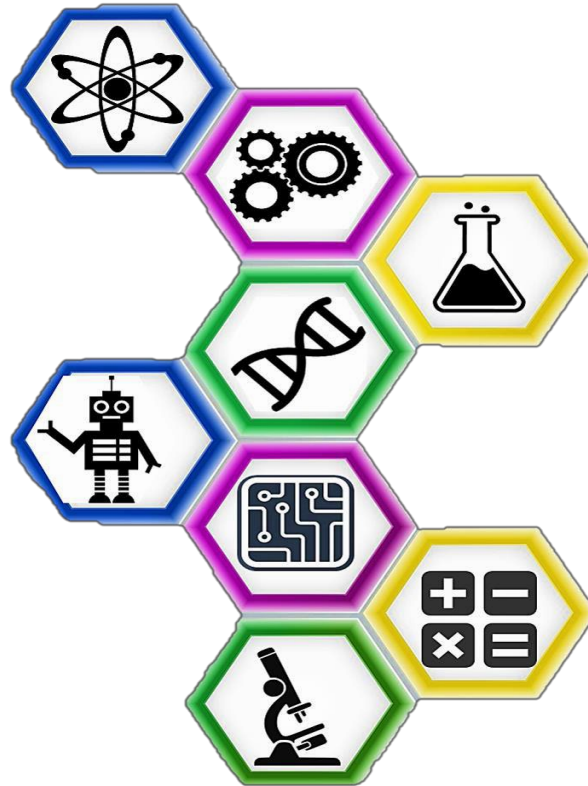




**The 7th Annual
2022 Maryland Collegiate STEM
Conference Program**

STEM Innovations:

Building a Stronger Future Together



April 30, 2022

Anne Arundel 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

CarrollCC – Carroll Community College

CSM – College of Southern Maryland

HagerstownCC – Hagerstown Community College

HarfordCC – Harford Community College

HowardCC – Howard Community College

MC – Montgomery College

SMCM – St. Mary's College of Maryland

Towson – Towson University

UMBC – University of Maryland, Baltimore County

UMD – University of Maryland, College Park



LARRY HOGAN
GOVERNOR

STATE OF MARYLAND
OFFICE OF THE GOVERNOR

April 30, 2022
7th Annual Maryland Collegiate STEM Conference
Baltimore, Maryland

Dear Friends:

Welcome to the Maryland Collegiate STEM Conference! For the past seven years, the Annual Maryland Collegiate STEM Conference has worked to advance and promote the professional development of students, faculty, and staff in STEM related fields.

As Maryland strives to compete nationally and across the globe, STEM education is helping us to create critical thinkers and to empower the next generation of leaders. It is thanks to innovative events, such as the Maryland Collegiate STEM Conference, that allow students here in Maryland the chance to gain in-demand skills that employers need in the 21st century workforce.

Please accept my best wishes for a memorable conference and for continued success in the years to come.

Sincerely,

A handwritten signature in blue ink that reads "Larry Hogan".

Larry Hogan
Governor

Morning Keynote

So You Want to Be a Scientist

Dr. Adam Ruben



Adam Ruben is a writer, comedian, and molecular biologist. He has appeared on the Food Network, the Travel Channel, the Weather Channel, Discovery, Netflix, and NPR, and he currently hosts "What on Earth?" and "Ancient Mysteries Decoded" on the Science Channel and "Inventions That Changed History" on Discovery Plus. Adam is the author of the books *Surviving Your Stupid*, *Stupid Decision to Go to Grad School* and *Pinball Wizards: Jackpots, Drains, and the Cult of the Silver Ball*. For more than a decade, he has written the monthly humor column "Experimental Error" in the otherwise respectable journal *Science* and is also a writer for the PBS Kids show "Elinor Wonders Why".

Afternoon Keynote

Encountering Math in the Media: statistical communication and our public voice

Dr. Rebecca Goldin



Dr. Rebecca Goldin earned a B.A. from Harvard University and a Ph.D. in mathematics from the Massachusetts Institute of Technology. She is a professor of mathematics at George Mason University, a fellow of the American Mathematical Society, and, until recently, director of STATS at Sense About Science USA. Dr. Goldin is a leading expert on the use and abuse of statistics in the media, as well as an accomplished mathematician focusing on geometry and related combinatorics. She was the inaugural winner of the Ruth I. Michler Memorial Prize of the Association for Women in Mathematics, an Etta Z. Falconer Lecturer on statistics use in the media, and has had numerous grants awarded from the National Science Foundation for her work in mathematics and in statistical communication.

PROGRAM SNAPSHOT

8:00 am – 9:00 am: Breakfast and Check-in

9:00 am – 9:15 am: Official Opening Remarks

9:15 am – 10:00 am: Student Centered Keynote

10:10 am – 10:40 am: Breakout Session #1

10:50 am – 11:20 am: Breakout Session #2

11:30 am – 1:30 pm: Lunch and Poster Sessions

A – 11:30 am-12:30 pm

B – 12:30 pm-1:30 pm

11:30 am – 2:25 pm: Exhibition and Transfer Fair

1:40 pm – 2:25 pm: Faculty Centered Keynote

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

3:15 pm – 3:45 pm: Breakout Session #4

3:50 pm – 4:00 pm: Closing Remarks and Raffle Giveaway (must be present to win)

Keynote Abstracts

Morning Keynote

So You Want to Be a Scientist

Keynote Abstract:

Since you're trained by career academics in an academic environment, it can be hard to escape the death grip of academic science. But not only are there a multitude of terrific non-academic jobs for science trainees, these jobs are often hiding in plain sight. In this talk, writer, comedian, TV host, and molecular biologist Adam Ruben will explore the world of non-academic science careers, describe his own bizarre career path, and deliver life lessons in large fonts.

Afternoon Keynote

Encountering Math in the Media: statistical communication and our public voice

Keynote Abstract:

News accounts of science and scientific ideas are filled with numbers and implicit advice. They also tell a story. Can brain scans read our minds? Does chocolate make us smarter? What are the risks of COVID-19? In contexts as diverse as political surveys, criminal courts and public health, numbers play an increasingly prominent role as data becomes more accessible. Despite our need for clear rendering of numerical information, many media accounts using statistics are misleading or confusing. In this presentation, I will share some humorous as well as serious stories about statistical bloopers in the media, peppered with suggestions for better communication. Numerical reasoning can be powerful when we move past politics and morality to clarify what quantitative information actually tells us, what it does not and what it cannot.

Conference Schedule

8:00am – 9:00am Check-in and Breakfast – SUN 100 (Dining Hall)

9:00am-9:15am – Official Opening Remarks – Robert Kaufman Theater (in the Pascal Center for Performing Arts - PCPA)

9:15am-10:00am – Keynote – Dr. Adam Ruben – Robert Kaufman Theater

10:10 – 10:40am: Breakout Session #1 – HLSB

Student Primary Research Presentations

HLSB 338

Life Sciences

- Lance Justin Nuique – MC

Using EFIRM to detect EGFR-L858R for early detection of lung adenocarcinoma (see abstract on page 18)

- Stephanie Fernandez – MC

Attention Deficit Hyperactivity Disorder in women, from childhood to adulthood, and its association with culture and time perception (see abstract on page 18)

HLSB 340

Physical Sciences

- Elizabeth Arhavbarien and Rebekah Anastasia Ericson – HowardCC

Asteroid Tracking with a Small Telescope (see abstract on page 19)

- Jacob Meyerson and Steven Ihejurobi – HowardCC

A Thorough Analysis of the Potential Exoplanet Orbiting Star TIC-271761420.01 (see poster #20 abstract on page 33)

HLSB 342

Computer Science

- Christine Ogunsola – MC

Validation tool for DART-MS Drug Library (see poster #3 abstract on page 23)

Student Centered 30 minute talks

HLSB 314

Bridging the Gap – Degree to Job

Amrita Madabushi, faculty – BCCC

If you are graduating with an Associate's or Bachelor's degree, you might have started thinking about the next steps of pursuing higher education or getting a job. This session will cover the essentials of ramping up efforts to highlight your education and skills and get empowered with the necessary tools to get a job. The session will specifically be geared towards biology and biotechnology students, but cover practical job search strategies for all fields. The focus will be on making your resume powerful, growing your network, and conducting an effective job search. The session will be interactive, and you can bring a hard or electronic copy of your resume to edit and get an expert opinion. You will also be provided with the opportunity to sign up for mentor support during your future job search.

HLSB 220

Creating a Network and Staying "Plugged-In"

Gracie Schultz, Owen Pruitt, Adriana Barrera, and Taylor Bjerkaas, students – CarrollCC

Mentors: Gregory Leppert, Jennifer Fain-Thornton, Raza Khan, Sharon Brunner, faculty – Carroll CC

How are you "plugged in" to your academic field? Do you put your name out there to get recognized? In this presentation, the students will discuss the benefits of networking to connect with professionals in the world of STEM. Networking can lead to new internships and job opportunities. You can use online platforms like LinkedIn or meet professionals in the field through conferences, career fairs, or other networking events. Networking as a college freshman provided us a head start interacting with professionals, establishing career-related expectations, and looking into careers that are available. Students will share the opportunities with how they connected with professionals in their field from four-year colleges, universities, and industries.

HLSB 170

UMD Biocomputational Engineering - New Degree Program at Shady Grove

Emily Bailey, Program Coordinator – UMD

Maryland Engineering's new bachelor of science in biocomputational engineering is one of the first degrees of its kind. Newly launched in 2021 at the Universities at Shady Grove, this program addresses the rapidly growing demand for engineers with expertise in both the biological sciences and computational methods. The bachelor of science in Biocomputational Engineering provides students with a breadth of fundamentals in biology and quantitative problem solving while developing skills in computation and data science. Students 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.

