 'Threads' by Kate Evans. The book is based upon events that happened in a refugee camp called 'The Jungle' in Calais, France.

Our work for the fall semester of 2019 was to acknowledge the situation and tie it to microbiology. We discuss the disease process and how to control the spread of infections in a dynamic population like a refugee camp.

This presentation is a small inkling of how the classroom can be the place of global reform and inclusiveness. Schools and colleges have a social responsibility to introduce young minds to the problems and crises happening in the world.

The assignment was worth 50 points, which is 7% of the total points for this course.

This assignment was done in collaboration with the Library Services at CCBC. The librarians not only designed a beautiful web page filled with resources, but were also able to assist the students to complete the assignment. The students also received the opportunity to speak with the author of the book, Kate Evans, via Skype and exchanged questions and opinions about the refugee crisis.

### Presentation Room C

*Ethnomathematics: Bringing Cultural Diversity into the Classroom*

Elliott Grabill – faculty, BCCC

Ethnomathematics is the fascinating study of the way people around the world incorporate math into their cultures. For example, using a base-20 number system, the Mayans built a complex civilization and predicted the movement of the planets. The Warlpiri, and Australian aboriginal people, used algebraic group theory to determine who marries whom. The Chokwes of Africa used their own geometry to create sona, intricate designs whose mathematical properties tell myths and fables. Games, art, and music from across the world also incorporate mathematical concepts.

Standardized math curricula come under criticism for excluding demographics of people. Historically, this has included women, people of color, and people of lower incomes. One way math education can be improved is by showing math's relationship with liberal arts, not just sciences. Ethnomathematics teaches cultural appreciation, and empowers students who aren't inspired by the way math is normally taught. By studying the way other cultures use math, students discover their own ways of incorporating math into their lives. Ethnomathematics can be aligned with curriculum standards, giving students practice with the same mathematical concepts the state requires them to learn, just in a different context.

### Presentation Room E

*Discussion about Incorporating Research in the Classroom*

Dr. Savita Prabhakar – faculty, FCC

An example of how Frederick Community College has incorporated Course based undergraduate research experience (CURE) in their curriculum will be presented. Student experiences and results from one successful research project will be presented. Discussion among the faculty teaching life sciences who are interested in introducing CURE in their courses or programs will be encouraged. The challenges, benefits and feasibility of introducing CURE will be discussed.

### Presentation Room F

*To Prove or Not to Prove*

Dr. Stephen Wheatley – faculty, MC

Proofs in an elementary calculus sequence can be a tricky business - should they be included at all, and if so, which ones? With so much material to cover already, giving up valuable class time to prove results most students are all too happy to believe anyway can lead to some serious instructor stress.

The purpose of this talk is to present some examples of proofs that might really be worth talking about in your Calculus I, II or III course. The reason? They force students to synthesize all different kinds of information that they have learned before (and not just right before the proof, but semesters or even years before the class), thus providing a concrete answer to that daunting student question, "when will I ever use this stuff again?"

### Presentation Room G

*Refocusing Introduction to Engineering on Connections between Topics*

Tricia Crossett – faculty, CarrollCC

Typical Introduction to Engineering classes focus on soft skills, i.e. technical communication, team work, ethics, etc. These courses are often set up as a series of lectures about individual topics in sequence, often following the same organization as the chosen textbook. After teaching this course at Carroll Community College for a few semesters, it became apparent that students were not making connections between topics and skills addressed. Students would often comment that the lecture and hands-on lab were almost two separate classes. This feedback showed a need to make better connections between the course topics, lab experience, and engineering profession. Using a summer stipend, I reworked the entire course to a series of lectures that were based on the connections between topics instead of the textbook, while still meeting all course objectives. The new course plan was designed to help students better understand the connections between lecture, the hands-on lab experience, and how soft skills are an integral part of the engineering profession. The presentation will provide an overview of how the new lectures were developed to meet course objectives, a look at improvements in student outcomes, and how moving the course to online this past fall provided both additional improvements and challenges.

### Presentation Room H

*And We're LIVE! How to Proctor Exams in Real-Time Remotely*

Shawntaye Adams – faculty, CCBC

Due to the pandemic, many of us lost the use of our classrooms and testing centers to proctor our written or electronic exams. With little preparation, we scurried to administer our exams online. Unfortunately, as a result, reports of academic dishonesty increased at an alarming rate. When in-person proctoring is not an option, what do you do? Although proctoring software is an option, live proctoring may be more appropriate for some disciplines (e.g., mathematics). But how can this be done remotely? In this session, you will learn ways to proctor written or online exams in real-time using a video conferencing system.

### Presentation Room I

*Undergraduate Research at the Community College – Process, Lessons, and Observations*

Barbara Leitherer – faculty, CCBC; Hannah O'Brien, Trinity Obiorah and Bah'Inah Saint Fort – students, CCBC; Roy Dwarka, Jignasa Rami and Entela Xhane – faculty, CCBC

\*This is a 60 minute presentation – please stay in the room for both sessions

Over a period of three semesters, Mathematics faculty guided community college honors students through an independent study analyzing real-world global climate change data supplied by the World Wildlife Fund (WWF). Students had access to scientists who arranged for a general orientation session, provided coding guidelines, and answered questions. Student work culminated in a research paper and a presentation of their findings to the WWF. This student and faculty panel will reflect on strategies used to support both collaborative and independent learning in the remote environment; how this contributed to students' success; and how this type of undergraduate research enhances students' interest and engagement in research and their preparedness for further education and a successful STEM career.

### Presentation Room J

*Can We CURE Low Interest in Biotech Careers by Providing Students from Underrepresented Groups with Opportunities for Authentic Research in Genomics? Adaptation of a GEP Gene Annotation Project to a Community College Sophomore Level Genetics Classroom*

Dr. Natalie Minkovsky – faculty, CCBC

Genomics is a fast-developing branch of biology promising significant advances in numerous fields by providing tools to solve various problems, from tracing evolution of species to designing individualized medical treatments. Genomic approaches are increasingly employed by the biotech industry, which provides its skilled workforce with good, high paying jobs. Community Colleges, educating the majority of low-income students from underrepresented first-generation and minority groups, remain on the sidelines of these exciting developments, mainly due to the lack of student exposure to these tools and careers.

While recognizing the importance of student engagement in undergraduate research to increase interest in science and biotech careers, community colleges, for the most part, lack resources for conducting sophisticated research projects. This presentation will demonstrate how tools developed by the Genomics Education Partnership (GEP) were used to enhance student engagement and understanding of molecular genetics by incorporating low-cost authentic research projects into the sophomore level genetics curriculum at the Community College of Baltimore County.

### Presentation Room K

*Diversity, Equity and Inclusion in the Physical Sciences*

Dr. Anthony Santorelli and Dr. Seth Miller – faculty, AACC

Drs. Santorelli and Miller will share the work that they have done with their amazing colleagues to promote diversity, equity and inclusion at the course and department levels in the physical sciences at Anne Arundel Community College (AACC). They will share the motivations for this work as well as initiatives that they have participated in for relevant professional development, both through the college and through other outside opportunities. Examples of teaching strategies implemented in several physical science courses to promote these themes will be given along with student feedback on if those strategies promoted a comfortable, engaging learning environment. They will also discuss the three-part professional development workshop series on incorporating inclusivity in science courses that they presented in Fall 2020 to AACC faculty from across the college. Finally, next steps for future work will be outlined.

