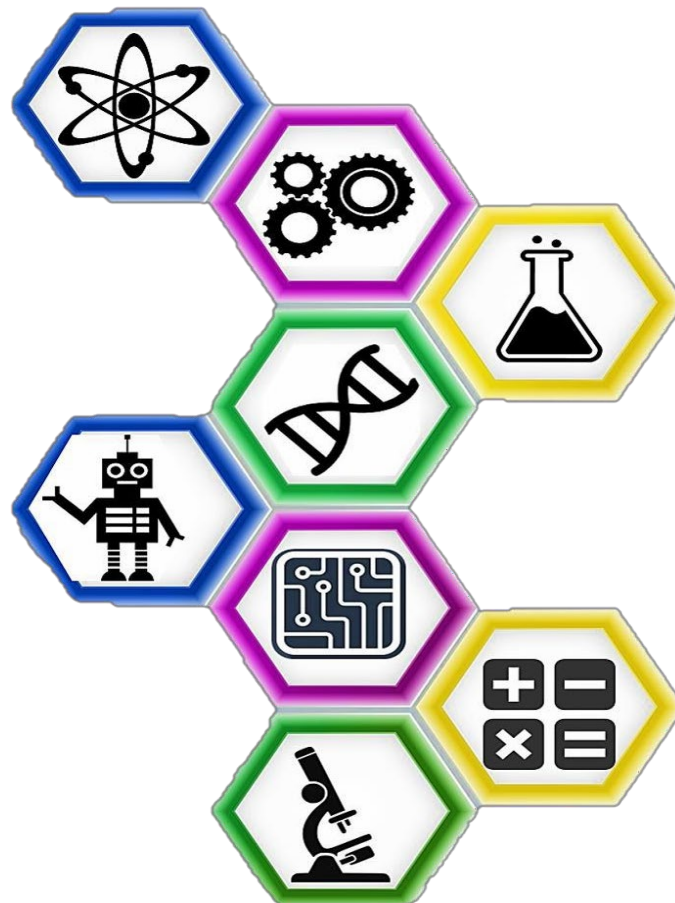




**2018 Maryland Collegiate STEM  
Conference Program**

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



**April 14, 2018**

**Howard Community College**

**Abbreviations used for colleges/universities:**

AACC – Anne Arundel Community College

ACM – Allegany College of Maryland

BCCC – Baltimore City Community College

CCBC – Community College of Baltimore County

CCC – Carroll Community College

CSM – College of Southern Maryland

FCC – Frederick Community College

FSU – Frostburg State University

HagerstownCC – Hagerstown Community College

HarfordCC – Harford Community College

Hood – Hood College

HowardCC – Howard Community College

MC – Montgomery College

PGCC – Prince George’s Community College

SU – Salisbury University

UMBC – University of Maryland, Baltimore County



LARRY HOGAN  
GOVERNOR

STATE OF MARYLAND  
OFFICE OF THE GOVERNOR



April 14, 2018  
4th Annual Maryland Collegiate STEM Conference  
Columbia, Maryland

A Message from Governor Larry Hogan

Dear Friends:

Welcome to the 4th Maryland Collegiate STEM Conference! I am delighted to provide this welcoming message to you.

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

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

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

Sincerely,

Larry Hogan  
Governor



*You Can Get There From Here.*

10901 Little Patuxent Parkway  
Columbia, MD 21044-3197  
443-518-1000  
MD Relay 711

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

Dear Conference Participants:

Welcome to Howard Community College and the fourth annual Maryland Collegiate STEM Conference. The 2018 conference brings students and faculty together for professional development and networking. It is also an opportunity to celebrate the achievements of science, technology, engineering, and mathematics (STEM) students who attend Maryland's community colleges.

I am pleased that Howard Community College's new Science, Engineering, and Technology (SET) Building is the setting for the conference. At 145,300 gross square feet, the \$77 million Science, Engineering, and Technology (SET) Building features innovative instructional spaces and modern advances in laboratory design to prepare students for employment or transfer to four-year universities. With more than 1,000 total classroom seats, the SET Building will help meet growing demand for well-trained cybersecurity professionals, scientists, and engineers. I invite you to take time today to explore the SET Building, which recently received LEED Gold certification for its sustainable practices in design, construction, and operation.

This conference showcases the very best in teaching and learning. I know the students attending today's conference will succeed and become the STEM workforce of the future. I wish you all the best for a successful and productive Maryland Collegiate STEM Conference.

Sincerely,

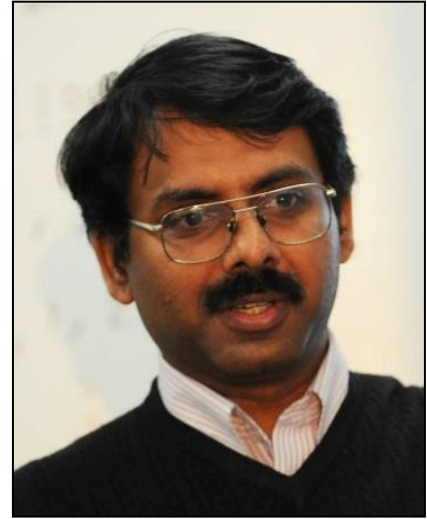
Kathleen Hetherington, Ed.D.  
President  
Howard Community College