Faculty Centered 30 minute talks

HLSB 330 The following presentation is also student focused

A New Opportunity in Maryland to Earn a Bachelor of Science in Marine Science

Shanen M. Sherrer, faculty – SMCM

St. Mary's College of Maryland recently launched the state's first Bachelor of Science in Marine Science, and it offers prospective students the opportunity to engage in learning and research across this broad field of study. Faculty members in this academic program have expertise in several disciplines that contribute to Marine Science, and students get the chance to engage in computational, laboratory-based, and field-based research that match their interests. This program continues to grow by developing transfer pathways with community colleges in Maryland. Importantly, students are learning professional skills on our waterfront campus which prepare them for a variety of career opportunities in Marine Science. Beyond having direct access to the local river, St. Mary's College of Maryland is surrounded by wetlands, an oyster reef sanctuary, the Potomac River, the Patuxent River, and the Chesapeake Bay. This expansive landscape provides a great learning environment for students interested in Marine Science that is unmatched in Maryland. Participants in this presentation will learn more about this new degree program and some of the Marine Science related research that is in progress at the college.

HLSB 332

Sequencing Project as a Course-Based Undergraduate Research Experience

Daniel Ford and Katie Benson, faculty – HarfordCC

Course-based undergraduate research experiences improve student engagement, teach marketable skills, and alleviate achievement gaps. Unfortunately, coordinating and designing these projects can be expensive and time-consuming.

Our presentation outlines an undergraduate research project that complements environmental DNA analysis. Wildlife researchers use environmental DNA to determine which animals are present in a region, but this analysis frequently identifies organisms that are not found in current databases. The purpose of this project is to help fill in those gaps by sequencing the mitochondrial 12S rRNA gene and the 16S rRNA gene of a different animal each semester and submitting those sequences to GenBank. This provides an ongoing small but valuable contribution to any researchers who are using environmental DNA analysis for wildlife monitoring.

In particular, we will discuss recent student research on sequencing the 16S DNA region of the Abert's Squirrel, and our current undergraduate research project on sequencing coati DNA.

10:50-11:20am – Second Breakout Session – HLSB

Student Primary Research Presentations

HLSB 338

Life science

- Jenna Luka – MC

Preference of Nesting Sites of Eastern Bluebirds (EABL) in a Suburban Landscape (see abstract on page 19)

- Daniel Hall – HowardCC and Alexis Jacobs – UMBC

Exploring the Mechanism Responsible for Feeding Inductions in Manduca sexta (see poster abstract #19 on page 27)

HLSB 340

Physical science

- Aditi Madabushi – BCCC

The MMS Era of tracking EMIC Waves in the Outer Magnetosphere: When, Where, And Why (see abstract on page 20)

- Jacob Lee – HowardCC

A Meta-Analysis of X-ray Data from LMC X-4 (see abstract on page 20)

HLSB 342

Engineering

- Nowrin Nuzhat – MC

Understanding the Role of Polymers in the Degradation of Solar Panels (see abstract on page 20)

- Joshua Thomas – MC

Understanding the Frictional Properties of Plastics (see abstract on page 21)

Student Centered 30 minute talks

HLSB 170

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

Shannon Buenaflor and Michael Robinson, faculty – 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.

HLSB 330

Road Trips: Transfer with Success

Jay Whitmon, Andrew Miller, Kaitlin Reddick, and Calyx Ruiz, students – CarrollCC

Mentors: Sharon Brunner, Jennifer Fain-Thorton, Raza Khan, Dr. Jill Krebs, Gregory Leppert, faculty – CarrollCC

In this presentation four students will discuss the importance of visiting 4-year colleges and universities, even in your freshman year. Attending campus tours and open houses is crucial to learning what you are looking for in a transfer college. What location, atmosphere, or campus size interests you? Is your program offered at the college you hope to attend? Whether you attend virtual visits or in-person visits, it is important to immerse yourself in a college atmosphere before selecting your new home for the next few years. These students will provide valuable insight and advice beneficial to community college students and faculty members.

HLSB 314

BIOTECH Pathways: Is biotechnology the career path for you?

Jaelyn Madden, faculty – HarfordCC

COVID vaccines and antibody treatments. Biofuels. Insulin for diabetics. Feeding the hungry. Combating antibiotic-resistant infections. Cleaning up the planet. 3-D printed transplant organs. Curing sickle cell anemia and cystic fibrosis. Tracking down a criminal. Beating cancer. What do they all have in common?

BIOTECHNOLOGY!

Biotechnology uses living organisms or systems to produce useful products. From healthcare and agriculture, to fighting climate change, biotechnology has a role to play, and Maryland is at the center of it. If you like cutting-edge science and want to make a difference, this could be the career for you!

Join me to learn about the historical and modern applications of biotechnology, biotechnology careers and academics, and how to achieve the job you want.

Faculty Centered 30 minute talks

HLSB 220

Implementation of STEM Core at the Community College of Baltimore County, Successes and Challenges

Gwen Gilinger, faculty and Camila Sotela, STEM Core Director – CCBC

STEM Core is a multi-college organization, developed by Growth Sector, a non-profit devoted to opening STEM careers to students from low-income backgrounds. CCBC became the Eastern regional hub for STEM Core in 2019 and is a sub-awardee on an NSF INCLUDES grant awarded to Saddleback College, a community college in California. The focus of STEM Core is on math acceleration, wrap around student support and internship opportunities. So many of our students enter college requiring developmental courses in math before they reach Calculus I, often the gateway math course for STEM majors. The purpose of STEM Core is to assist these students in their journey from developmental math to or through Calculus I and beyond by focusing on math acceleration, wrap around student support and internship opportunities. In this talk we will go through the fundamentals of STEM Core, how it works, the challenges we have met and the dovetailing of STEM Core with two other NSF funded grants, an ATE grant, STEM Core in Central Maryland, and an S-STEM grant, Math Acceleration for STEM Students.

HLSB 332

Environmental Justice Issues Engage Chemistry Learners and Promote Inclusion

Maureen Sherer and Joseph Sparenberg, faculty – AACC

Investigating course concepts through the lens of environmental justice helps us to develop skill sets to build a better world. Studying environmental justice increases social awareness, promotes civic responsibility, and incentivizes learning. Generally, it is economically disadvantaged and historically under-represented populations, which are adversely affected by these issues. Students from these groups frequently learn best when concepts are contextualized in their communities. This presentation will describe a number of different types of learning activities for general chemistry and organic chemistry students.

HLSB 356 The following presentation is also student focused

Sustaining an Active STEM Club during the Pandemic & Beyond

Anthony Santorelli, Dan Fernandez, Katherine Keough, faculty – AACC and Emily O’Donnell, student – Towson

Because of the pandemic, we ran into many challenges continuing the membership and organizing activities for our Earth Science Club. We’ve been fortunate through some creative planning and enthusiastic participation by our student club officers, student club members, & faculty club advisers, to have been able to sustain a successful Science Club which included combining with other existing science disciplines. During the seminar, we hope to share our experiences with our recent Science Club plans & activities. Even more importantly, we would like to hear other experiences, ideas, & insights from those participating in our presentation.

Presentation goals will be for participants to:

- gather information about what can help make successful Science Club recruitment & operation each semester,
- share ideas & experiences about successes & challenges encountered in sustaining Science Club activities,
- possibly develop a network for future collaboration in Science Club activities.

11:30am – 1:30pm Poster Sessions and Lunch – HLSB lobby

Poster Session A – 11:30am-12:30pm

Odd numbered posters (see pages 23-29 for listing of Poster Abstracts) 1-27

Poster Session B – 12:30am-1:30pm

Even numbered posters (see pages 29-34 for listing of Poster Abstracts) 2-28

11:30 am – 2:25 pm Exhibition and Transfer Fair – HLSB Lobby

See page 36 for list of transfer schools and exhibitors

1:40 – 2:25pm Faculty Centered Keynote – Robert Kaufman Theater

Keynote Address: Dr. Rebecca Goldin

2:35 – 3:05pm Third Breakout Session – HLSB

Student Primary Research Presentations

HLSB 338

Life science

- Elissa Tuten – CSM

How Does Participating in Environmental Activities Influence a Person's Perception of Themselves, Others, and the World? (see abstract on page 21)

- Donovan Waters – HowardCC

Manduca sexta Larvae Exhibit Rhythms in Feeding Behavior and Rhythms in Gene Expression of the Circadian Gene: Period (see poster #17 on page 27)

HLSB 340

Physical science/Mathematics

- Anthony Dcosta – PGCC

PMV in the DMV: Estimating the Partial Molar Volume of each Component in a Binary Solution Using Refractive Index Measurements (see abstract on page 22)

- Jose Ayala, Nathanael Bickel and Stefan Cehan – HowardCC

The Effect of Different Strategies on Winning 6 Nimmt! (see abstract on page 22)

Student Centered 30 minute talks

HLSB 170

The Department of Defense (DoD) Science, Mathematics, and Research for Transformation (SMART) Scholarship-for-Service Program

Shadei Jones and Tom McConnell, staff – Smartscholarship

Join the SMART Program Office to learn about the Department of Defense (DoD) Science, Mathematics, and Research for Transformation (SMART) Scholarship-for-Service Program. This unique opportunity provides current students and early-career professionals with an opportunity to receive full tuition and gain valuable work experience within the DoD. With a full scholarship, students pursuing STEM degrees will be able to focus on complex research to further the DoD's mission and create a lasting impact. Summer internships are performed at DoD facilities alongside scientists and engineers; these experiences prepare scholars for full-time employment and get them accustomed to working with the DoD. SMART is focused on creating a diverse and inclusive culture for the next generation of STEM professionals in the DoD.