### Presentation Room L

*Writing and Managing a Million Dollar Grant in the Time of COVID*

Sandy Poinsett and Melanie Osterhouse, faculty – CSMD

This presentation will share lessons learned from applying for an NSF S-STEM grant. Also, the presenters will discuss the challenges and successes of starting and running the grant in the time of COVID, including implementing an undergraduate research experience.

The S-STEM grant provides academically gifted financially needy students the support and learning community needed to help with degree completion. The goal is to have these higher-risk STEM majors maintain full-time status and complete the associate degree in the intended two years. The College of Southern Maryland has been able to obtain this grant for the second time. The goal of the presentation is to help encourage other colleges to apply, to help navigate the difficult grant process (we got turned down 3 times before finally achieving funding), and to explain the impact of the grant on student success. We currently have an external evaluator and an educational researcher whose research from our first year of the new grant will be shared, including the students' sense of belonging in the STEM environment.



## 2:40 pm – 3:10 pm Fourth Breakout Session

### Presentation Room A

*Simulated Demonstrations using Excel Macros*  
M.J. Clark and Dave Baum – faculty, CCBC

### Presentation Room B

*Chemistry Experiments Completed at Home That Teach Core Lab Skills*  
William J.W. Miller – faculty, PGCC

One important component of teaching at a community college is addressing the needs of students who seek to transfer to a four-year college, earn an associate degree, and/or upgrade skills to enter the workforce. The coronavirus pandemic challenged us to develop a series of online labs in which students could learn these skills without physically being in a chemistry lab. This presentation describes our efforts to develop labs based around simple household chemicals and a lab kit of equipment, which can be purchased on Amazon for approximately \$60. Using this kit, we have been able to teach over 40 lab skills online that were normally taught in a face-to-face General Chemistry lab. Results from a student learning experience survey indicate that significant progress has been made towards students learning these skills using our kit.

### Presentation Room C

*Building a Stronger Future by Preparing Excellent STEM Teachers*  
Dr. Christopher Stromberg and Dr. Ann Stewart – faculty, Hood, Dr. Perry Wood - faculty, FCC

There is a pressing need, both locally and across the country, for excellent STEM teachers at the secondary school level. Preparing those teachers should be a critical priority for all levels of the education system. Training a diverse group of STEM teachers requires partnerships among local school districts, community colleges, and four-year institutions. Hood College's Noyce STEM Teacher Education Partnership (NSTEP) program is one example of such a collaborative effort, developed as a collaboration between Hood College, Frederick County Public Schools, and Frederick Community College.

The NSTEP program is an NSF-funded program that provides substantial scholarship support to students in the last two years of their Bachelor's degree and teacher certification program. This funding requires a commitment by the recipients to teach in a high-need school district for two years for every year of support that they receive. Because the program supports students in their final two years, transfer students from community colleges are encouraged to apply.

In addition to the scholarship support, the NSTEP program provides professional development opportunities for both pre-service teachers and college faculty and staff. Workshops on developing a growth mindset and teaching with culturally relevant practices have been offered, and additional opportunities are planned.

### Presentation Room D

*Using My Open Math for instruction*  
Dr. Mark Shore – faculty, Allegany

My Open Math (MOM) is a free learning management system for teaching mathematics and other STEM fields. It offers all the features of paid systems, such as My Math Lab, but has additional features such as: Math Forums; the ability to write and edit your own questions; linked written examples and videos; and the ability to select prepared courses and questions. In this presentation, you will see MOM sites that you can use and how to create your own site and add or write your own problems. The presenter has created MOM sites for Developmental Math courses, Math for Elementary School Teachers, Probability and Statistics and College Algebra.



### Presentation Room E

#### *Course-Based Undergraduate Research Experiences to Improve Undergraduate Student Learning in Stem Majors*

Dr. Chimdimma Esimai – Program Manager, Bowie State University and Dr. George Ude – Faculty and Chair, Natural Sciences, Bowie State University

Research experience is essential to the education and professional development of undergraduate STEM majors. To provide adequate opportunity for research experiences, the Bowie State University Department of Natural Sciences has embarked upon a Course-based Undergraduate Research Experiences (CURE) Program, in which faculty develop projects that engage whole classes of students to address a research question or problem that is of interest to the scientific community. Unique research projects across the department's curriculum afford multiple opportunities for undergraduates to explore research as a further career pathway and to develop technical skills. CURE courses are designed to complement and build upon one another in order to enhance student learning and provide maximum opportunity for impact. This year, CURE courses offer research opportunities to whole classes of students in molecular biology, genetics, immunology, cell biology, genetic engineering, microbiology, bioinformatics and organic chemistry.

### Presentation Room F

#### *Embedded Systems and Internet of Things (ESIOT) Undergraduate Engineering Program Introduction*

Dr. Mel Gomez – ESIOT Program Director and Ms. Glenn Kasten-Sportes – ESIOT Program Coordinator, UMD

The Bachelor of Science in Embedded Systems and the Internet of Things (ESIOT) is a new undergraduate Engineering program offered by A. James Clark School of Engineering at the University of Maryland, College Park. This program is offered through the Department of Electrical and Computer Engineering and is held at the Universities at Shady Grove campus in Rockville, Maryland.

The Embedded Systems and the Internet of Things (ESIOT) curriculum is a combination of Electrical Engineering, Computer Engineering, Computer Science, and Networking, with courses designed and developed by University of Maryland faculty members, in collaboration with experts in the industry. This is the first undergraduate engineering program to be offered at the Universities at Shady Grove campus and is intended for transfer students pursuing a STEM program at any public Maryland community college. This unique curriculum trains students in hardware and software design, with specializations in the areas of networks, cyber security, and machine learning, and offers a balanced method of course instruction between theory and real-world hands on experience.

We invite prospective students to join us for a brief presentation introducing this innovative new undergraduate engineering program and its importance within the rapidly growing industry of the Internet of Things (IOT).

### Presentation Room G

#### *Global Learning in Mathematics Courses*

Radhakrishnan Palaniswamy and Adugna Kebede, faculty – CCBC

Mathematics courses incorporate elements of global learning in several ways. One effective way is through the use of assessments. This is especially true with multicultural students, who become more engaged when application-based assessments are created by incorporating global learning features. In this session we will share our experience on how global learning features can improve student success. During this session the attendees will: 1) explore how global learning can improve student success; 2) learn how to incorporate global learning features in their assessments; and, 3) describe how to engage multicultural students through application based assessments.

## Presentation Room H

### *Open Educational Resources*

Deepa Radhakrishnan and Daniel Izume – faculty, BCCC

The high cost of textbooks affects the retention of low-income students in colleges in the United States. Our main focus is to transform and empower teaching and learning through high-impact educational content and practices to build equity, access, and inclusion for all. The proposal will focus on OER foundations and practices, and adopting and integrating OER directly into the Canvas course shell for STEM-related courses. Adding the OER resources is an effective way to share course materials with students in Canvas. Our presentation will help faculty develop OER content to increase the availability of high-quality educational resources to all students. We will discuss adapting and authoring open and affordable course content as well as revising the course to accommodate the open and low-cost resources. To sum up, our presentation would include ways to increase affordability and enhance learning experiences by adapting and authoring open/affordable content.