## MORNING KEYNOTE SPEAKER

### **Becoming Next Generation Change Agents in Multidisciplinary Global Problem Solving through STEM**

Dr. Padmanabhan Seshaiyer, Professor of Mathematical Sciences, George Mason University



Dr. Padmanabhan Seshaiyer (Padhu) is a full Professor of Mathematical Sciences at George Mason University (GMU) and serves as the Associate Dean for Academic Affairs in the College of Science as well as the Director of COMPLETE (Center for Outreach in Mathematics Professional Learning and Educational Technology) at GMU in Fairfax, Virginia. He also recently served as a Program Director at the National Science Foundation. His research interests are in the broad areas of computational mathematics, scientific computing, computational biomechanics and STEM education. During the last fifteen years, Dr. Seshaiyer has initiated and directed a variety of national and international educational programs including graduate and undergraduate research, K-12 outreach, teacher professional development, and enrichment programs to foster the interest of students and teachers in STEM at all levels. He has delivered two TEDx talks and also is one of the Nifty Fifty speakers for the USA Science and Engineering Festival. He serves on many national organizations including serving as a Councilor for the Mathematics and Computer Science Division of the Council on Undergraduate Research, as the Chair of the Diversity Advisory Committee for the Society for Industrial and Applied Mathematics and, a member of the US National Commission for Mathematics Instruction by the National Academy of Sciences.

## AFTERNOON KEYNOTE SPEAKER

### **Rethinking the Culture of STEM Education in America: Promoting the Success of Students from All Backgrounds**

Dr. Freeman A. Hrabowski, President, University of Maryland, Baltimore County



Dr. Freeman A. Hrabowski, President of UMBC (University of Maryland, Baltimore County) since 1992, is a consultant on science and math education to national agencies, universities, and school systems. He was named by President Obama to chair the President’s Advisory Commission on Educational Excellence for African Americans. He also chaired the National Academies’ committee that produced the report, *Expanding Underrepresented Minority Participation: America’s Science and Technology Talent at the Crossroads* (2011). His 2013 TED talk highlights the “[Four Pillars of College Success in Science.](#)”

Named one of the 100 Most Influential People in the World by *TIME* (2012) and one of America’s Best Leaders by *U.S. News & World Report* (2008), he also received TIAA-CREF’s *Theodore M. Hesburgh Award for Leadership Excellence* (2011), the Carnegie Corporation’s *Academic Leadership Award* (2011), and the *Heinz Award* (2012) for contributions to improving the “Human Condition.” UMBC has been recognized as a model for inclusive excellence by such publications as *U.S. News*, which the past eight years has recognized UMBC as a national leader in academic innovation and undergraduate teaching. Dr. Hrabowski’s most recent book, *Holding Fast to Dreams: Empowering Youth from the Civil Rights Crusade to STEM Achievement*, describes the events and experiences that played a central role in his development as an educator and leader.

## Special Session

Group Meeting (starting at 10:10 am): **SET 401**

Breakout Rooms: **SET 401** and **SET 403**

### **STEM Supervisors' Meeting**

Supervisors from STEM fields will meet and discuss ideas of collaboration among community colleges in Maryland to help run program courses that are suffering from low enrollment. The RoundTable discussion will be moderated by Dr. Rose Mince, Vice President of Academic & Student Affairs, Carroll Community College at the session(s). Supervisors from all areas of Sciences, Biotechnology, Technology (including but not limited to CAD, CIS, Cybersecurity, Digital Fabrication), Engineering and Engineering Technology, Mathematics and other related STEM fields will be in attendance. Based on number of participants and the academic fields, the group may be divided into 2 – 3 different rooms. This session is open to the supervisors who have been invited to attend. This is a 70-minute session from 10:10 am – 11:20 am. **By Invitation Only**

## Welcome and Student Centered Keynote

**8:00 – 9:00am Registration (SET lobby) and Breakfast (SET 111)**

### **SET 101**

**9:00 - 9:05am Welcoming Remarks**

**9:05 am – 9:20 am: Remarks from Lt. Governor Boyd K. Rutherford**

**9:20 am – 10:00 am: Keynote Address: Dr. Padmanabhan Seshaiyer**

#### **Keynote Abstract:**

In this talk, the participants will be exposed to multidisciplinary global problem solving using STEM (Science, Technology, Engineering and Mathematics). Specifically, participants will have opportunities to engage in rich STEM-based tasks that require the use of higher-level critical thinking strategies and self-monitoring problem solving skills to create innovative solutions. Specific examples will include solving global challenges in food, water and energy systems through STEM based approaches as well as enhancing learning through innovative educational frameworks including active learning, experiential learning, project-based learning and learning by doing. Participants will also recognize that not only does an integrated STEM curriculum provide a shared collaborative experience to develop professionally but also will help to give them an opportunity to become change agents to transform their respective institutional practices. Participants will also have the opportunity to learn about funding opportunities for undergraduate research, internships and graduate research fellowships.