HLSB 220

Fun with Science

Curtis Jones, faculty – BCCC and Joseph Sparenberg, faculty - HowardCC

This exciting, student-led activity is a collection of short Science demos that highlight the intriguing, fun side of science. The activity will include multiple experiments involving chemistry, dry ice, liquid nitrogen, conservation of energy, and resonance frequency. There will be a unique demonstration by Professor J. Sparenberg on how to make delicious home-made ice cream on the spot. Students can participate in making the ice cream or observe. Either way, you can enjoy a treat that is nothing like you have ever experienced.

HLSB 330 The following talk has a roundtable format

How Has Online Learning Impacted Student Success?

Tammy Field, faculty – Chesapeake College

The technological impacts affecting STEM-Learners has initiated a renaissance of diverse teaching styles. But how are STEM students doing? Acceptance of new remote, online learning modalities, especially in underprivileged, rural communities appears to be limited only by the information relay, infrastructure, mobile devices, and data available to the student (Mutambara and Bayaga, 2021).

Students are the receivers of what teachers have put together during an unprecedented emergency transition into online learning (Korkmaz and Toraman, 2020). How are STEM students thinking in classes using various learning modalities, e.g., 100% Distance learning using Online labs, Blended, Hybrid, Hy-Flex and/or Traditional Lecture/Theory and Lab-based Face-to-Face teaching styles? How will the continued incorporation of computer technology affect the present and next generation of STEM-thinkers and doers?

Thus, how students are thinking and learning from what teachers are delivering will be explored and discussed. Input directly from students about their academic learning experiences in remote, distance classroom settings will be compared to traditional, face-to-face classroom and lab learning. This discussion exchange will help teachers continue to reflect on how to adapt and align teaching styles that will successfully prepare students for their future in STEM-based careers (Turner, Adams, and Eaton, 2022).

Mutambara, D., & Bayaga, A. (2021). Determinants of mobile learning acceptance for STEM education in rural areas. *Computers & Education*, 160, N.PAG.

Korkmaz, G. & Toraman, Ç. (2020). Are we ready for the post-COVID-19 educational practice? An investigation into what educators think as to online learning. *International Journal of Technology in Education and Science (IJTES)*, 4(4), 293-309.

Turner, K.L., Adams, J.D. & Eaton, S.E. Academic integrity, STEM education, and COVID-19: a call to action. *Cult Stud of Sci Educ* (2022)

HLSB 314

Internship - Gateway to a Successful Transfer and Career

Amrita Madabushi, faculty – BCCC

Students pursuing STEM careers need not only in-depth knowledge, but also substantial training and experience to be successful in their field. The internship is a real-world learning experience that enables students to gain invaluable experience, obtain great recommendations, and give a huge boost to their resumes. In this faculty-led session, we will have a panel of successful students from the Biotech program at Baltimore City Community College (BCCC) who are doing internships as a part of the requirement of an Associate degree. Panel members will share experiences and provide invaluable advice on what it takes to be successful at the internship site and how it will enable them to transition to their next step. The panel members will be engaged in an interactive discussion with the audience throughout the session where the audience can ask questions and get tips on doing a successful internship in their discipline.

Faculty Centered 30 minute talks

HLSB 332

Innovative Ways of Increasing Biotechnology Awareness and Enrollments

Savita Prabhakar, faculty – FrederickCC

Biotechnology programs across the nation have low enrollment issues. This is partly because of the lack of awareness of the field among students both at undergraduate and high school level. The programs are also not able to offer transfer options as other general STEM courses. With the biotech industry booming in Maryland and employers looking to find a trained workforce, it is imperative that community college biotech programs find innovative ways to build a steady pipeline of students into the program. To achieve this Frederick Community College (FCC) has developed a novel apprenticeship program with the Maryland Department of Labor where participating companies employ students out of high school as apprentices, pay them regular salaries with benefits and additionally pay for their entire associates degree tuition and books. This is a great opportunity for the student as he/she gets on the job training, work experience in the industry and related instruction at FCC. The employers benefit as they have employee retention. The development of this program and a pre-apprenticeship program for high school juniors and seniors will be discussed.

HLSB 342

From Data to Information to Knowledge

Tetyana Bezbabna, Assistant Director and Galina Reitz, Faculty Program Director – UMD
Information Science at Shady Grove

Many of you are familiar with the fields of computer science, information systems, and information technologies. But only some of you have heard about the field of information science - the discipline that uses data and information to generate knowledge, which is very critical in the decision-making process. Information science brings together the theories, principles, techniques, and technologies of various well-known disciplines with the goal of solving information and data-related problems in business and our society as a whole. Among the disciplines brought together are computer science, cognitive science, psychology, mathematics, logic, information theory, electronics, communications, linguistics, economics, classification science, systems science, library science, and management science.

Building information systems, managing information resources, and designing efficient user interfaces are just a few of the things that Information Science experts “do,”—but what motivates them is addressing the challenges of bringing together diverse groups of people, complex collections of information, and powerful technologies to create solutions to problems that make the world “work better.”

Join our session to learn about the field of information science and all the wonderful opportunities it presents.

HLSB 356

Iron Range Engineering

Luke Nyberg and Andrew Hanegmon, staff – Iron Range Engineering

The Iron Range Engineering Bell model is a transfer program designed specifically for community college completers. Upon completion of lower division, students participate in a one-semester “academy” where they both begin their upper-division technical and design learning and develop strong job-search and leadership skills. The following 24 months are done on full-time co-op while finishing the degree requirements in evening synchronous courses.

Iron Range Engineering has existed since 2009, winning ABET’s 2017 Innovation Award and being named by MIT as an “emerging world leader in engineering education”. For the first 10 years, IRE served only community college graduates from northern Minnesota. In 2019, IRE expanded to a nation-wide audience with the Bell model. Students can complete the academy portion on-ground in Minnesota or synchronously remote. To date, 100 students have enrolled in the program. The first graduating class was December 2021.

Students develop a wide range of transversal skills which are highly sought after by companies. Students work around the country for major employers or in their home region for small engineering firms.

The Iron Range Engineering model of learning is a PBL curriculum adapted from the Aalborg University model (Denmark). The PBL pedagogy puts a project at the center of the curriculum and then builds technical, design, and professional skill learning

3:15 – 3:45pm Fourth Breakout Session – HLSB

Student Centered 30 minute talks

HLSB 330 The following talk has a roundtable format

A Unique Perspective for Mental Health of Students (A Roundtable Discussion)

Joseph Sparenberg, faculty – HowardCC, CCBC, AACC

As a former nontraditional student who attended community college in his late 20’s, Joseph brings a unique perspective for students who feel they may not belong. Part of the reason Joseph took the time off between high school and college was because of debilitating anxiety. Joseph earned dual degrees in Biochemistry and Biology in his mid-30’s and his MS in Chemistry the day before his 40th birthday. Joseph has focused on mental health of students during his entire teaching career as well as previously having a certification in Mental Health First Aid. From being a student frozen with anxiety and almost giving up on his dreams to becoming a community college chemistry instructor, Joseph provides perspectives not often available to students. This roundtable discussion with students will focus on the mental health of students, being a nontraditional student, and tips on how to succeed on exams, assignments, and presentations all of which naturally induce anxiety. The purpose here is to open up about mental health and to avoid anxiety from reaching detrimental levels.

HLSB 338

Professional Branding: A Student Perspective

Gracie Coakley, Ainsley Lundquis, Patrick Transue, and Skylar Goonan, students – CarrollCC

Mentors: Gregory Leppert, Jennifer Fain-Thornton, Raza Khan, Barb Gregory, Sharon Brunner, faculty – CarrollCC

How many students go through 4-years of college and never attend a resume-building workshop? Many college students worry about getting good grades and completing their degrees, but how many are prepared to go into the workforce? Many college students have a plan of what job they want after they graduate, but how many know how to apply for the job they want? Professional development needs to start in the first semester at college. We will be discussing the importance of professional development in your college career through creating a brand of yourself to advertise to future employers. We also will be discussing how to develop interview skills through the experience of being on both sides of the interview.

HLSB 340

Internship Opportunities as an Undergraduate Will Open Many Doors to a Community College Student

Alex Zarta Mahecha, student – CarrollCC

Mentor: Raza Khan, faculty - CarrollCC

Just like any other community college student, I started taking classes at community college and did not think about the importance of gaining real-world experience. Finding an internship opportunity was not on my radar. After some time in college, I started looking for an internship. I ended up securing an internship at the Catholic University of America. At the end of the internship, I got to present at an MIT virtual conference. Due to my internship opportunity, I have secured another internship at another University for this summer. I have also applied to some prestigious four-year schools and have gotten accepted to them so I can transfer this fall. Getting an internship as a community college student has opened many doors for me. Attend to hear my journey as I will provide advice and answer any questions.

HLSB 356

Iron Range Engineering

Luke Nyberg and Andrew Hanegmon, staff – Iron Range Engineering

The Iron Range Engineering Bell model is a transfer program designed specifically for community college completers. Upon completion of lower division, students participate in a one-semester “academy” where they both begin their upper-division technical and design learning and develop strong job-search and leadership skills. The following 24 months are done on full-time co-op while finishing the degree requirements in evening synchronous courses.

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Students develop a wide range of transversal skills which are highly sought after by companies. Students work around the country for major employers or in their home region for small engineering firms.

The students will take part in an interactive workshop on identifying the essential skills to succeed as a leader in an engineering internship early in their career. They will leave with a leadership card they can carry with them and an appreciation for aspects such as inclusivity, self-awareness, reflection, and being responsive.