## Presentation Room J

### *Earth Scientist Spotlights in the Classroom*

Dan Ferandez and Katherine Keough – faculty, AACC

During the 2020 school year, a five-member cohort of Earth Science faculty at Anne Arundel Community College (AACC) participated in a year-long series of workshops and activities through the 'Supporting & Advancing Geoscience Education at Two-Year Colleges' (SAGE 2YC) program. As a result, the cohort members conducted a culminating 3-part virtual workshop for AACC faculty and staff, with focus on the infusion of diversity, equity, & inclusion in the classroom. A part of this workshop series included the incorporation of Earth Scientist Spotlights within their Earth Science courses. Earth Scientist Spotlights assignments are meant to:

- bring student awareness of the many Earth Scientists from all different backgrounds, who have made significant scientific contributions in their respective fields, and
- provide avenues for minority students to identify with those scientists sharing similar backgrounds and similar challenges.

As a result of preparations through the SAGE 2YC program activities, feedback from the 3-part workshop, plus classroom experiences based on different variations of the Scientist Spotlights assignments attempted during the Fall 2020 and Spring 2021 semesters, this presentation is meant to report on initial experiences, lessons learned, and also ask for any shared experiences and insights about the topic.

## Presentation Room K

### *How to Help Students Minimize Anxiety Before and During Exams*

Joseph Sparenberg – faculty, HowardCC

Initially, Joseph struggled on exams regardless of how well he understood the material. He was the student who left exams and never came back due to a panic attack. He was going to fail out, so he took some time off. During the time off he got the help he needed for anxiety. A decade later, he returned to school at CCBC. Then, he transferred back to UMBC and, while working full time, earned dual BS degrees in Biochemistry and Biology. Continuing at UMBC for Chemistry, he earned his MS in 2019. He would not have been able to do it without getting help and has made it a major focus to help students succeed in difficult situations. It also helped that he is certified in Mental Health First Aid. Between personal experiences as a student and observations as an instructor, he created tips to help students combat anxiety before and during exams. Initially an announcement to a class, it blossomed into this presentation for instructors. Included are tips for students, tips for instructors, and signs for instructors to look for. Sometimes students often are not willing to reach out to us. We need to reach out to them.

# Student Talk Abstracts

## 10:20-10:50am Presentation Room A

*Species-Specific and Generalized Inductions of Preference in Manduca sexta*

Pilar Thomas and Mary Lenahan – students, HowardCC

Mentor: William Gretes – faculty, HowardCC

Diet-induced changes in the feeding preferences of *Manduca sexta* caterpillars have been observed in a number of studies. In the current study, two types of feeding inductions (species-specific and generalized) were explored using primarily non-solanaceous plants.

Larvae were reared in a greenhouse on rapeseed (*Brassica napus*), turnip (*Brassica rapa*), and cabbage (*Brassica oleracea*) from the family Brassicaceae; cowpea (*Vigna unguiculata*) and pea (*Pisum sativum*) from the family Fabaceae; and tobacco (*Nicotiana tabacum*) from the family Solanaceae. Freshly-molted 5th instar larvae were recorded using cameras during a no-choice test in which they were given a single leaf from a test plant. Percent consumption was visually analyzed over a 10-hour period. Our feeding assay data provides evidence for: (1) species-specific induction of preference for cowpea, as well as: (2) generalized induction of preference for pea-reared larvae on cowpea, cowpea-reared larvae on pea. We conclude that both species-specific and generalized inductions of preference exist in some, but not all, non-solanaceous plant rearing and testing combinations. Our findings expand the understanding of inductions of preference and reveal that the mechanism for these inductions may be more complex than concluded by previous studies.

## 10:20-10:50am Presentation Room B

*Increasing Triacylglycerol (Tag) Production with Gene Mining Techniques in Various Algal Species*

Aditi Madabushi – student, UMBC

Mentor: Dr. Stephen Miller – faculty, UMBC

The need for biofuel production is continually increasing as energy demands surge. One of the most promising biofuel producers is algae. Algal biofuels are extracted from polar and nonpolar lipids. A class of nonpolar lipids, triacylglycerols (TAGs) are the preferred neutral lipids for biofuel production. The focus of this research is to find mechanisms to improve production of TAGs by identifying genes in algal species that can influence TAG production. The species used for this research were chosen for their application as model systems (*Chlamydomonas reinhardtii*) or abilities to produce large amounts of oil (*Nannochloropsis oceanica*). This study uses bioinformatic and gene mining techniques through Phytozome and MycoCosm databases to devise an in silico strategy for enhanced biofuel production. Analysis of these species through gene mining techniques, protein alignment and keyword search methods, will help create an inventory of TAG related genes. Our preliminary findings showed different numbers of fatty acid and TAG genes present in *N. chloropsis* compared to *C. reinhardtii*. These results could provide a possible correlation between the number of genes and the amount of TAG produced in an organism. The project's outcome could be instrumental in translating laboratory studies towards the goal of enhanced biofuel production.

## 10:20-10:50am Presentation Room B

*Unpacking a Genome: Building the Foundation for Future Discoveries*

Jacob Funk – student, CCBC

Mentor: Dr. Natalie Minkovsky – faculty, CCBC

A functional model of the coding region for contig42, a segment of the *Drosophila bipectinata* genome found on the 4th chromosome or the Muller F element, will be presented. This work was completed by the Community College of Baltimore County students and faculty in conjunction with the Genomics Education Partnership, a network of colleges and universities that crowd-sources comparative genome analysis to hundreds of institutions across the nation in order to broaden the modern understanding of how chromosomal expansion impacts the evolution of gene and chromosomal characteristics.

**10:20-10:50am Presentation Room C**

*Reimagining the Complex Plane*

Joshua Thomas – student, MC

Mentor: Zhou Dong – faculty, MC

Jean-Robert Argand, a simple bookkeeper in Paris used his amateur mathematics skills in order to form the complex plane. Although these ideas were already circulating due to mathematicians such as René Descartes, Argand was the first to pioneer the complex plane and ideas such as imaginary numbers by means of a geometric application. This project aims to rediscover these basic geometric principles in Argand's complex plane, their application in the modern era, and propose the idea of imaginary numbers as a misnomer for students today.

**10:20-10:50am Presentation Room C**

*A Look at Early Graph Theory and Minimum Spanning Trees*

Koray Bailey – student, MC

Mentor: Zhou Dong – faculty, MC

In the mid 1800s Arthur Cayley would develop the concept of trees as he attempted to count labeled versions of this construct. This branch of graph theory would only grow from there. His work would be further expanded on by German mathematician Heinz Prüfer, who developed a method for counting labeled trees, motivated by counting the possible ways to construct railway networks in order to connect towns with the least number of railway segments. Finally, Otakar Borůvka, would develop a method for constructing a minimal spanning tree, a tree that connects all points where the weights of the paths are minimized. We follow in the footsteps of these pioneers as they make their discoveries, culminating in a Java implementation of Borůvka's algorithm for finding the minimal spanning tree of a graph.