## **10:10 am – 10:40 am Student Session #1**

### **SET 203**

*The Impact of Experiential Learning Programs on Student's Success!*

Donnita Harrison and Michael Smith, faculty – PGCC

Case Study Representatives: Adekunle Olayiwola<sup>1</sup>, Joshua Hardaway<sup>2</sup>, Temitope Akomolafe<sup>3</sup>

Many college graduates face the grim reality of being overwhelmed or underwhelmed with the tasks, and demands of their new found professions. Why are students experiencing these obstacles when entering into the workplace? Many students may lack appropriate knowledge of their industry, or fail to possess the needed practical skills to fulfill day to day tasks. According to the Association of American Colleges and Universities, “Four in five employers (79%) want colleges to place more emphasis on internships or community-based field projects that teach students to apply knowledge and skills in real-world settings.” The necessity for organizations to provide STEM students with experience and professional development is vital for our students to meet the demands of their careers. The Center for Technology Access and Training (CETAT) programs offers the practical experience that provides the platform for information technology students to bridge the gap between their knowledge gained in the classroom, and the technical skills required in the workplace. In addition, CETAT internship programs help students to acquire essential soft skills that are valuable for their professional career. Case studies from CETAT will be used to illustrate the symbiotic relationship of internships and collegiate studies.

<sup>1</sup>IT Professional, CETAT, <sup>2</sup>PGCC student, <sup>3</sup>Technology Client Support, PGCC

### **SET 205**

*Presenting “AR Lab,” Labs at your Fingertips by SMACAR Solutions*

Shankar Koladi and Srihari Unnikrishnan, SMARCAR Solutions

Perform your lab experiments digitally and interactively at any time on your mobile device. The workshop will simulate a lab session on a mobile device, wherein the student will virtually execute a lab course that is currently being taught in the Biology department. The two lab exercises that will be showcased as proof-of-concepts (POC) are: Microscopy and Photosynthesis. The AR Lab App Demonstration will show how to use the App, including how to login and register, how to scan the assigned marker/select the experiment, and how to download and complete the assignment.



*A Microbial Source Tracking Analysis of Biological Pollutants in the Chesapeake Bay Watershed and the Policies That Got Us Here*

Daniel Morales and Sarah Carpe, students - BCCC  
Faculty Mentor: Amrita Madabushi, BCCC

Estuaries around the world provide a critical habitat for many organisms and support local businesses as maritime economic and culture areas, but through human interference and development we risk the safety and biodiversity of these great bodies. This research project focuses on the microbial source tracking of biological contaminants such as manure run-off and sewage leaks into the tributaries of the Maryland/Pennsylvania sectors of the Chesapeake Bay Watershed. The project utilized qPCR assays found in the Southern California Coastal Water Research Project technical report 804 for the detection and quantification of species-associated fecal contaminants for cattle, poultry, horses, humans. In addition to this, we analyzed the public policies and regulations of the Chesapeake Bay tributaries we sampled with model data from the South Florida Coastal Areas. Additionally, samples were collected prior to and after heavy rains to detect variations between environmental background contamination and heavy rain run-offs into the tributaries.

**SET 109**

*Out of the Cave, into the Darkness*

Kathleen Hamilton, student – HowardCC

Over the past century, our understanding of the universe has evolved. Exciting new theories have emerged, simultaneously enlightening us as to how things truly are and confounding our sense of reality. As science continues to progress in multiple fields, driving human experience further from the Newtonian mechanics of daily routines, questions in metaphysics take center stage. Revolutions at the sub-atomic level have transformed our understanding of matter and energy. Quantum mechanics reveals a probabilistic world constantly in motion. General relativity presents time dilation on a universal scale. Some attempts to unify these theories are envisioning everything as vibrating, one-dimensional strings. Mysterious dark matter and dark energy pervade the universe. While cosmology has transitioned from the province of philosophers to the domain of science, the philosophical implications of modern science are worth study. In attempting to answer what is real, and how we can know, Western philosophy may have to defer to other traditional forms that visualize a truly connected existence. Only when we reflect on the scientific advances in understanding our universe can we begin to comprehend how our lives truly work.

**SET 211**

*Internship - Your gateway to a Successful Transfer and Career*

Amrita Madabushi, faculty – BCCC

Panelists: Newton Bosire<sup>1</sup>, Lian Jackson<sup>2</sup>, Djeneba Sidibe<sup>3</sup>

Students pursuing STEM careers need not only in-depth knowledge but also substantial training and experience to be successful in their field. Internship is a real-world learning experience that enables students to gain invaluable experience, obtain great recommendations and give a huge boost to their resume. In this faculty-led session, we will have a panel of three successful students from Biotech program at Baltimore City Community College (BCCC) who did internship as a part of the requirement of Associates degree, These Biotech alumni have since transitioned to jobs in company, research institute and/or university for Bachelor degree. Panel members will provide invaluable advice on how they got the internship, what they did to be successful at the internship site and how it enabled them to transition to their next step. The panel members will be engaged in an interactive discussion with audience throughout the session where the audience can ask questions and get tips on doing successful internship in their discipline.

<sup>1</sup>Lab Asst., Congruent Medical Solutions, <sup>2</sup>Student, UMBC, <sup>3</sup>Research Asst., Hussman Institute for Autism

## SET 209

### *Women in STEM*

Elizabeth Johns, student - HarfordCC Faculty Mentor:  
Supawan King, HarfordCC

In this presentation, iconic historical and modern female mathematicians and scientists, dating back to as early as 1815 and as modern as 2018, will be discussed. Their path to success, including their familial, educational, and environmental experiences plus their contributions to the STEM field will be included in the discussion. The women's contributions will be delved into and how their ideas made and are making vast improvements for future generations will be explained. Secondly, the presenter will share data on the recent statistical reports regarding the percentage of women in STEM jobs. The presenter's analysis of the aforementioned reports will be described and reasoning behind why the current statistic that, women make up only 25% of the STEM workforce, is not fully accurate. During the presentation, an argument will be made that the popular statistic overlooks a crucial segment of female STEM workers that should be included in the percentage.