Faculty Centered 30 minute talks

HLSB 314

Collaborative Teaching Fellows Program – An Innovative Program to Address the Teaching Needs at the Community Colleges

Amrita Madabushi,¹ Jennifer Aumiller,² Kelly Clark,³ and Moremi Oladeinde⁴

Collaborative Teaching Fellows Program (CTFP) provides graduate students and postdoctoral fellows at Johns Hopkins (JHU), University of Maryland (UMB), and National Institute on Aging (NIA/NIH) opportunities to teach at the undergraduate level. CTFP partners with eight organizations, including colleges and universities in and around Baltimore. These organizations share teaching opportunities with CTFP, which then helps facilitate the placement of Collaborative Teaching fellows for one or more semesters in these organizations. This allows the Collaborative Teaching fellow to gain teaching experience and enhances their resume for academic jobs. This program can be highly beneficial to community colleges as it provides a great pool of candidates for teaching opportunities. This session will be geared towards faculty and administration to provide an overview of CTFP and how it can benefit community colleges.

¹Assoc. Dir. of Post Doc. Affairs – National Institute on Aging, ²Director, Office of Postdoctoral Scholars & Office of Graduate and Postdoctoral Career and Professional Development – UMD, ³Associate Director, The Teaching Academy – Center for Educational Resources Johns Hopkins University, ⁴Program Coordinator, JHM Professional Development and Career Office – Johns Hopkins University

HLSB 170

Supporting Underrepresented STEM Faculty: Do We Do Enough?

Raza Khan, faculty – CarrollCC

There have been nationwide conversations with regards to the goal of both an inclusive and diverse faculty. If this goal must be achieved, it must start from the point of recruitment efforts through the faculty's tenure - be it retirement, relocation or departure from academia. This topic and goal have been a selfish interest of mine as well with my service to higher education for almost two decades. I was the first and currently still the only minority academic chair at my academic institution. It is not about being the first or breaking the barrier, but all of us doing our part to bring inclusiveness and diversity among our colleagues and selfishly so in STEM departments. A lot of research has primarily focused on the diversity and inclusive gaps that exist at four-year colleges in the country, but very little has been written of the gaps as they stand at community colleges. Let us have a frank discussion and let us learn from each other as to what we can do at Maryland's community colleges to reach this goal. Let us all ask: Do we do enough?

HLSB 220

Evaluating Soil Texture Lab Activity

Antonio Chaves, faculty – MC

This activity provides students with means for measuring three parameters of soil texture. These include infiltration time, water holding capacity, and workability. The hands-on tasks are relatively easy to complete, do not involve hazardous substances, and are fun to do (especially the “crush test”). Assessments will be done on sand, clay topsoil, soil mixtures using items commonly available at hardware stores. The resulting data is used for generating both linear graphs and bar graphs. Soil samples and equipment will be provided so attendees can participate in the hands-on measurements.

The relevance of what students learn with regards to environmental stewardship cannot be underestimated because soil texture plays a critical role in sustaining plant growth and groundwater levels and soil degradation played a major role in the decline of several pre-industrial societies. This activity was designed for Biology 106 (environmental science).

Abstracts for Student 15 Minute Primary Research Presentations

Breakout Session #1

HLSB 338

Using EFIRM to detect EGFR-L858R for early detection of lung adenocarcinoma

Lance Justin Nuique, student - MC

Mentor: Susan Bontems, faculty - MC

The earlier the cancer is detected the easier it is to treat. Detecting the EGFR-L858R mutation could be a sign of lung adenocarcinoma (lung cancer). The current problem with current liquid biopsy is the amount of time it takes for the result to be returned with the EFIRM (electric field induced release and measurement), the results could be quicker. The EFIRM can be used to detect the presence of the mutation. By using a small sample of saliva or plasma, the mutation can be detected and could lead to early detection of the lung cancer. In the future devices like the EFIRM can be used to detect other cancer biomarkers which can lead to the patients getting their diagnosis as early as possible.

Attention Deficit Hyperactivity Disorder in Women, from Childhood to Adulthood, and its Association with Culture and Time Perception

Stephanie Fernandez, student - MC

Mentor: Jennifer Capparella, faculty - MC

Attention Deficit Hyperactivity Disorder (ADHD) is a complex neurological and behavioral condition that affects almost 10% of American children and 4% of adults. Currently, boys are diagnosed more than twice as much as girls, likely due to the connotation of hyperactivity that they tend to exhibit externally. This small but important detail marks the difference the overlooking of girls during childhood diagnoses. This research presents a less told perspective of growing up as women with ADHD and offers a timeline-style approach to understanding the development through childhood, adolescence, into adulthood. Emotional and social difficulties arise when young and can last through adulthood, wrecking the path of academic and professional success. Moreover, reports of peripheral symptoms of anxiety and depression are common. With a medical diagnosis of adult ADHD, women are finally learning that their symptoms were not a product of laziness, a flawed popular belief. Furthermore, cultural aspects also explored here remain a fundamental stratum relevant within the melting pot of the United States and the world. Finally, a solution is presented that focuses on developing time management skills and routines to reduce the symptoms of ADHD on daily life, in the hope of a more peaceful and manageable lifestyle.

HLSB 340

Asteroid Tracking with a Small Telescope

Elizabeth Arhavbarien and Rebekah Anasta Ericson, students - HowardCC

Mentor: Brendan Diamond, faculty - HowardCC

Asteroid observation is vital for the future of space research. Tracking asteroids and determining their positions is key to preventing possible asteroid impacts with Earth and provides opportunity for future explorations to discover new information about our solar system and universe. During fall 2021, our team initiated asteroid observation at HCC by performing observations for asteroid astrometry. To make these observations, the team used data from the Minor Planet Center (MPC), which is the primary data site for all astrometry data for comets, asteroids, and other minor planets.

The team hopes to establish an observation program for asteroid tracking at HCC, making it able to submit observations for less well-known orbits, by first obtaining an official observatory code from MPC. To accomplish this, we needed to demonstrate the ability to gather position data on at least eight asteroids from magnitude 14 to 18 and have the predictions and observations agree within 2 arcseconds. The observations made have an error within 1.40 arcseconds. However, our newly established process presents an error in DEC being double that of the error in RA and with inconsistent measurements in magnitude.

Breakout Session #2

HLSB 338

Preference of Nesting Sites of Eastern Bluebirds (EABL) in a Suburban Landscape

Jenna Luka, student - MC

Mentor: Kiersten Newtoff, faculty - MC

A majority of bluebird trails are placed along open areas such as in parks, on farms, and along country roads. Rarely are they recommended for suburban or urban areas since bluebirds prefer open spaces, are not considered urban birds, and human disturbance can negatively impact nestlings. In March 2020, an 11-box EABL trail was set up on the Montgomery College campus in Germantown, Maryland. The environmental factors of each nesting box (distance to the closest tree, sidewalk, road, and building; tree density 30m around the box; whether attached to a tree, post, or other medium; and the height of the box) were correlated with nesting success of EABL. Two of the 6 factors showed a correlation with the number of successful fledglings: the distance to the nearest tree ($r = -0.28$), and distance to the nearest road/parking lot ($r = 0.5$). The results of finding greater EABL success in or around trees is surprising since many predators such as cats, raccoons, and mice can easily scale trees to access nests. We hope that this information may inspire other urban and suburban organizations to take advantage of any space that they have on their grounds to place bluebird boxes.

HLSB 340

The MMS Era of tracking EMIC Waves in the Outer Magnetosphere: When, Where, And Why

Aditi Madabushi, student - BCCC

Mentor: Sarah Vines, Johns Hopkins Applied Physics Lab

Electromagnetic Ion Cyclotron Waves (EMIC waves) are a special class of ultra-low frequency waves that traverse and transfer energy throughout Earth's magnetosphere. EMIC waves play a major role in controlling the Earth's radiation environment, along with causing charged particles from Earth's Van Allen belts to precipitate into the atmosphere. To better understand where EMIC waves are generated, how they travel and evolve, and how they can potentially affect Earth's near space environment, we use EMIC wave observations gathered by NASA's Magnetospheric Multiscale (MMS) mission from 2015 through 2020. We analyze EMIC wave occurrence rates as a function of magnetic latitude (MLAT), magnetic local time (MLT), and dipole L-shell for all EMIC wave events observed by MMS. These observations exhibit EMIC wave occurrence peaks in the afternoon and morning sectors at large L shells, with indication of enhanced wave activity at higher MLATs, especially near noon. Occurrence rates by wave band (H, He, and O) and distributions of EMIC wave properties, such as ellipticity, are also investigated, allowing a deeper understanding of outer magnetospheric processes and impacts on EMIC wave generation.

A Meta-Analysis of X-ray Data from LMC X-4

Jacob Lee, student - HowardCC

Mentor: Frederic Lang, faculty - HowardCC

This study will be examining the X-ray binary LMC X-4. X-ray binaries are binary star systems (two stars orbiting each other), where one of the stars has died and become either a neutron star or black hole. The other star is called the companion star. When matter from the companion star falls onto the surface of the neutron star or black hole, X-rays are released. The X-rays that are released can then be detected by satellites. This data can be used to create light curves, which graph the intensity of X-rays as a function of time. Light curves can be analyzed to determine the periodicity (repeated patterns) of the X-ray binary. Other studies on LMC X-4 have determined the spin period of the neutron star, the orbital period, and the period of precession of the warped accretion disk. The goal of this study is to investigate these known periods and also determine if there are any other long-term periodicities in LMC X-4.