**10:55-11:55am Presentation Room A**

*Effects of Changing Rainfall Patterns on Livelihood in Tanzania*

Angel Obiorah – student, CCBC

Mentor: Jignasa Rami – faculty, CCBC

In this study, raw data in the form of interviews on changing rainfall patterns in Tanzania, from the World Wildlife foundation were utilized. This data was divided based on the location of the interview. This division is paramount, as Tanzania has several physical features that contribute to its high local variability in its climate.

These changing patterns have a domino effect on the livelihood of people. Ranging from agricultural practice, as well as livestock practices and cultural practices, to human wildlife conflicts, economy, wildlife migration, and down to the prevalence of diseases especially Cholera and Malaria.

The study focused on finding the correlation between the changing rainfall patterns and its effects on life in Tanzania. This study is derived from interviews from locals throughout Tanzania, reporting their personal observations on the changing rainfall pattern, as well as how it directly and indirectly affects livelihood, and their responses to this change. The SPSS software will be used to test variables to detect any association.

**10:55-11:55am Presentation Room B**

*When Polycythemia Vera is JAK2-Negative: an Investigation of Non-Driver Mutations*

Piper Fair – student, MC

Mentor: Deborah A. Sterner-Krizman, Ph.D. – faculty, MC

Polycythemia Vera (PV) is a rare, life-threatening blood disorder which carries an elevated risk of thrombotic events over a patient's lifetime. PV is a myeloproliferative neoplasm (MPN) characterized by increased red blood cells (RBC) and in many cases, increases in leukocyte and platelet levels. In 95% of patients, the molecular driver of this chronic disease is a single mutated hematopoietic stem cell in the bone marrow. This mutation is found in exon 14 of the Janus Kinase 2 (JAK2) gene. Patients positive for the JAK2 mutation carry an additional risk of progression to Myelofibrosis (MF) or transformation into Acute Myeloid Leukemia (AML). As a result of PV's diverse phenotypic heterogeneity, further sequence analysis is needed to discover potential non-driver mutations (NDMs) that contribute to disease progression in JAK2-negative patients. Literature-backed evidence of potential NDMs supports the creation of a genetic risk profile for improved disease prognostication. We propose PCR amplification and sequence analysis of the candidate gene ASXL1, identified as a potential NDM in the literature. Work will focus on samples obtained from JAK2-negative PV patients. Sequencing data will also be compared to results of phlebotomy therapy in this same group of PV patients over a 3-5 year period.

**10:55-11:55am Presentation Room C**

*Comparison Between Availability of Organic Matter and Chemical Indicators in Burnt and Unburnt Soil from Black Hill Regional Park*

Tiziano Russo – student, MC

Mentor: Kiersten Newtoff – faculty, MC

Natural disasters and misuse of resources can result in catastrophic impacts on soil quality. It is necessary to understand the consequences that such unpredictable events can have on our ability to take advantage of lands for agricultural development. In this study, burnt and unburnt parts of Black Hill Regional Park, MD, where a wildfire occurred in 2016, were analyzed to test for differences in soil organic matter (SOM), pH, cation exchange capacity (CEC), and availability of the three main soil nutrients (nitrogen, phosphorus, and potassium). Soil samples were collected from both areas and sent to a lab for analysis. Unburnt soil was found to have significantly lower pH, higher potassium, higher SOM, and better CEC than burnt soil. The difference in nitrogen and phosphorus was determined insignificant. Overall, unburnt soil had a better quality than burnt, despite being more acidic. Further study will be necessary to address limitations present in this research and to investigate other determinants of soil quality, such as physical and biological properties.

**10:55-11:55am Presentation Room C**

*The Relationship Between Race/Ethnicity and Suicide Deaths in New York Between 2003-2017*

Teresa Doley – student, MC

Mentor: Zhou Dong – faculty, MC

To improve suicide prevention efforts, recognizing racial differences in the amount of suicide deaths is crucial to design effective suicide prevention outreach programs. When research has been conducted on how race affects the rate and number of suicide deaths, American Indians commit suicide at a higher rate than other racial groups. This project aims to determine if race/ethnicity is related to number of suicide deaths in the state of New York from 2003-2017. To test the hypothesis, I used the programming language R to run statistical tests on a dataset from New York. The data were collected by observations of death certificates on record from 2003 – 2017. The results showed that Hispanics had a particularly high number of suicide deaths relative to the other ethnic groups. A Kruskal-Wallis test provided evidence that the Hispanic group had experienced a significantly higher number of suicide deaths relative to the Black, Other, and White groups (p-value = 0.00000005444). These results suggest that there is strong evidence to support a difference in suicide deaths between different racial groups in NY between 2003 – 2017. On this basis, race and ethnicity of the targeted demographic should be considered when designing suicide prevention programs.

**10:55-11:55am Presentation Room E**

*Reducing Error in Quantum Computing With Improved Circuit Design Methods*

Zobia Khan and Alexandar Jones – students, HowardCC

Mentor: Dr. Alex. M Barr – faculty, HowardCC

Using IBM's Quantum Experience platform, we compare the accuracy of two different implementations of a half adder circuit on IBM's quantum computers. We set out to show that a system of gates can perform the same logic function while reducing the error introduced to the algorithm. We find that the reduced number of Controlled-Pauli X gates that compose the improved AND (QAND) gate-set compared to the standard Toffoli AND gate results in significantly less error. We propose that the QAND gate-set, composed of two Controlled- Hadamard gates with a Controlled Pauli-Z gate in between, can often provide more accurate results than a Toffoli gate in quantum algorithms.



# Poster Abstracts

## Session A – odd numbered abstracts

**1. Noyce STEM Teacher Education Partnership: Preparing Secondary Education STEM Teachers** Dr. Christopher Stromberg – faculty, Hood, Dr. Perry Wood – faculty, FCC

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.

**3. Surface Water Quality for Cu and Mn around the HCC Campus**

Vincent Carmody – student, HowardCC

Mentor: Dr. Hannah Pie – faculty, HowardCC

Water pollution is a serious issue which requires constant attention. This problem requires frequent monitoring because surface water flows into reservoirs. In this study, concentrations of copper (Cu) and manganese (Mn) were determined in surface waters around Howard Community College (HCC). Surface water was collected at four locations, processed, and then analyzed using an atomic absorption spectrophotometer. Preliminary work was needed to determine the appropriate methods for analysis.

The Cu concentrations in our samples ranged from below detection limit to 9.18  $\mu\text{g/L}$ , with the highest concentration being detected in the early spring. The Mn concentrations in our samples ranged from 1.90 to 766  $\mu\text{g/L}$ , with the highest concentrations being detected in the early spring. This suggests a contribution of Mn due to increased leaching in the presence of road salt. The greatest concentration of Cu was 9.18  $\mu\text{g/L}$ , and the EPA limit for Cu is 1.3 ppm (1300  $\mu\text{g/L}$ ), well below the EPA limit. However, the EPA limit for manganese is 50  $\mu\text{g/L}$ , and our greatest concentration was 766  $\mu\text{g/L}$ , approximately 15 times higher than the level the EPA considers safe for drinking water.