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

## SET 203

### *Virtual, Inc: A Biotechnology Company Driven by Undergraduate Research*

Elena Andreeva<sup>1</sup>, William Bernabe<sup>1</sup>, Adriana Campos<sup>2</sup>, Marthe Folivi<sup>3</sup> Sabra Friloux<sup>1</sup>, Mary Kreysa<sup>1</sup>, Lucie Sorelle Tchuinte Lekuikue<sup>2</sup>, Kevin Martinez<sup>2</sup>, Sarah Nerud<sup>2</sup>, Jacqueline Ngati<sup>1</sup>, Saima Salim<sup>1</sup>, Shannon Theisen<sup>1</sup>, Kathryn Trahern<sup>2</sup>, Erica Weiner<sup>1</sup>, Timothy Wilson<sup>1</sup>, Mike Smith<sup>1</sup>, Natalie Leach Stringer<sup>2</sup>, and Deborah Sterner-Krizman<sup>1</sup>

Virtual, Inc. is a collaborative project between the Biotechnology and Biology Programs at Montgomery College-Germantown. The goal of the “virtual” company is to provide students with realistic experience in many phases of biotechnology. The initial focus of the company is the development of an instructional Western blot kit. Western blots are biological assays that detect specific proteins from complex mixtures of proteins and can be used for both research and diagnostic purposes. The kit will contain all of the reagents required for running a Western blot including a purified protein that will serve as a positive control. Currently, two separate two-stage western blot systems are under development. The Stage One kit will allow identification of a purified, positive control protein. Western detection in the Stage Two kit will be performed on cell lysates from *E. coli* using an expression vector that contains a positive control protein. Students have been testing two candidate proteins, FLAG-Bacterial Alkaline Phosphatase (FLAG-BAP) and Glutathione S-transferase (GST) for use in the kits. This includes optimizing buffer conditions for antibody incubations as well as protein expression and purification of both FLAG-BAP and GST.

<sup>1</sup>Biotechnology Program, Chemical and Biological Sciences Department, Montgomery College-Germantown, 20220 Observation Drive Germantown, MD 20876, <sup>2</sup>Biology Program, Chemical and Biological Sciences Department, Montgomery College-Germantown, 20220 Observation Drive Germantown, MD 20876, <sup>3</sup>Visiting Student, Chemistry-Biology Interdisciplinary Program, Ripon College, 300 West Seward Street, Ripon, Wisconsin 54971

## SET 209

### *Exploring Ways to Inspire, Increase, and Retain Women in STEM*

Frances Turner, Roberta Brown and Paul Hogan, faculty – Howard CC

In 2013, women earned 50.3% of the bachelor's degrees in science and engineering and yet comprise only 29% of the STEM workforce. This disparity is even greater in technology and engineering jobs, where women remain sorely underrepresented. The goal of our session is to explore creative ways to support our female students in college so that they remain in STEM fields. We hope that in this conversation, we will be able to identify solutions to keep women in STEM, build a network of support among peers and mentor them in their journey towards their career paths.

### **SET 107**

*A STEAM (Sci., Tech., Engi., Art, Math) Learning Approach: Exploring Rayleigh-Taylor Instability via the “Accidental Painting Technique”*

Michelle Ramsahoye, student – HarfordCC

Since the eighteenth and nineteenth centuries, disciplinarity and specialization has risen to become the structure of the academic landscape. Long gone are the days of Renaissance learning, where polymaths such as Leonardo Da Vinci demonstrated great strides and proficiency within both the sciences and arts by combining them together. As such, the modern-day STEM community faces a problem; how can we get (and keep) students interested and receptive to science, regardless of their major? The “STEAM” (Science, Technology, Engineering, Arts, and Mathematics) approach seeks to integrate the arts to aid within traditional STEM education. Within this lecture, I seek to actively demonstrate this learning approach. In 1936, a Mexican muralist named David Siqueiros created a new technique when he poured different layers of paint on top of each other to create unique patterns and textures. I utilized Siqueiros’ “accidental painting technique” myself as an introduction to Rayleigh-Taylor instabilities, a physical explanation for the interaction between boundaries of fluids with different densities.

### **SET 109**

*Lightness of Being: Molecular Clocks and Entrainment*

Carolyn Jew Godfrey, student - MC

Faculty Mentor: Carole Wolin, MC

“There is music where there is rhythm, as there is life wherever there beats a pulse.” Igor Stravinsky The 2017 Nobel Prize in Biomedicine was awarded to Jeffrey Hall, Michael Rosbash, and Michael Young for their decades of research into the genetic mechanisms of circadian rhythm. Their discoveries are leading to a more nuanced understanding of the interaction between internal cues and external environment, linking DNA, RNA, proteins, tissues, organs, organisms, and communities with the presence of daylight. This research paper will examine the genetics and mathematics of circadian rhythms and their impact on symbiotic relationships; on the well-being of plants and animals; in neuroscience; as well as new forms of medical treatment for Parkinson’s, Alzheimer’s, and sleep disorders. On a more abstract level, this genetic information is the contribution of the field of biology to the concept of time: circadian rhythms demonstrate how life physiologically embodies time through light. The eternal returns of chemical oscillations in a negative feedback loop nevertheless move an organism forward in age, one day at a time. It may be a clue as to why only in the field of biology does the arrow of time neverreverse.