HLSB 342

Understanding the Role of Polymers in the Degradation of Solar Panels

Nowrin Nuzhat, student - MC

Mentor: Kiersten Newtoff, faculty - MC

Due to the high voltage conditions at which solar panels usually operate, a phenomenon called potential induced degradation occurs. This causes leakage current to flow between the layers in the solar panel. Due to the leakage current, sodium ions present in the glass can pass through the encapsulant polymer which decreases the solar cell's operating capacity. Previous research has shown that Ionomers and Polyolefins are better polymers to use as the encapsulant to prevent this electrical shunting. However, the mechanism isn't fully understood. The goal of the project is to elucidate the mechanism in three different commercially available encapsulants by analyzing encapsulant chemistry and imaging the sodium flow.

Understanding the Frictional Properties of Plastics

Joshua Thomas, student - MC

Mentor: Susan Bontems, faculty - MC

Plastics have become the reliable one-time use product which we assume to have taken back control of through recycling campaigns of reuse-reduce-recycle. Unfortunately, the plastics which we believe we are disposing of carefully are more complex than we think. All plastics are not created equal and therefore require a form of separation. The plastics we hope to focus on contain olefins which are monomers that make up high-density polyethylene, low-density polyethylene, and polypropylene. Our research hopes to take advantage of the frictional properties of these different plastic types and be able to separate them using a vibrating surface. In theory, when set to a certain temperature, a specific plastic type will be the only one displaying frictional properties allowing it to remain stuck to the vibrating plate while the rest of the blended plastic is forced out. The work we are currently performing focuses on manipulating plastics to better understand how they relate to one another, specifically understanding their static and kinetic frictional properties in relation to temperature. Using a rheometer, we performed tests that involved seeing how plastics react to different amounts of forces pushing down on them, their reaction to deviating temperatures and analyzed their movements under various speeds.

Breakout Session #3

HLSB 338

How Does Participating in Environmental Activities Influence a Person's Perception of Themselves, Others, and the World?

Elissa Tuten, student - CSM

Mentor: Alan Hemming, faculty - CSM

The goal of this study is to observe how engaging in environmental activities can impact the perceptions and emotional energy of students at the College of Southern Maryland. Participants will be asked to fill out a total of 10 questions: 5 survey questions reflecting on "before work" in the garden experience and 5 questions reflecting the participants "after work" in the garden impact. The garden experience is an actual physical garden that produces food to support local food pantries and communities in need. Volunteers will work in the garden, assisting with harvesting food in the spring season. Within this experience, is a component of team building activities. Volunteers can voluntarily discuss any issues that may be troubling them in their life and how the garden has personally impacted them. The survey and act of team building is a key observation to see if there is change happening in students due to the garden project. The results produced from the study will determine if environmental activities influence a person's perception of themselves, others, and the world. The research is intended for a platform presentation at the Maryland Collegiate STEM conference as a culmination of an Undergraduate Research Letter of Recognition at CSM for the principal investigator."

HLSB 340

PMV in the DMV: Estimating the Partial Molar Volume of each Component in a Binary Solution Using Refractive Index Measurements

Anthony Dcosta, student - PGCC

Mentor: William J. Miller, faculty - PGCC

In the classic physical chemistry experiment, the partial molar volumes of each component in a binary solution are determined using a pycnometer. However, by assuming that the molar refractivity of these solutions behaves ideally (even for non-ideal solutions), we have obtained estimates of the partial molar volumes based on measurements of the refractive indices of these solutions. We compare our estimates to literature values of the partial molar volumes. We also present results for new binary systems for which there are no literature results.

The Effect of Different Strategies on Winning 6 Nimmt!

Jose Ayala, Nathanael Bickel, and Stefan Cehan, students - HowardCC

Mentor: Kristel Ehrhardt, faculty - HowardCC

The German card game “6 Nimmt!” is a game where the player begins with ten cards, playing one card each round until there are no cards left. The 104 cards are each numbered from 1-104 and have a specific number of “bullheads” or point values attached to them. The goal of the game is to finish with the least amount of bullheads. We examined different strategies that the participants developed to acquire the least number of bullheads per game and the strategy’s effectiveness in multiple rounds of 6 Nimmt!. This experiment was conducted as a randomized, blind study to control the participant’s knowledge of multiple strategies. Each player independently developed and implemented their own strategy. Ultimately, we found the best strategy to be one where the low numbered cards were played first and the high number cards last. This, in combination with targeting other players who were doing well, was the most effective strategy.

Poster Abstracts

Odd Numbered Posters – Session A, 11:30am – 12:30pm

1. *Determining the Concentration of H₂O₂ in Teeth Whitening Products by Redox Titration*

Derin Sabir, student - MC

Mentor: Thomas Chen, faculty - MC

Hydrogen Peroxide has been in common use as the active ingredient in teeth whitening products since the late 1980s. Studies show that gum irritations, gingival inflammation, and teeth sensitivity are adverse side effects related to the teeth whitening procedure. These issues are also more commonly associated with the over-the-counter (OTC) products intended for the less controlled in-home use, especially when the H₂O₂ concentration is higher than the recommended safe to use range (3.6 to 6.0%). However, most of the OTC teeth whitening products do not specify the concentration of H₂O₂. In this work, we used redox titration between H₂O₂ and permanganate, which also serves as the redox indicator, to determine the concentrations of H₂O₂ in different types of teeth whitening products. The two most common active whitening agents, carbamide peroxide and hydrogen peroxide, were examined. Teeth whitening products in the form of gel and toothpaste were also investigated. Preliminary results suggest while the concentration of H₂O₂ may be within the recommended range, the adverse issues mentioned are still a concern due to the less controlled setting in which these OTC products are intended.

3. *Validation tool for DART-MS Drug Library*

Christine Ogunsola, student - MC

Mentors: Arun Moorthy and Edward Sisco, staff scientists - NIST

With the ability to create a new drug by the minuscule differentiation of a recipe, identifying illegal drugs is challenging. At the National Institute of Standards Technology, we are studying the use of Direct Analysis in Real-Time Mass Spectrometry (DART-MS) to measure compounds and combat this challenge. Recently, we have created a DART-MS library, or database, of mass spectra of various drugs and related compounds. However, as a database grows, computer-generated and human errors always form. The goal of this project was to develop tools to validate the metadata for associated compounds at the library's intermediary step, the Excel data.

Each chemical identifier (Mass, Canonical SMILES, InChi Code, InChi Key, and Class) is validated against the chemical formula (assumed as fact). Depending on the identifier, the data is verified by a script with custom-built functions or tools from Rdkit, a Cheminformatics industry-standard module.

The identifiers' scripts are compiled into a user-friendly validation application. The dataset can be filtered by multiple values and downloaded as an Excel file depending on the user's needs. This tool is regularly used in building our library.

This research proposal will be about the necessity, creation, and use of the validation tool, VUF.

5. Identification and Annotation of InR Gene Ortholog from *D. melanogaster* in *D. biarmipes*

Natasha Acuña, Sadeiah Matthews, Sophie Berger, students - CCBC

Mentor: Natalie Minkovsky, faculty - CCBC

Genetics Education Partnership (GEP) is an academic consortium through which faculty and students can collaborate in genetics. The GEP offers research projects which provide opportunities to deepen and broaden knowledge for genetics and biomedical studies.

The GEP Pathways project explores the evolution of routes that biological processes take to get to an important biological outcome as a pathway in various species of *Drosophila*, commonly known as a fruit fly. The current focus of the GEP Pathways project team is the insulin signaling pathway, which directs critical processes in growth and homeostasis within an organism. We hypothesized that the species *D. biarmipes* has an ortholog of the InR gene found in *Drosophila melanogaster*. We identified the gene ortholog in *D. biarmipes* with high sequence similarity detected by BLAST search and annotated it using the tools provided by the GEP: FlyBase, Gene Model Checker, Gene Record Finder, and UCSC Genome Browser. Initiation of the insulin signaling pathway is caused by insulin-like peptides binding to insulin-like receptors (InR). When a mutation occurs in the InR gene, insulin can no longer bind to the InR protein on the cell surface thus causing major problems in the rest of the pathway.

7. Annotation of the Coding Sequence of the Mipp2 Gene in *Drosophila hydei*

Bianca Giosa and Matthew Quattrochi, students - CCBC

Mentor: Natalie Minkovsky, faculty - CCBC

We report the annotation of the multiple inositol polyphosphate phosphatase 2, or ‘Mipp2’ gene in *Drosophila hydei*, coding for the enzyme bisphosphoglycerate 3-phosphatase, which acts within the extracellular exosome of the adult head. Mipp2 is predicted to work as a part of TORC1 complex, which suggests a multifaceted role, as TORC1 is involved in mediation of the organism’s responses to stress, insulin-like peptides and amino acids, and regulation of intracellular processes like autophagy, cell growth, and translation. The human ortholog of Mipp2, multiple inositol-polyphosphate phosphatase 1, MINPP1, has been linked to various cancers. TORC1 counts among a broader group of TORC complexes that function as signaling networks controlling spatial and temporal cell growth within mammalian cells. This role, coupled with their implication in human cancer and aging, makes annotation and further study of Mipp2 and other genes that contribute to TORC1 paramount.

The Mipp2 gene of *D. hydei* was annotated using GEP genomics tools. The NCBI BLAST was utilized to determine the *D. melanogaster* Mipp2 ortholog in *D. hydei*. The most likely sequence was chosen based on the low E-value and high percent identity.