## **5. Molecular Mechanisms for Circadian Rhythms in the Tobacco Hornworm (*Manduca sexta*)**

Mary Green and Jennifer Jun – students, HowardCC

Mentors: Dr. Hannah Pie and Dr. Ellena McCarthy – faculty, HowardCC

The tobacco hornworm, *Manduca sexta*, notorious for its peculiar feeding behaviors toward the plant family Solanae, is known to the agricultural world as a pest. The exact reasoning behind this voracious feeding preference of Solanae is currently unknown. However, the molecular mechanism of circadian rhythms has been found to effect feeding behaviors in a multitude of organisms. Recent research has discovered tissue within the antennae of the adult *Manduca sexta* containing period (*per*) gene expression, a gene associated with circadian rhythms. Therefore, we will investigate the *per* gene and quantify its expression at two different larval stages, just hatched and 5th instar larvae. In this experiment, primers were designed to amplify the *per* gene in *Manduca sexta*. Our research then utilized PCR and qPCR to analyze the presence and quantify the expression of the (*per*) gene. The products of PCR were analyzed using agarose gel electrophoresis and the quality of the qPCR results was verified via melting curve analysis. Our qPCR results suggest that the *per* gene is expressed in both the just hatched larvae and the 5th instar larvae. These data will allow for further studies to tease out correlation between circadian rhythms and feeding behavior in *Manduca sexta*.

## **7. Whoa, Equine Math!**

Amy Germain – student, HowardCC

Mentor: Dr. Loretta FitzGerald Tokoly – faculty, HowardCC

Mathematical modeling is useful for a variety of different data sets. This project explored applying it to the field of equestrian show jumping. The main goal was to attempt to predict competitor rankings at the highest level of global competition. The main data set for this mathematical analysis encompasses the characteristics of competitors at ten 2019 European World Cup show jumping events. The year 2019 was chosen due to the varied nature of 2020 sporting events from COVID-19 pandemic restrictions.

Based on an initial examination of the data to determine correlations between rankings and characteristics; scatterplots were created comparing the likely main contributing factors to winning. The graphs compared ranking results to jump heights, horse/rider number of competitions, competition frequency, and the horse's age. Linear regression analysis was applied to these factors and also total horse/rider competitions and rider age to find contributing factors. Linear Algebra was used with five of these factors to create a model for prediction. The equations found from the calculations of the 2019 data were used to examine 2018 data to see if the patterns or coefficients were still valid.

## **9. HCC's Next Generation of Exoplanet Research**

Bryan Cheung, Nichole Warner, Farah Razzak and Johnathan Hernandez – students, HowardCC

Mentor: Dr. Brendan Diamond – faculty, HowardCC

As the field of exoplanet research has progressed, further improvements to the quality of data are necessary to detect more subtle signals. Four aspects of the HCC telescope's hardware were analyzed: the impact of telescope rebalancing, uniformity of focus, choice of calibration method, and linearity of the camera. Rebalancing the telescope has significantly improved telescope tracking; the drift before was 6.8 pixels/hour horizontally, and 2.68 pixels/hour vertically. After rebalancing, the drift was less than 0.25 pixels/hour in the horizontal and vertical axes. For the focus, there was a clear systematic difference that yielded a uniform focus; the manufacturer's adapter maintaining a focus of  $\pm 0.3$  pixels, while the 3D printed adapter had a focus of  $\pm 2$  pixels. The twilight sky was determined to be slightly more precise than images of a calibration light panel; the twilight sky white calibration images yielded an average coefficient of variation of 0.84%, while the light panel white calibration images had an average coefficient of variation of 1.17%. The camera was linear in its response to incident light, within the nine regions analyzed, and precise for measurements of light in these regions for exposure times greater than 10 seconds and a brightness less than 60000 ADU.



### **11. *Testing Probiotic Supplements' Abilities to Accelerate Digestion in an Artificial Stomach***

Brandon Bitz, Maxwell Angell, Henry Grosh, Amir Rasul and Dalton Schwanke – students, CarrollCC  
Mentors: Dr. Gregory Leppert, Dr. Jennifer Fain-Thornton and Dr. Raza Khan – faculty, CarrollCC

There is currently a massive market for probiotic supplements and products. However, their efficacy is not clear and there is a lack of conclusive scientific evidence that supports their effectiveness. This investigation will analyze the effects of multiple probiotic supplements on digestive performance by simulating the digestive process. To evaluate the effectiveness of several probiotics, the digestive environment was emulated using a solution containing 0.154M HCl, 0.086M NaCl, 0.067M KCl, and .0000715M pepsin. The nutrient source evaluated will be beef, which provides large amounts of proteins and a small amount of lipids.

### **13. *Farmer's Almanac Research Mission***

Austin Leister, Matthew Hodgdon, Genevieve Thacker and Libby Kramer – students, CarrollCC  
Mentors: Dr. Raza Khan, Dr. Gregory Leppert, Dr. Razieh Shahriari and Mr. Peter Hiltz – faculty, CarrollCC

Long range weather predictions have long been regarded as inaccurate, due to their difficulty in accounting for the dynamic nature of the atmosphere. The Old Farmer's Almanac, founded in 1792, intended to provide a solution to this problem, claiming to have an 80% accuracy rate for predicting precipitation values 12 to 16 months in advance. Collection of the monthly precipitation predictions (given in inches of melted precipitate) from the years 2011 through 2020 for the Appalachian region has been compiled and compared to archival precipitation data acquired from the National Oceanic and Atmospheric Administration (NOAA). Through binary code analysis and utilization of Microsoft Excel and Python Software, the group will either confirm or reject the claim that The Old Farmer's Almanac has an 80% accuracy, regarding their precipitation predictions for the Appalachian region. The research group will be looking at 1320 data points over a ten-year period.

### **15. *Automatic Facial Covering Verification System***

Patrick Yarber, Bryce Schilling, Nikolai Haldorsen and Ryan Gilbert – students, CarrollCC  
Mentors: Alan Cudmore – engineer, NASA, Peter Hiltz and Dr. Raza Khan – faculty, CarrollCC

This research project creates a system to identify if someone is wearing their mask according to CDC guidelines. Entry to a building will be permitted or denied upon verification that a mask is being worn correctly and specific questions are answered. To accomplish this, the group is using a Raspberry Pi 4, a NVIDIA Jetson Nano, a Logitech HD Webcam, and a Google Voice Kit. The Google Voice Kit is presented as the beginning of the process using a button to begin the device's dialogue. Using the Raspberry Pi 4, the device will receive information from the Logitech HD Webcam, through the NVIDIA Jetson Nano, if the user is wearing a mask. The technology will be integrated into a system that will control a door lock to allow or deny entry into a building.