### **SET 211**

*Games as a Source of Example for Discrete Mathematics*

Robert Koca, faculty – CCBC

Examples of counting problems, recursive algorithms, logic, and number theory arising in the games of backgammon, SET, calcudoku, and Nim will be presented. Prior knowledge of those games is not needed. In the ancient game of Backgammon checkers are raced around a board but players go in opposite directions leading to blocking formations. The number of endgame formations can be solved by a clever application of the combinations formula. The probability of winning from a certain position can be found recursively. SET is a card game where certain patterns must be quickly found visually. It leads to some counting problems and to a proof involving an invariant condition. Calcudoku is a puzzle similar to Sudoku but where the numbers must satisfy some equations. Number theory and logic can help one solve these puzzles. Nim involves piles of matchsticks and players taking turns where they can take from one to all of the matchsticks from a pile of their choice. The one who takes the last matchstick loses. A clever binary representation of the game leads to a winning strategy.

### **SET 205**

*Learn about STEM Programs and how to Transfer to Salisbury University*

Kristen Paul and Maureen Conlon, SU

Kristen Paul- STEM coordinator and Maureen Conlon - Assistant Director of Transfer Admissions will discuss STEM departments/programs, scholarships and research opportunities. Get all your questions answered about the easy transfer process to Salisbury University. Find out about transfer requirements, how credits transfer and merit scholarships that are available.

### **SET 303**

*Motivation Techniques for College Students*

Thomas Karras, FCC

How to Motivate College Students: Provide them with bonus points (up to seven) which they can earn throughout the course and add them to their final score. The following provides means whereby bonus points can be earned by a student: 1.) Class attendance 2.) Doing their textbook homework and sharing their work on the white board with other students. 3.) Researching the internet for course-related links (sample problems, simulators, lab demonstrations), which the instructor has not already provided to the class and sharing those links with the class students. The instructor considers: 1.) adopting for most exams; open book, open notes, open computer, open internet. The instructor considers 2.) Giving take-home exams during snow days. This will gain extra class lecture time to help stay on the syllabus schedule and increase student morale and motivation. 3.) The instructor provides students with internet links of instruments used or pertaining to the course along with actual results and case studies etc. Thus, students will have a better understanding of science and their applications and various types of instruments available and how they function or are used in the field. This paper makes the case for computer-based math with “samples presented” whereby the student can access the internet to take advantage of the great online resources available for computer base – math or Stem , science or engineering course resources available to them for so they can they excel in their class quizzes and exams to demonstrate their time management skills and work efficiencies achieved using these great online resources.

## **11:30 pm – 1:30 pm: Poster Sessions (SET 163) and Lunch (SET 111)**

### **SET 163**

**Poster Session A – 11:30am-12:30pm**

**Odd numbered Posters (see pages 16-21 for listing of Poster Abstracts)**

### **SET 163**

**Poster Session B – 12:30pm-1:30pm**

**Even numbered Posters (see pages 22-27 for listing of Poster Abstracts)**

## **1:40 pm – 2:40 pm: Faculty Centered Keynote**

### **SET 101**

**Keynote Address: Dr. Freeman A. Hrabowski**

**Keynote Abstract:**

Rapid and dramatic demographic and technological changes present our nation’s schools, colleges, and universities with significant challenges for preparing students – particularly those from diverse backgrounds – for careers in science, technology, engineering, and math (STEM) fields. Over the past four decades, Dr. Freeman Hrabowski has studied student achievement in STEM, focusing special attention on how to increase the participation and performance of students of all backgrounds. Dr. Hrabowski will discuss innovation in undergraduate STEM education -- including course re-design, active learning, community-building, and partnerships -- that promotes student success, inclusive excellence, and achievement for all students in STEM.

## 2:50 pm – 3:20 pm: Student and Faculty Centered Session

### SET 211

*Launching and Sustaining a Successful Student Club at Community College*

Amrita Madabushi, faculty – BCCC

Charity Ensor, Brianna Holmes, students – BCCC

Student clubs are an important entity at Community Colleges that bring students of similar interest together and help them network and be aware of opportunities related to transfer, internships and careers. This session will be focused on the Biotech club at Baltimore City Community College (BCCC), however we hope that there will be enough tips and take away messages for any discipline across the board, to form and sustain their club at their own community colleges. In the presentation, we will share the journey of Biotech club at Baltimore City Community College (BCCC), that has been running successfully for the last 5 years. The primary goal of the club is to enable the seamless transition of students to professionals. For this, the club organizes about 25 club activities year round including, information sessions pertaining to internships, transfer sessions, professional development, visit to scientific labs. By engaging students in these activities, the club promotes strong network and teamwork, help develop leadership skills, build confidence as well as lifelong relationships for students who stay connected within and beyond academics. Club members will not only provide information in an interactive setting but also engage audience in an interesting hands on activity in the session involving a quick experiment.

### SET 109

*From Matlab to Python Scipy*

Scott Foerster, faculty – Howard CC

People are switching from MatLab to Python within the academic, scientific and engineering communities because it is free, teaches everyone best practice work habits and builds a community of people constantly improving open source code.