9. The Annotation of the Lpin Gene on *Drosophila sechellia*

Allana Therese Calahatian and Jacquelyn Amaya, students - CCBC

Mentor: Natalie Minkovsky, faculty - CCBC

To understand the functioning of organisms, it is essential to study the biochemical pathways they use to conduct metabolism. One of the very important conserved pathways is the insulin pathway which is involved in the homeostasis of blood glucose. Working as a part of the project conducted by the Genomics Education Partnership which seeks to map the evolution of the insulin pathway within fruit fly (*Drosophila*) species, we focused on the annotation of the Lpin gene of the species *Drosophila sechellia* to further analyze how its gene sequence and organization, as well as position in a specific genomic region evolved. Using the GEP UCSC Genome Browser, Gene Record Finder, Gene Model Checker, NCBI Blast, and FlyBase, we identified and annotated a sequence within the *D. sechellia* genome that has high similarity to the *D. melanogaster* Lpin gene. It is located in the genomic region, which includes upstream Kermit and CG8708 and downstream Obp44a and Pabp2 genes, making it similar to the *D. melanogaster* Lpin gene neighborhood.

Lpin gene encodes a protein that has an essential role in fat body function and energy metabolism. *D. sechellia* is a species of *Drosophila* native to Seychelles.

11. Annotation of the Impl2 Gene of *Drosophila Serrata*

George Githiomi Njuguna and Ansari Noor, students - CCBC

Mentor: Natalie Minkovsky - CCBC

The insulin transduction pathway is a biochemical pathway by which insulin increases the uptake of glucose into fat and muscle cells and reduces the synthesis of glucose in the liver and hence is involved in maintaining glucose homeostasis.

A study was done within the insulin signaling pathway project through Genomics Education Partnership (GEP). We worked within this project to annotate the Impl2 gene in *Drosophila serrata*. This gene is essential in the developmental role during embryogenesis, in particular the normal development of the nervous system. It may be involved in some aspect of cell adhesion. 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. serrata* 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 gene and the surrounding regions are mostly aligned with the ones shown in *D. melanogaster*, supporting the hypothesis that both genomes are relatively homologous.

13. *Diversity and antibiotic resistance in individual human nasal microbiomes*

Alison Wade and Huijie Zhang, students - Allegany

Mentor: Carolyn George, faculty - Allegany

The human body harbors complex microbial ecosystems composed of numerous bacterial, archaeal, fungal, and viral species. The precise compositions of these microbiomes are unique to individuals and with respect to body site (e.g. gut, skin, respiratory system, etc.), and they are influenced by numerous environmental factors. While there is still much to learn about human microbiomes and their role in human health, it is clear that diversity and stability of core microbiomes are key to protection against pathogenic microorganisms and non-infectious diseases. Overuse of antibiotics, which is well-known to lead to increased populations of antibiotic resistant bacteria, both pathogenic and commensal, is a threat to the diversity of microbiomes. The nasal microbiome is particularly under-studied with respect to the prevalence of antibiotic resistance. To begin an exploration of diversity and antibiotic resistance in the human nasal microbiomes, nasal swabs from three individuals are being analyzed to identify predominant culturable bacterial genre or species. Once isolated and identified, these species will be tested for resistance to a variety of antibiotics. It is expected that an individual with a history of frequent antibiotic treatments is more likely to carry antibiotic-resistant strains compared to two individuals with little history of antibiotic treatments.

15. *Our New Friend HannaBella: Isolation and Characterization of a Novel Bacteriophage*

Hanna Habiba and Isabella Scopelliti, students - HarfordCC

Mentor: Breonna Martin and Jaclyn A Madden, faculty - HarfordCC

A bacteriophage is a virus that can infect and destroy bacteria. Bacteriophages have the potential to combat infections caused by antibiotic-resistant bacteria. This is a reason to explore bacteriophages as a form of modern medicine. The bacteriophage, Hannabella, was isolated from a soil sample at Harford Community College. A series of plaque assays, using the host *Microbacterium foliorum*, were used to isolate and purify the phage. After achieving the desired bacteriophage concentration, the DNA was extracted and sequenced with the help of the Pittsburgh Bacteriophage Institute. Hannabella is a *Podoviridae* bacteriophage that is part of Cluster EM. Hannabella's genome is 53,643 base pairs long, contains 47 genes, and the GC content is 64.8%. We are annotating the bacteriophage genome using bioinformatics tools including PhagesDB, DNA Master, HHPred, and NCBI BLAST. Completing the genome annotation may shed light on other bacteriophage genomes and contribute new information to those experimenting with phage therapy.

17. *Manduca sexta* Larvae Exhibit Rhythms in Feeding Behavior and Rhythms in Gene Expression of the Circadian Gene Period

Donovan Waters, student - HowardCC

Mentors: Ellena McCarthy and Hanna Pie, faculty - HowardCC

The tobacco hornworm (*Manduca sexta*) is considered an agricultural pest due to its predation on agriculturally significant Solanaceous plants, such as tomatoes and tobacco, making the behavioral and molecular mechanisms underlying its feeding behavior of great interest to agriculture. Circadian rhythms are daily biological rhythms endogenous to an organism that can be reset by environmental cues and have been shown to influence the behavioral output of organisms. The molecular basis for these approximately 24-hour rhythms is a transcriptional/translational feedback loop in individual cells, involving a gene called period (*Per*). While circadian rhythms have been shown to be functional in the adult *Manduca sexta* and to affect behavior, the presence of a functional circadian clock has not yet been described in the larvae. In this study, we explored whether the tobacco hornworm exhibits rhythms in feeding behavior and whether the circadian gene *per* is rhythmically expressed. Testing of larvae at different times of day, found that there were significant differences in the amount of leaf consumed at different time points. In addition, when tissue samples were harvested at these same time points, the expression level of *Per* also significantly differs at different times of the day. Our data are consistent with the tobacco hornworm having a functional circadian clock, but further investigation will be necessary to determine if their feeding behavior is indeed modulated by circadian rhythms.

19. Exploring the Mechanism Responsible for Feeding Inductions in *Manduca sexta*

Daniel Hall, student - HowardCC and Alexis Jacobs, student - UMBC

Mentor: William Gretes, faculty - HowardCC

In the wild, the Tobacco Hornworm, *Manduca sexta*, is a known specialist that feeds primarily on plants from the family Solanaceae. Previous research has supported the hypothesis that exposure to chemicals in Solanaceous plants causes the larvae to restrict their diet and avoid feeding on other plant families. While it has been previously established that larval behavior can be modified by experience within and outside of the Solanaceous family, the mechanisms behind these changes are still poorly understood. This has been due partly to limits in the amount and detail of the data being collected. The goal of this research is to better understand how past diet affects feeding decisions of larvae later in life with the help of recently developed deep learning methods.

Larvae reared on plants from the family Fabaceae (cowpea, soybean, pea) tended to feed on these plants more than larvae reared on Solanaceous or Cruciferous plants. Alternatively, larvae reared on Cruciferous plants did not appear to display any increase in the consumption of those plants. This may suggest that the mechanism of induction (and the plant compounds critical for the induction) in *M. sexta* larvae differ from one plant family to another.

21. *Multispectral Analyses on Drone-Captured Images for Submerged Aquatic Vegetation (SAV) Monitoring*

Alexander Thompson, student - AACC
Mentor: Tim Tumelty, faculty - AACC

The important ecological role of submerged aquatic vegetation (SAV) makes its year-to-year distribution of significant interest to environmental monitoring organizations. The use of drones to perform the task of SAV monitoring through multispectral analyses is a promising tool to achieve a methodology that is automatable, repeatable, time efficient, and accessible. A preliminary trial was conducted at Eagle Cove near Gibson Island on the Magothy River where a DJI Phantom 4 Drone with a Sentera special purpose camera captured multispectral digital images with five spectral bands. These were used to apply and analyze four vegetation indices: NDVI, GNDVI, mNDVI, and NDAVI. Analyses was done using ArcGIS Pro. The images generated by each index show some measure of successful identification of SAV, though there are many false-positives due to a variety of factors. The effectiveness of each index in our images was estimated by comparing the amount of pixels identified as SAV in the area of observed SAV growth and outside of this area. The most effective index was indicated to be mNDVI. This methodology will continue to be developed at AACC, and future work will aim to improve upon this process and to make calculations of SAV acreage and density that can be compared to ground-truthed observations.

23. *Longitudinal Study of a Regenerative Step Pool Storm Conveyance (SPSC) on Stream Stability and Water Quality*

Emily McManus, Lexi Jurchen, Nicholas Marsella, William Umberger, Andi Galvin-Manico, students - 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 in 2016. This investigation focuses on photo-documenting the geomorphology of the stream as well as monitoring water quality indicators, such as salinity, total suspended solids (TSS), pH and others. Water quality 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 informing the design of other restoration projects. Photographs show no appreciable erosion. Test results generally show comparable water quality upstream and downstream of the SPSC, indicating some benefit from the SPSC. (This is an ongoing project of chemistry service learning students.)

25. *The Room Where It Happens: Socialization and STEM in the 2020's*

Bryant F. Pepe and Elise Porcelli, students - AACC
Mentor: Anthony Santorelli, faculty - AACC

The presenters share their experience using a unique approach to campus engagement, centered on physical and mental accessibility for traditionally marginalized groups in STEM spaces, specifically in the COVID era. Using technological innovation and on-going feedback, they developed a method of sustainable digital engagement that still allows for hybrid and traditional collaboration by utilizing virtual methods.

27. *Estimating the Partial Molar Volume of Each Component in a Binary Solution Using Refractive Index Measurements*

Anthony D-Costa, Laura Nyoh Tabi, Kate Oparaji, Tonderai Kodzwa, Autumn Jackson Bartholomew, Ilham Kabir, students - PGCC
Mentor: William Miller, faculty - PGCC

In the classic physical chemistry experiment, the partial molar volumes of each component in a binary solution are determined using a pycnometer. However, by assuming that the molar refractivity of these solutions behaves ideally (even for nonideal solutions), we have obtained estimates of the partial molar volumes based on measurements of the refractive indices of these solutions. We compare our estimates to literature values of the partial molar volumes.