**17. Teaching STEM During Remote-Learning: Being a Virtual Learning Assistant at Montgomery College**  
Ashley Pattammady – student, MC  
Mentor: Carolyn Schick – faculty, MC

Montgomery College provides students with the opportunity to try on teaching through its STEM Learning Assistant (LA) program. The journey of a Learning Assistant was documented as the LA was immersed in the remote lecture and discussion components of a first-semester chemistry course. The LA presented lessons and problems to the class, worked alongside the professor assisting students, and held collaborative study sessions each week. The LA was supported through one-on-one LA/faculty mentor meetings and by attending weekly pedagogical training sessions with cohort LAs. Being in a virtual environment, the students benefited from having a Learning Assistant embedded in their class - they saw the LA as a successful and resourceful peer-model and the LA increased student confidence and understanding of the course material by encouraging students to articulate and defend their ideas. Having completed the course recently, the LA also provided helpful study tips and strategies to the students. Throughout the experience, the LA gained a deeper knowledge of chemistry plus a unique teaching experience, and the students gained a supportive peer who helped them to foster a positive attitude toward learning chemistry - all leading to student success and increased interest in STEM teaching for everyone involved.

## **Session B – even numbered abstracts**

### **2. STEM Scholars at FCC**

Dr. Matthew Lochman – faculty, FCC; Alan Whelan and Laure Fom Kembou – students, FCC  
Student Mentors: Dr. Brian Stipelman – Administrator, FCC; Dina Yagodich – faculty, FCC

Funded by an S-STEM grant from NSF, the STEM Scholars program at FCC helps students with demonstrated financial need by providing additional levels of support in both academic and non-academic areas. The three main components of the program involve a 4-credit sequence of professionalization seminars, a faculty mentor who meets with the students at least twice per month, and additional scholarship funding based on cost of living aimed at decreasing or eliminating the need to work to pay for tuition. Our poster will highlight the program features and requirements. Faculty and students will be available to discuss their involvement in the program.

### **4. Annotation of *Drosophila ananassae* gene (CG7414)**

Phebe Ismail and Similoluwa Olatunde – students, CCBC  
Mentor: Dr. Natalie Minkovsky – faculty, CCBC

A gene annotation research project, which is the procedure of assigning functions to different parts of a newly sequenced genome, in this case, the *Drosophila ananassae* MullerD\_Mar2020\_contig2, was carried out using tools provided by Genomics Education Partnership for the genetics class. Annotations can be performed on three main levels: nucleotide-level, protein level, and identifying pathways and processes. The successful annotation of a gene provides accurate information for different species and populations which leads to the advancement of bioinformatics and the science of genetics.

In this project we hypothesized that assigned contig 2 would have a gene which can be identified by the homology to a *Drosophila melanogaster* gene, presence of start codon, in-frame coding regions uninterrupted by stop codons, splice sites and other data. The initial survey of contig 2 in UCSC Genome browser identified regions of homology to *D. melanogaster* CG7414 gene. BLASTX was used to identify regions within the project sequence that code for amino acid sequences similar to the *D. melanogaster* CDS. Gene record finder was used to ascertain the gene structure for the *D. ananassae* CG7414 gene, and the gene model checker was used to confirm the validity of the gene model coordinates.

## **6. Annotation of *Drosophila bipectinata* contig18 by Employing Homology to *D. melanogaster***

Kento Crocitta and George Njuguna – students, CCBC

Mentor: Dr. Natalie Minkovsky – faculty, CCBC

A research project in the gene annotation of contig18 from the *Drosophila bipectinata* genome was conducted for the Genetics class. Gene annotation is an important task for the advancement of genomics because sequence of nucleotides alone does not give information about genes and other genetic elements present in a newly sequenced genome.

The genomics tools that were used in this project were the Fly Base website, NCBI BLAST website, and the GEP UCSC Genome Browser, Gene Record Finder, and Gene Model Checker. The hypothesis was that the final gene model of the *D. bipectinata* genome would be relatively homologous to that of *D. melanogaster*. The use of exons, splice sites and presence of ATG codon helped in comparing the genes to find homology between them. It was expected that the genes and promoter regions within contig18 are mostly aligned with the ones shown in *D. melanogaster*, supporting the hypothesis that both genomes are relatively homologous.

## **8. Wound Healing: Analysis of two *in vitro* models of murine fibroblasts using ImageJ**

Matthew Allen – student, MC

Mentor: Victoria Virador, Ph.D. – faculty, MC

We have studied two *in vitro* models of tissue regeneration after injury which recapitulate the necessary requirements of cell proliferation and cell motility to close the wound. In this presentation, we examine cell motility and the behavior of fibroblast cultures in 2- and 3-dimensional scratch wound models. Because Manuka Honey (MH) has been found to influence cellular migration and proliferation, we used it to demonstrate its effects on wound closure and cellular dispersion. Methods: Fibroblasts were cultured in Monolayers (2D) and Pancakes (3D). Cultures were scratched and photographed to observe wound healing progression. In some experiments MH was applied to the monolayers in various concentrations. Results: Monolayer culture scratches closed significantly faster than Pancake cultures, and MH had a significant impact on monolayer wound closure in a dose-dependent manner. Our image analysis provides initial insights into the closure mechanisms in the Pancake model. Conclusions: Natural compounds like MH can potentially be used to accelerate wound healing by influencing fibroblast motility and behavior.

## **10. Uniquely Similar: A Summary of Strathdee**

William M. O'Boyle – student, Allegany

Mentor: Steven Heninger – faculty, Allegany

Discovered by the University of Ottawa and Annotated by Allegany College of Maryland, Strathdee is a bacteriophage, categorized with the EA1 sub cluster. The goal of this project was to find how this virus fits within its close and extended family. Using resources provided by Phages DB and Allegany College of Maryland it was found that Strathdee has closely related genetic and geographic characteristics and preferences that provide more evidence surrounding the EA clusters. It also shows the virus has some unique variation such as its boreal discovery and far northern location setting it apart from the others of its family.

## **12. *tRNA in Phage Dignity and tRNA's role in Bacteriophages***

Cheyenne Wright – student, Allegany

Mentor: Steven Heninger – faculty, Allegany

tRNAs are highly structurally conserved molecules that are frequently found in specific clusters of bacteriophages. One tRNA was found in Bacteriophage Dignity of Cluster A based on SEA-PHAGE tRNA identification criteria. Research into why tRNA may be in bacteriophages was conducted. tRNA in phages appears to serve a role in infecting multiple hosts. tRNA is usually found in certain areas of the phage genome. One study found that when the DNA's G to C ratio is different between the bacterial host and the phage, the phage is more likely to contain tRNA in its genome. Another study proposed that tRNA in phage genomes may be lifted from bacterial hosts, but further research is needed. Phage Dignity's tRNA appears to fit the findings of specific location for tRNA genes in Cluster A, typically found before lysin A and has a 4% G to C ratio difference than its host.

## **14. *Cytokine Expression and Treatment in HepG2 Cells***

Ian Cubit and Victoria Kulikowski – students, FCC

Mentor: Dr. Savita Prabhakar – faculty, FCC

Several cytokines are associated with inflammation, chronic illness, and subsequent cancer. Anti-inflammatory molecules could pose a preventative treatment to high-risk patients as they help decrease inflammation. Budesonide is an anti-inflammatory medication used in the treatment of ulcerative colitis, as well as asthma. This molecule holds a three-fold potency when compared to prednisone but features extensively less systemic side effects. Utilizing ethanol and lipopolysaccharide, we will induce cytokine expression and then examine the efficacy of budesonide as a treatment in HepG2 cells. Our target proteins will include tumor necrosis factor alpha, transforming growth factor beta, oncostatin m, and intracellular adhesion molecule 1. These proteins hold a strong correlation to chronic illness, as well as cancers.