If you know MatLab, you will get a starting point that leverages your background. If you know a little about the SciPy world and are interested in the differences between Jupyter and Mathematica notebooks, what IPython has evolved into, you are going to be really excited. SciPy, Numpy, Sympy, Jupyter and MatLibPlot stickers will be passed out.

### SET 209

*Building and Maintaining a Chemistry Club at a Community College*

Kristine Miller and Robert Carp, faculty – AACC

The mission of the Chemistry Club at Anne Arundel Community College (AACC) is to promote student awareness of and interest in chemistry through campus, community and educational activities. Given the busy lives of today's community college students combined with the plethora of campus clubs and opportunities on our campus, it is often a challenge to attract enough students to achieve a 'critical mass' in our chemistry club. In addition, the transient nature of our student population makes it difficult to retain club members from one semester to the next. Initiatives to address these obstacles will be discussed, culminating in an open discussion and exchange of ideas. Discussion topics will include strategies for recruitment, promoting student leadership, fundraising, and sponsoring outside speakers and presentations. The roundtable format for this presentation will facilitate the ability to share strategies and brainstorm innovative ideas for engaging students in a chemistry or STEM-related student club.

### **SET 107**

#### *Mathematics in Arabic*

Erum Marfani, faculty – FCC

In languages that are written from right to left, mathematical writing takes on a different form. In Arabic, numbers are written from left to right, but letters are written from right to left. This makes writing equations a bit tricky. A system of equations has been developed throughout the Arab world, with minor differences depending on the country. This presentation will walk participants through equation writing in Arabic, from linear equations in Algebra to integrals in Calculus. This presentation is suitable for all mathematical levels.

### **SET 303**

#### *Partnering with Your College's IT Department to Create Authentic Learning Opportunities for Students*

Treca Stark, faculty – PGCC

Authentic learning opportunities for our students are within reach each day. Authentic learning opportunities are those that mirror or actually provide a real world tangible benefit to the students and organization. At Prince George's Community College, the Information and Engineering Technology academic department has worked with the Enterprise Technology administrative department on multiple occasions to create a variety of authentic learning experiences. This includes student internships, usability testing for systems, strategic planning, and full-time job opportunities for students. This round table session seeks to explore how Information Technology academic departments can partner more strategically to create experiences that truly help prepare students for professional work, while also advancing the administrative IT functions of community colleges.

### **SET 203**

#### *Following Up STEM Scholarship Awardees to Degree Attainment*

Sylvia Sorkin and Barbara Yancy, faculty – CCBC

Follow a diverse group of 91 need-based STEM scholarship awardees as they progress toward their goal of associate's and/or bachelor's degree attainment in STEM fields. Scholarships have been awarded to full-time community college students in selected programs with minimum GPA of 2.8, and US citizenship or PRA/RA status. Eligible programs are: computer science, cybersecurity, engineering, engineering technology, information technology, mathematics, network technology, and physics. Awardees are given support through NSF-funding and student support services including mentoring by faculty in STEM fields, and monthly luncheon workshops with guest speakers and panelists. How do gender, race/ethnicity, and initial math placement level affect awardee outcomes? Learn about the role of STEM faculty mentors in this scholarship program for students with unmet financial need as determined by completion of FAFSA. See what efforts were built into the program to help awardees overcome difficulties associated with mathematics requirements for STEM degrees. Share your best practices for successfully retaining and transitioning STEM students to four-year institutions.

### **SET 205**

#### *Faculty and Student Collaboration between Hood College, Mount St. Mary's University and Frederick Community College*

Wen Nellis<sup>1</sup>, Patricia Sheppard<sup>1</sup>, Christopher Stromberg<sup>2</sup>, Perry Wood<sup>1</sup>, Pegah Avazpour<sup>3</sup>, Brianna Higgins<sup>4</sup>, Laura Mundy<sup>5</sup>

For the last three years, faculty at Hood College, Mount St. Mary's University and Frederick Community College (FCC) have worked together on an NSF IUSE grant, "Expanding Instrumentation Access at Multiple Institutions Using Portable IR, Raman, and XRF Spectrometers." This grant has provided extensive opportunities for faculty collaboration and professional development. The grant has also provided the students at the three institutions with research opportunities involving the shared research-grade portable equipment. These collaborations have also provided a transfer path for FCC students pursuing a Baccalaureate degree in a STEM field. In this panel discussion, students and faculty from FCC and Hood College will describe the outcome of this NSF grant and how the opportunities provided by the grant have enriched their experience in teaching, learning and research.

<sup>1</sup>faculty – FCC, <sup>2</sup>faculty – Hood, <sup>3</sup>student – UMBC, <sup>4</sup>student – Hood, <sup>5</sup>student – FCC

## 3:30 pm – 4:00 pm: Faculty Session #1

### Special Student Activity during Faculty Sessions #1 and #2

#### Come Be a Star Gazer!

Come see the HCC Observatory on the 5th floor of the SET building. The observatory features six 8" telescopes and if the weather is clear we'll use a special solar filter to allow safe viewing of our nearest star! The observatory features a heated floor to prevent icing, red lighting to preserve night vision, and a control room.