Even Numbered Posters – Session B, 12:30pm – 1:30pm

2. *CRISPR Guide RNA Designed to Knock Out the HbA1 Promoter Region to Treat Alpha-type Methemoglobinemia*

Jay Matta, student - MC
Mentor: Linda Jurata, faculty - MC

Clustered regularly interspaced short palindromic repeats (CRISPR) is a fairly new technology that can edit genes. In CRISPR gene editing, a guide RNA (gRNA) shepherds Cas9 protein to the precise editing site on a DNA strand. Once the Cas9 protein reaches the target site, it attaches onto the DNA and cuts the unwanted part.

CRISPR technology has been thoroughly tested on sickle cell disease, which stems from mutations in β -globin. A clinical study found that by using CRISPR technology on human CD34+ Hematopoietic stem cells (HPSCs) and targeting the BCL11A erythroid-enhancer region in the γ -globin gene, sickle cell disease can be treated (Haydar et al., 2021).

Alpha-type methemoglobinemia is a clinical condition in which more than 1% of hemoglobin is oxidized to methemoglobin, a type of hemoglobin that contains the ferric form of iron. This disorder is a result of a mutation in the HbA1 gene on the alpha-globin locus (METHEMOGLOBINEMIA, 2018). This disease affects the alpha-globin subunit of Hemoglobin.

My research is critical to the field of CRISPR gene editing because I have developed gRNAs that can treat alpha-type methemoglobinemia. With the design of these gRNA, CRISPR application can be expanded to treat other genetic disorders (Ledford, 2020).

4. *Common Variations within the SCN9A Gene that May Alter Pain Perception*

Mertinu Geleta, student - MC

Mentor: Linda W. Jurata, faculty - MC

Considerable progress has been made over the last few decades in the understanding of peripheral and central mechanisms involved in chronic pain syndromes. It has been proven that different people do not experience pain in the same manner (Mogil, 2012; Kambur et al., 2018; Nishizawa et al., 2021). Certain regions of our brains, such as the thalamus and the insula are responsible for how we deal with pain (Namkung et al., 2017). Genetics vary from person to person, therefore, the genes in the above-mentioned brain regions could be expressed differently, affecting pain perception. Identification of genes involved in pain perception is important to develop specific treatment of people once their genetic variants are discovered. The SCN9A gene codes for the alpha subunit of a sodium channel known as NaV1.7, which is located in pain-transmitting nerve cells (Xing et al., 2021). Gain-of-function mutations in SCN9A cause severe neuropathic pain in humans, whereas loss-of-function mutations cause pain indifference (Dib-Hajj et al., 2013). In my research, bioinformatics databases including NCBI dbSNP and PDB were used to identify and characterize the ten most commonly occurring SCN9A missense mutations and map these variants to the 2D- and 3D- structures of the NaV 1.7 channel.

6. *Characterizing Elements of the ST18 gene that have been Associated with Alzheimer's Disease*

Noelle Hailu, student - MC

Mentor: Linda Jurata, faculty - MC

The ST18 gene codes for a zinc-finger transcription factor that regulates expression of myelination genes. This gene has shown numerous connections to Alzheimer's Disease (AD). Genome-wide association studies (GWAS) associated SNP rs10109716 in the ST18 gene with mean cortical thickness in AD-associated parts of the brain (Kim et al., 2021), while SNP rs7009219 was associated with cognitive decline in AD (Sherva et al., 2014). Also, expression of the antisense RNA AC021915.1, located within the ST18 gene, was shown to increase in late-onset AD and positively correlated with transcription of ST18 itself (Humphries et al., 2014). To learn more about the relationship between ST18 and AD, I used bioinformatics techniques to characterize SNPs rs10109716 and rs7009219, and three antisense RNAs in the ST18 gene. While both SNPs located to introns, the proximity of rs7009219 to the antisense RNA AC103831.1 and numerous enhancers might allow it to impact expression of both AC103831.1 and the main ST18 gene. Also, while unusually high expression of antisense RNA AC021915.1 was reported in the brain of AD patients (Humphries et al., 2014), I found that it is normally only expressed in the testes. Further functional investigations are needed to clarify the connection between ST18 and AD.

8. mRNA Vaccines and Pancreatic Adenocarcinoma (PAAD) Antigens: Which Antigen is the One?

Nikki Faroughi, student - MC

Mentor: Linda Jurata, faculty - MC

Pancreatic Adenocarcinoma (PAAD) is a malignancy of the digestive system. There currently is no cure for this cancer and there has been little advancement in treatment in the past two decades. Treatment for PAAD usually involves surgery followed by chemotherapy, but not all patients are candidates for surgery due to late diagnosis and metastasis of the cancer. Hundreds of research experiments have been done to attempt to find a cure for this cancer.

mRNA vaccines have become exceptionally popular recently due to their usage for COVID-19 vaccines, which have led scientists to think: could mRNA vaccines be used to cure cancer? In 2021, Huang et al. identified six mRNAs whose overexpression in PAAD tumors correlated with poor prognosis. ADAM9, EFNB2, MET, TMOD3, TPX2, and WNT7A were thus identified as possible antigens that could be used in the creation of a vaccine (Huang et al., 2021).

In my research, I used bioinformatics approaches to compare subcellular localization and gene expression profiles to determine which of the six potential antigens discovered by Huang et al. could be the most potent for use in a pancreatic cancer mRNA vaccine. In the end, I concluded that MET and WNT7A were the best candidates.

10. Species Richness & Abundance in Burnt Mills West Special Parks River

Barbara Canales Diaz and Shubire Baderzada, students - MC

Mentor: Kiersten Newtoff, faculty - MC

Located in Montgomery County, Burnt Mill Special West Park attracts residents from around the county to hike, bike, walk, or picnic at the park. The Northwest Branch Anacostia River flows through the park and has a dam built over 25 years ago. The purpose of the dam is to prevent flooding which is prevalent during the warmer season. The dam also serves as debris management, but the consequences of this are that the dam might destroy habitats. Initial samples were collected from two different locations in October 2021; one location upstream from the dam, and the other downstream. The goal was to measure species richness and abundance of stream macroinvertebrates. The initial results show that there was more species richness and abundance downstream. More data was collected in April 2022, and we will present the results of these updated findings. Our results can provide insight into water and habitat quality, and safety for humans and pets in using these waters.

12. Determining Successful Nesting Sites for Eastern Bluebirds in a Suburban Landscape

Zhonyar Amini and Diana Loyo Ramos, students - MC

Mentor: Kiersten Newtoff, faculty - MC

The population of Eastern Bluebirds has declined dramatically over the years. Two main causes are modernization and increased competition for nesting sites by invasive species, such as the House Sparrow. By using nest boxes designed specifically for bluebirds, the species has managed to rebound in recent years. In March of 2020, an 11-box bluebird trail was set up at the Montgomery College, Germantown campus. Each year since then, students have researched various factors that might impact the Bluebird nesting boxes' success. This year, our research adds variables such as field of view and distance to forest as potential factors. Using previous as well as current research, we have analyzed the bluebird trail to remove unsuccessful boxes and establish new ones. By collecting data each breeding season, we can learn about the nesting preferences of bluebirds and how to maximize their reproductive success. Our recommendations can be used at other community colleges across Maryland in constructing their own suburban bluebird nest box trail. Providing nest boxes under the right environmental conditions will help increase the bluebird population.

14. *Moth Behavior to Light Wavelength*

Rasanjali Ilandara and Jennifer Gonzalez, students - MC

Mentor: Kiersten Newtoff, faculty - MC

While moths are not a charismatic species, they do provide many benefits to our ecosystem such as being a major contributor to pollination and an indicator of a healthy environment. We studied the impacts of different lights on moth activity to provide us information on how to protect these insects as we continue to urbanize. Traditional white, red, and blue light bulbs were used as porch lights in October and November 2021, and the number of moths each color attracted were recorded. Additional data will be collected in March and April 2022.

Initial data concluded that the white bulb attracted significantly more moths than blue and red, which were not significantly different from each other. Based on the current findings of this experiment, the use of white light may be lowering the rate of pollination. Determining which color least attracts these organisms can be incorporated as we continue to innovate and urbanize our cities and towns.

16. *Determining How Glycine Permeates through the Russet Potato and Acorn Squash Cell Membrane*

Emily Tran and Khang Tran, students - MC

Mentor: James Smith, faculty - MC

We investigated the osmolarity and tonicity of *Solanum tuberosum* tuber and *Cucurbita pepo* fruit using both solutions of NaCl and of glycine. Another objective of this study was to determine if glycine is a penetrating solute for these samples. We will discuss the factors influencing the transport of glycine across plant membranes.

To determine the osmolarity of potato and acorn squash, replicate samples were prepared and placed in four different glycine solutions and weighed at ten-minute intervals over 50 minutes. We likewise treated replicate control samples in NaCl solutions.

The osmolarity of the potato determined in NaCl was 0.46 osM. Squash had a higher osmolarity of 0.7 osM than potato did in NaCl. However, in both NaCl hyperosmolar and glycine hyperosmolar solutions the potato pieces did not reach equilibrium. While only 0.9 osM (0.5 M) NaCl appeared to be hyperosmotic. All the glycine solutions used were hypo-osmotic and therefore hypotonic.

While we were able to determine the osmolarity of the potato and squash, these results are inconclusive regarding the penetrability of glycine, because osmotic equilibrium did not occur during the 50 min experiment duration. Also, due to the higher osmolarity of the squash, solutions of greater concentration than 0.6 M must be used to determine the penetrability of glycine.