## **16. *Where are the Active Galaxies in the Infrared?***

Joseph Mooney – student, AACC

Mentor: Marcio Melendez – faculty, AACC

The class of galaxies called Active Galaxies (or AGNs) have supermassive black holes in their centers, where an accretion disk around the black hole transforms matter from the disk into energy. The immense energy output of an AGN has direct implications for the evolution of the Universe over cosmic timescales, therefore, it is important to determine their spatial distribution and population. In order to study AGNs, we rely on certain selection criteria that allow us to collect statistically significant data samples. One way to do this is by analyzing infrared light and determining color differences over a large array of likely objects.

Throughout this project, we used observations from the Wide-field Infrared Survey Explorer (WISE) to select a subset of AGNs from a large sample of pre-selected X-ray bright AGNs. The purpose of this study was to evaluate a particular method, Infrared selection, and determine its validity for a collection of various AGN spectra. From this process, we found that Infrared selection failed to reliably detect many AGNs at low luminosity. We concluded that infrared selection criteria are generally unreliable for low- to intermediate-power AGNs.

## Thanks to our Sponsors!



*You Can Get There From Here.*





AT



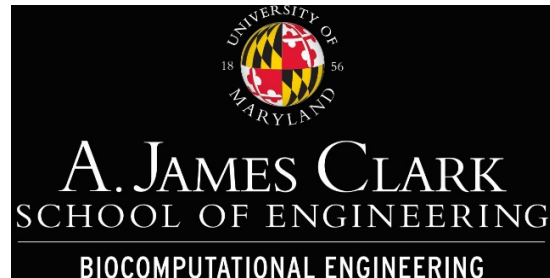
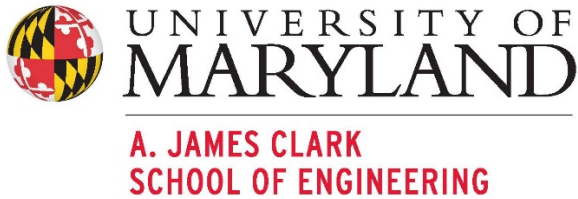
AT



The Universities  
AT SHADY GROVE

Embedded Systems & Internet of Things

DEPARTMENT OF ELECTRICAL & COMPUTER ENGINEERING  
A. JAMES CLARK SCHOOL OF ENGINEERING



Our Gold Sponsors!





**ANNE ARUNDEL  
COMMUNITY COLLEGE**

*School of Science  
and Technology*

**EXPLORE** *high-demand,  
technical and scientific fields.*

**BUILD** *on current skills  
and gain expertise.*

*Certificate and degree  
programs available.*

***ENHANCE  
YOUR CAREER  
POTENTIAL!***

For more information visit the  
School of Science and Technology  
at [www.aacc.edu](http://www.aacc.edu).



Capitol Technology University proudly recognizes the 2021 Maryland Collegiate STEM Conference participants.



*Congratulations!*

**Charge Up Your Future.**

1.800.950.1992  
[www.captechu.edu](http://www.captechu.edu)

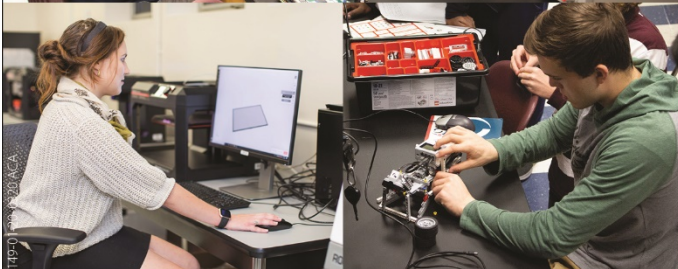
Capitol Tech is an innovator in engineering education as recognized by the Accreditation Board for Engineering and Technology (ABET), Capitol is the only independent college in Maryland dedicated to engineering, computer science, information technology, cybersecurity, data science, business, and management of technology.



# *Congratulations*

Student participants of  
6<sup>th</sup> Maryland Collegiate STEM Conference

With special recognition  
to our Carroll presenters!



Carroll Community College offers such leading-edge STEM programs as:

- Biology
- Chemistry
- Cybersecurity
- Digital Design & Fabrication
- Engineering
- Geology
- Physics



**CARROLL**  
COMMUNITY COLLEGE

Explore Carroll's STEM programs at [carrollcc.edu/STEM](http://carrollcc.edu/STEM)

# Congratulations

to the presenters and participants of the 2021 Maryland Collegiate STEM Conference.

## Prepare for a STEM Career

Science, Technology, Engineering, and Math (STEM) fields are rapidly growing.



**\$54,745**

Typical full-time STEM worker earnings among those with some college education\*



**\$86,980**

STEM median annual wage\*\*



8.0% STEM job growth 2019-2029\*\*



One third of U.S. workers are STEM professionals\*\*\*



STEM workers with some college education earn 26% more than similarly educated non-STEM workers\*



Computer occupations are projected to make up 2/3 of all new STEM jobs created by 2029\*\*\*\*

### Frederick Community College (FCC) STEM Programs

- Audio Production
- Biology
- Biotechnology
- Chemistry
- Computer Aided Design
- Computer Science
- Construction Management
- Cybersecurity
- Engineering
- Game & Simulation Development
- Information Technology
- Mathematics
- Network Engineering
- Software Engineering
- STEM
- STEM Technology

[frederick.edu/programs](https://frederick.edu/programs)

### FCC STEM Scholarship and Apprenticeship Opportunities

STEM Scholars:

[frederick.edu/STEM-Scholars](https://frederick.edu/STEM-Scholars)

Registered Biological

Technician Apprentice Program:

[frederick.edu/apprenticeships](https://frederick.edu/apprenticeships)

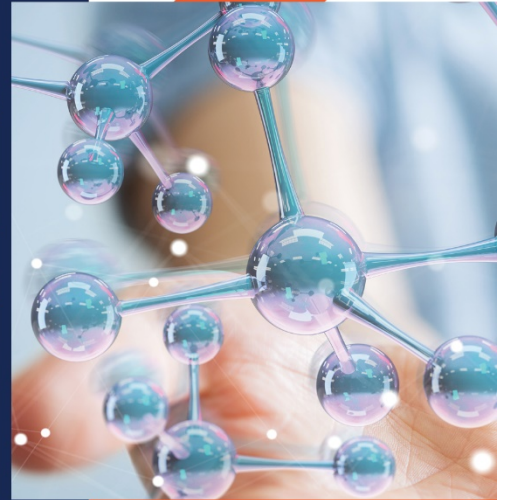


Frederick Community College Admissions: [admissions@frederick.edu](mailto:admissions@frederick.edu) • 301.624.2716

\* Source: Pew Research Center <https://www.pewresearch.org/fact-tank/2018/01/09/7-facts-about-the-stem-workforce/> \*\* Source: The U.S. Bureau of Labor Statistics (BLS) 2019–29 employment projections <https://www.bls.gov/emp/tables/stem-employment.htm> \*\*\* Source: Consortium of Social Science Associations (COSSA) [https://www.cossa.org/wp-content/uploads/2020/02/AAAS-STEM-Workforce-Report\\_1-24-2020.pdf](https://www.cossa.org/wp-content/uploads/2020/02/AAAS-STEM-Workforce-Report_1-24-2020.pdf) \*\*\*\* Source: The U.S. Bureau of Labor Statistics (BLS) <https://www.bls.gov/oppub/btn/volume-10/why-computer-occupations-are-behind-strong-stem-employment-growth.htm>