#### SET 107

*Fostering Online Collaboration: An Engaging Cloud-based STEM Learning Tool*  
Scott Sinex, faculty – PGCC

Come see some of the capabilities, such as data pooling or building a collaborative document, demonstrated in this presentation, so *bring a device that can access Google Drive*. Google Drive, a free cloud-based application, is easy to use and has a remarkable similarity to the Microsoft Office suite. Participants will leave this interactive session with resources (how to set up sharing or judge the level of collaboration), ideas, and examples to take back to their classroom at Data Pool in the Cloud (<https://goo.gl/PLF7Mb>). Student feedback for a variety of uses from online collaborative pair spreadsheets, group laboratory reports, and competitive data collection are very positive! This work was supported by the NSF Division of Materials Research Partnership for Research and Education in Materials (PREM) Grant DMR-1205608. Remember BYOD!

#### SET 109

*Metacognition – A Key to Student Success*  
Jennifer Capparella, faculty, and Kimberly George, instructional assoc. – MC

Student success, retention, graduation and transfer rates have become areas of intense scrutiny at many institutions. Multiple efforts have been made to address these deficiencies, yet students continue to struggle in gateway biology and chemistry courses. One important, relatively new avenue that is currently being explored is a focus on changing students' views on learning. Promoting metacognition and reflection, and providing students with targeted and specific learning strategies, has proven successful at a number of institutions. Thinking about how you think about teaching, that's metacognition. Could metacognition be a useful tool for you and your students? We have implemented multiple strategies in both the classroom and the Science Learning Center to teach and encourage students to use metacognitive learning strategies. During this session, we will guide participants through a metacognitive exercise, share our techniques, and discuss our findings.

#### SET 203

*STEM Scholars – A Two-Year Cohort Journey*  
Noah Simmons, Kaelyn Gales, Steven Treadwell, Jack Wheaton, students – CCC  
Raza Khan, faculty – CCC

Six STEM students started on a journey in Fall 2016 together in a "cohort" model experience where though they were pursuing academic courses in various STEM fields, they were connected by experiences in the STEM Scholars – a selective admission program at their college. Four students remain at the end of the program who will share their experiences in professional development from Myers-Briggs to resume, business cards to tough interview questions, networking with professionals in the field, preparations for four-year colleges and also lessons learnt from their undergraduate research projects. The students will be sharing their research projects at the Conference during the poster session as well. The students will share their written portfolios that are done as part of their signature work – in progress! STEM Scholars program at the College is funded by a kind donation that also awards students in \$2000 scholarship during the two-year commitment.

### **SET 205**

*Presenting “AR Lab”, Labs at your Fingertips by SMACAR Solutions*

Shankar Koladi and Srihari Unnikrishnan, SMARCAR Solutions

Perform your lab experiments digitally and interactively at any time on your mobile device. The workshop will simulate a lab session on a mobile device, wherein the student will virtually execute a lab course that is currently being taught in the Biology department. The two lab exercises that will be showcased as proof-of-concepts (POC) are: Microscopy and Photosynthesis. The AR Lab App Demonstration will show how to use the App, including how to login and register, how to scan the assigned marker/select the experiment, how to download and complete the assignment, and how to answer the assignment questions for evaluation.

### **SET 211**

*Bridging the Gap between Disciplines and Cultures*

Ewa Gorski, faculty – CCBC

This presentation will emphasize the role of the faculty in designing and leading a study abroad program that focused on the community college students’ first-hand experience of other cultures. I will share my experience of leading the Human Anatomy in Poland Study Abroad Program and will discuss the interdisciplinary collaboration and bridging the gap between cultures in the 21st Century.

### **SET 209**

*The Development of an On-Campus Research Program at a Community College*

Cynthia Dove and Savita Prabhakar, faculty – HagerstownCC

Learn how an on-campus biotechnology internship program was developed at Hagerstown Community College. Innova-Bio MD provides a unique opportunity for students to gain hands-on, real world experience with regional employers. The presenters will share how employer partnerships are developed as well as how resources for the program are obtained. Student reflections on the experience as well as assessment procedures will be provided. Come prepared to discuss internship opportunities at your institution.

## **4:10 pm – 4:40 pm: Faculty Session #2**

### **SET 205**

*Trying on Teaching: The Learning Assistant Program at Montgomery College*

Carolyn Schick, faculty – MC

The nationally recognized Learning Assistant (LA) model, based at U. Colorado, Boulder has been transformed for the community college setting. LAs are recruited to assist in STEM classrooms and labs with various unique assignments to enhance student engagement and improve student success. LAs get an opportunity to 'try on teaching' as they work one-on-one with their faculty mentors throughout the semester. Emphasis is placed on the LA helping to establish group interactions during discussion, orchestrating review sessions, and building students' confidence in the lab as well as setting them up for success in the course. Strong pedagogical techniques are fostered during group LA sessions throughout the term when the LAs meet to share teaching experiences and develop teaching strategies. The one-on-one faculty/LA mentorship provides constant guidance and development for the LA throughout the semester. The LA program at Montgomery College has been very successful in providing an additional learning resource for students and also providing a unique teaching experience for the Learning Assistants early in their academic journeys. Come see how the LAs, their faculty mentors, chemistry students and the field of STEM education all benefit from this collaboration.