18. *How Can HCC Contribute to the International Database of Asteroid Orbital Information?*

Rebekah Anastasia Ericson and Elizabeth Arhavbarien, students - HowardCC

Mentor: Brendan Diamond, faculty - HowardCC

Asteroid observation is vital for the future of space research. Tracking asteroids and determining their positions is key to preventing possible asteroid impacts with Earth and provides opportunity for future explorations to discover new information about our solar system and universe. During fall 2021, our team initiated asteroid observation at HCC by performing observations for asteroid astrometry. To make these observations, the team used data from the Minor Planet Center (MPC), which is the primary data site for all astrometry data for comets, asteroids, and other minor planets.

The team hopes to establish an observation program for asteroid tracking at HCC, making it able to submit observations for less well-known orbits, by first obtaining an official observatory code from MPC. To accomplish this, we needed to demonstrate the ability to gather position data on at least eight asteroids from magnitude 14 to 18 and have the predictions and observations agree within 2 arcseconds. The observations made have an error within 1.40 arcseconds. However, our newly established process presents an error in DEC being double that of the error in RA and with inconsistent measurements in magnitude.

20. *A Thorough Analysis of the Potential Exoplanet Orbiting Star TIC-271761420.01*

Jacob Meyerson and Steven Ihejurobi, students - HowardCC

Mentor: Savannah Hamilton, faculty - HowardCC

In the past two decades, technological advancements as well as human curiosity have led to the discovery of extrasolar planets or exoplanets. Similar to Earth, exoplanets are planets that orbit a star. Attempting to observe these planets with a conventional telescope is difficult due to their distance from Earth and the brightness of the stars they orbit. However, in the early 1990's, various techniques were used to effectively indirectly detect exoplanets. These techniques include the transit method and the radial velocity method. Employing these techniques, we plan to make contributions to the TESS (Transiting Exoplanet Survey Satellite) database with hopes of confirming an exoplanet after analyzing the data collected from our observations.

22. *Mobile Satellite Tower (MoSaT)*

Gracie Coakley, Ainsley Lundquist, Patrick Transue, Owen Pruitt, students - CarolICC

Mentors: Gregory Lepper, Jennifer Fain-Thornton, Raza Khan, Sharon Brunner, faculty - CarolICC

This project involves building a fully functional satellite tower that is also conveniently portable, so that information packets can be collected on the go and wherever a signal is clearest. To accomplish this, a Raspberry Pi 4 is being used in coordination with a software-defined radio and a homemade double turnstile antenna to receive the satellite data. The satellite tower will be stored in a convenient portable box that will also double as the base of the tower and allow its user to set up the structure wherever they see fit. This custom housing will be made from wood with wheels for portability and have a telescoping mid-section to allow for a quick assembly and disassembly.

24. *Hydraulic Robotic Exoskeleton*

Jay Whitmon, Kaitlin Reddick, Calyx Ruiz, Andrew Miller, students - CarrollCC

Mentors: Sharon Brunner, Jennifer Fain-Thorton, Raza Khan, Gregory Leppert, faculty - CarrollCC

Mobility is a crucial aspect of human life; however, the human body can be limited when put under an excessive amount of strain. Exoskeletons were developed to support joints under stress through the combination of anatomical, mechanical, and robotic components. There are existing exoskeletons designed for upper body assistance, although they are not easily affordable, lightweight, or accessible to the public. This research group intends to develop a new exoskeleton approach that accounts for these issues by simulating human motion of the upper body with a combination of hydraulics, robotics, and ergonomics. After constructing a bicep flexion arm brace prototype with a hydraulic system, the group will test the device by applying a series of incremental weights ranging from 10 to 50 lbs. In designing a new and affordable approach to an exoskeleton, this project would enable people who have physical limitations in their upper limbs to gain enhanced function and movement.

26. *Mycoremediation of Common Soil Pollutants by *Pleurotus ostreatus**

Gracie Schultz, Adriana Barrera, Taylor Bjerkaas, and Skylar Goonan, students - CarrollCC

Mentors: Dr. Gregory Leppert, Dr. Jennifer Fain-Thornton, Dr. Raza Khan, and Dr. Sharon Brunner, faculty - CarrollCC

Mushrooms have proven to be powerful decomposers. In the past thirty years, they have been tested on their innate abilities to break down harmful environmental pollutants into simpler compounds. This experiment is designed to test the efficiency of the Blue Oyster mushroom, *Pleurotus ostreatus* var. *columbinus*, and its abilities to digest or absorb common contaminants found in Maryland soil and waterways. The pollutants being tested in this experiment include motor oil, ammonium nitrate, and ammonium phosphate. Motor oil is a contaminant that can pollute the environment through car-related wastes, while ammonium phosphate and ammonium nitrate are both major components in fertilizers that can also be pollutants. To test the fungal ability to remove pollutants from an environment, pre-inoculated mushroom spores from *P. ostreatus* will be grown in sterilized rye. Once newly formed mycelia are available, they will be transferred to coco fiber substrate with clay beads for aeration and exposed to the three pollutants at concentrations of 1000 ppm of motor oil, 200 ppm of ammonium phosphate, and five ppm ammonium nitrate. By monitoring changes in the pollutant's concentration in the soil, *P. ostreatus* will be evaluated to determine if it is sufficient in absorbing and breaking down environmental pollutants.

28. *Implementing a Terminal Course-Based Research Experience*

Wayne Manrakhan, faculty - HarfordCC

PHYS 205 is the terminal physics course (of a sequence of 3 classes) taken primarily by Physics, Mathematics, and selected Engineering students at Harford Community College. This course is usually taken by students in their last semester of study for their associates degree. A short, tailored investigation based on students' major and background was designed and will be conducted during the course. Students will be exposed to research investigative methods including literature search, collecting and reporting data, and presenting results via a short in-class presentation. While the investigative level of this assignment does not match that of a CURE (Course-based Undergraduate Research Experience), it does contain elements of these types and courses and represents the first steps to creating a viable CURE for this course. I will report on students' choice of investigations, and their progress towards completion.

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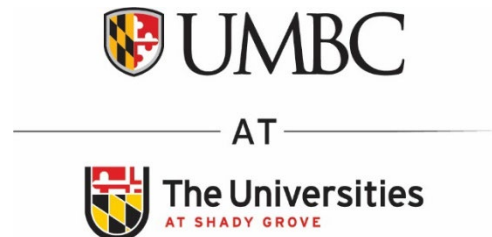
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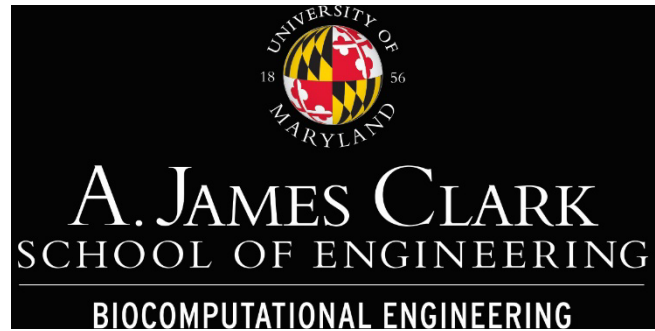
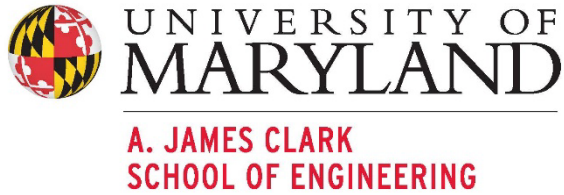
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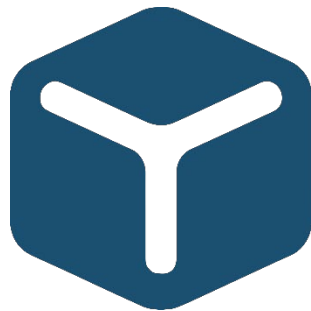


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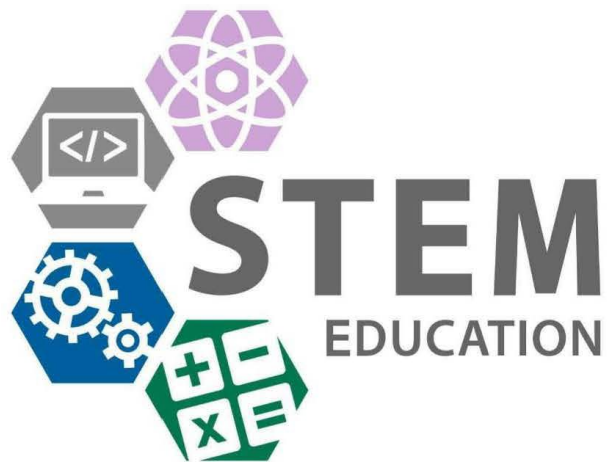
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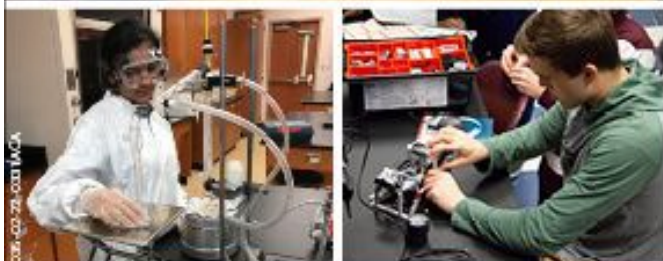
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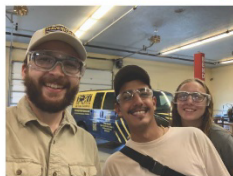
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