Frederick Community College prohibits discrimination against any person on the basis of age, ancestry, citizenship status, color, creed, ethnicity, gender identity and expression, genetic information, marital status, mental or physical disability, national origin, race, religious affiliation, sex, sexual orientation, or veteran status in its activities, admissions, educational programs, and employment. • Frederick Community College makes every effort to accommodate individuals with disabilities for College-sponsored events and programs. If you have accommodation needs or questions, please call 301.846.2408. To request a sign language interpreter, please visit <http://fcc-interpreting.genbook.com>. If you have interpreting related questions, please email [Interpreting@frederick.edu](mailto:Interpreting@frederick.edu). Sign language interpreters will not be automatically provided for College-sponsored events without a request for services. To guarantee accommodations, requests must be made at least five workdays in advance of a scheduled event. If your request pertains to accessible transportation for a College-sponsored trip, please submit your request at least 21 calendar days in advance. Requests made less than 21 calendar days in advance may not be able to be guaranteed.





# CONGRATULATIONS & THANKS TO

Maryland STEM Faculty  
& Student Presenters  
at the **2021 Annual Maryland  
Collegiate STEM Conference.**

Your commitment to the advancement  
of STEM education is not only recognized,  
but highly valued.

[www.harford.edu](http://www.harford.edu)

- BIOLOGY
- BIOTECHNOLOGY
- CHEMISTRY
- COMPUTER SCIENCE
- DATA SCIENCE
- ENGINEERING
- ENVIRONMENTAL SCIENCE
- ENVIRONMENTAL TECHNOLOGY
- MATHEMATICS
- PHYSICS

*Congratulations  
to all the  
student presenters.*



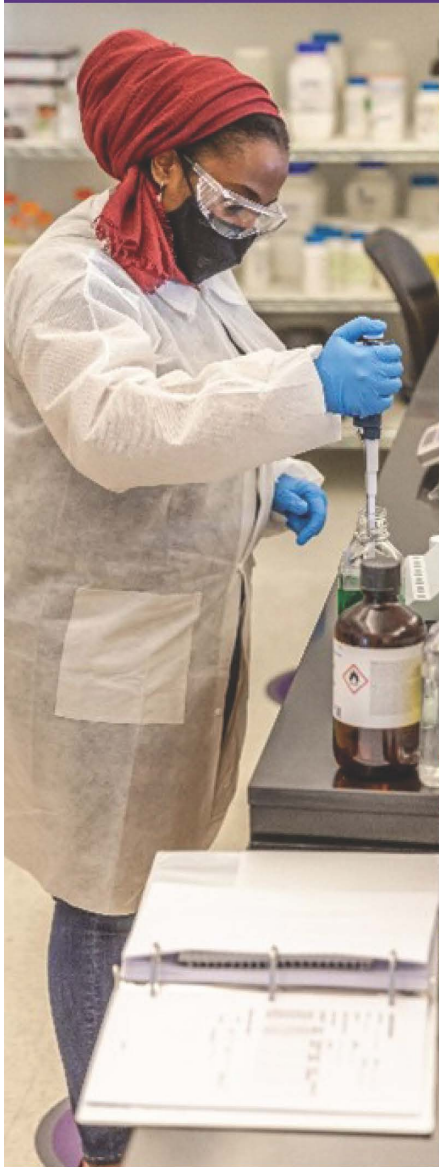
*You Can Get There From Here.*

Columbia, Maryland

**howardcc.edu**







# Congratulations Faculty and Student Presenters!

## Maryland Collegiate STEM Conference

Degrees & Certificates in Biotechnology,  
Computer Science, Cybersecurity, Data Science,  
Engineering, Biological Sciences, and many more.



Montgomery College | Montgomery County, MD  
<https://www.montgomerycollege.edu>



Our Bronze Sponsors!



**ALLEGANY COLLEGE**  
of MARYLAND

*Congratulations to our*  
**PhageHunters**  
*who are part of the*  
**HHMI SEA-PHAGE program**

**hhmi** | Howard Hughes  
Medical Institute

SEA PHAGES



Your time. Your place.  
**Chesapeake College**

*Congratulations*  
to all presenters & participants of the  
6th MD Collegiate STEM Conference

See what Chesapeake has to offer in STEM:  
Computer Information Systems  
Biological Sciences  
Engineering Technology

[www.chesapeake.edu/STEM](http://www.chesapeake.edu/STEM)



**CONGRATULATIONS**  
**PRESENTERS**

Take your CAREER  
to the NEXT LEVEL  
with a DEGREE  
from UMBC

**COMPUTER SCIENCE**

**TRANSLATIONAL LIFE  
SCIENCE TECHNOLOGY**

   
shadygrove.umbc.edu

**Join us  
here**



**To change everything  
out there**



Become a **FutureEngineer@umd.edu**

 **UNIVERSITY OF  
MARYLAND**  
A. JAMES CLARK  
SCHOOL OF ENGINEERING



# Congratulations!

on the **6th Annual Maryland  
Collegiate STEM Conference**



*From your friends at Lumen Learning; where  
we believe you can choose affordability  
without sacrificing quality.*



[lumenlearning.com/courses](https://lumenlearning.com/courses)

**2021 Maryland College STEM Conference Steering Committee Members Conference**  
**Chairs:** Kiersten Newtoff, Montgomery College, Raza Khan, Carroll Community College

### **Registration & Finance Committee**

Co-Chair: Brendan Diamond, Howard Community College, [bdiamond@hcc.edu](mailto:bdiamond@hcc.edu)  
Co-Chair: Kiersten Newtoff, Montgomery College, [Kiersten.newtoff@montgomery.edu](mailto:Kiersten.newtoff@montgomery.edu)

Raza Khan, Carroll Community College  
Maria Burness, Carroll Community College

### **Presenters' Selection & Program Committee**

Co-Chairs: Gwen Gilinger, Community College of Baltimore County  
Kiersten Newtoff, Montgomery College

Malathi Radhakrishnan, Baltimore City Community College  
Greg Dempsey, Chesapeake College  
Mike Long, Howard Community College  
Anil Malaki, Baltimore City Community College  
Radhakrishnan Palaniswamy, Community College of Baltimore County  
Russ Seidel, Harford Community College  
Maureen Sherer, Anne Arundel Community College  
Patti Turner, Howard Community College

### **Sponsors & Exhibitors Committee**

Co-Chairs: Raza Khan, Carroll Community College  
Anil Malaki, Baltimore City Community College

Malathi Radhakrishnan, Baltimore City Community College  
Shyamala Sivalingam, Anne Arundel Community College

### **Venues & Platform Committee**

Maria Burness, Carroll Community College  
Brendan Diamond, Howard Community College  
Raza Khan, Carroll Community College  
Amrita Madabushi, NIH  
Sithy Maharroof, Carroll Community College  
Shyamala Sivalingam, Anne Arundel Community College