### **SET 109**

*Using Open Educational Resources in Biology*

Malathi Radhakrishnan, faculty, and Jeremy Harvey, staff – BCCC

Over the last year, Baltimore City Community College (BCCC) has embarked on an ambitious initiative to use Open Educational Resources (OERs) to reduce student textbook costs and provide wider access to materials. After initial experimentation with OERs, and receiving several OER related mini-grants from the Kirwan Center for Academic Innovation, BCCC developed its own OER Institute, held in spring 2017, to train faculty to design courses using OERs. The faculty who attended designed their own OER courses over the following summer, which were run in the Fall semester as an OER pilot. Among those courses was our Introduction to Biology course, using a tool called Waymaker, designed and distributed by Lumen Learning, a course was developed where all materials were hosted directly in BCCC's learning management system. There were 4 sections of the OER Biology course run during the pilot, and that is being expanded this semester to 9 sections. This session will briefly cover BCCC's endeavors to adopt OER, including the OER Institute, and reception of OER courses from both students and faculty. However, it will focus specifically on their use and implementation in the Biology courses, and the student results and outcomes when using these open resources.

### **SET 107**

*Faculty Panel on Student Research at HCC*

Brendan Diamond, Alex Barr, Heather Lemko, and William Straube, faculty – Howard CC

Faculty Panel: Howard Community College has a four semester research program where students work in small groups with a faculty mentor on a research project and have shared research seminars. On this panel, you can hear from three faculty mentors involved in the program; Alex Barr (physics), Heather Lemko (biology), and William Straube (biology). Learn more about how the program works, why the faculty are involved, and what their personal experience has been so far.

### **SET 211**

*Assessing Conceptual Knowledge of Developmental Math Students without Stress*

Radhakrishnan Palaniswamy and Deepa Radhakrishnan, faculty – CCBC

The objective of this project was to assess the fundamental knowledge/basic algebraic skills of my Math 082 (Introductory Algebra) through an assessment that is not stressful to students. Class is divided into 2 groups on a voluntary basis – Experimental group and Control Group. Students in Experimental Group were given a question paper named “Grade Your Teacher” with clear instructions that they should find faults, correct mistakes and grade as per the rubrics provided. This question paper (actually an answer paper) contained problems with wrong solutions and wrong final answers. Students in Control Group were given the same question paper in a traditional method and were asked to answer them. The average grade of the Experimental group was 81% while the average grade of the Control group was only 53%. The results clearly proved the advantage of assessing a student in a stress/exam anxiety free environment. Many times, the students don't answer correctly in spite of knowing the correct answer due to stress and anxiety. This “Grade Your Teacher” assessment removes the “stress” and “anxiety” element and students find it interesting to grade the teacher. In addition, this assessment strengthens the ability of students to sharpen their skills because they play the role of a teacher.

## **4:50 pm – 5:20 pm: Open Forum for Faculty by Discipline**

Biology/ Biotechnology – **SET 107** Moderator: Kathleen Berlyn, BCCC

Chemistry – **SET 109** Moderator: Shyamala Sivalingam, AACC

Engineering – **SET 205** Moderator: Maria Burness, CCC

CIS / Cyber / Technology – **SET 203** Moderator: To be Determined

Mathematics – **SET 209** Mike Long, HowardCC, Bernie Sandruck (Dean of Math, HCC)

Physics – **SET 211** Moderator: Sithy Maharroof, CCC

## POSTER ABSTRACTS

### Session A – Odd numbered abstracts

#### 1. *Use of Winogradsky Columns to Culture Diverse Microorganisms*

Muhsinat Emmanuel, Christiana Daramola, Adedoyin Adesida, Dianne Eboh, Joy Okhuevbic, Adebukola Kayode, Stephen Fuh, BCCC Science Club students – BCCC

Faculty Mentor: Kathleen Berlyn, BCCC

The Winogradsky column is a simple device for assaying diversity of microbial communities. We collected sediment and stream water in Gwynn Falls Park (Baltimore, Maryland). We also collected sediment near Baltimore City Community College (BCCC). The sediment near BCCC was noted to be less sandy than sediment samples collected from the stream. We set up eight bottles of sediment containing 250 grams of sediment each with four bottles consisting of stream sediments and four bottles consisting of sample collected from BCCC. Two bottles were designated as “Controls” where no additional material was added. To the experimental bottles we added: 125 g Carbon (shredded newspaper); 125 mg Sulphur (egg yolk) and carbon/Sulphur). The sample will be observed weekly for a minimum of eight weeks at which time microbial diversity should be visible by visual observation. We will then sample the layers and assess using the following methods: Gram Stain; microbial subculture on non-selective media; DNA extraction and 16s rDNA gene sequencing.

#### 3. *Baltimore Harbor Watershed- Microbial Assessment Project*

Daniel Morales and Sarah Carpe, students – UMBC, Michael Dabney and Joseph Stevenson, students – BCCC

Faculty Mentors: Amrita Madabushi, Kathleen Berlyn

The Baltimore Harbor Watershed is an area that consists of every tributary that flows into the harbor. Baltimore’s rivers and streams have a history of pollution from sewage leaks, runoff, and trash. Although harbor health has been showing some ecological health improvements, it received “F” grades in almost all aspects of the 2017 Healthy Harbor Report Card, an initiative run by the Waterfront Partnership of Baltimore. The purpose of this project is to assess and identify the microbes present in the harbor & surrounding watersheds using a combination of microbiological and biotechnological methods. Samples were collected, aliquots plated on various media and incubated overnight. Colonies were described and Gram stained. Four samples were selected for further study and identification using the API 20E system. The results of the study showing the types of microbes present in Baltimore Harbor Watershed will be presented.

#### 5. *Carbonic Anhydrase Enzyme Overexpression to Increase Cell Growth in Algae*

Charity Ensor, student – BCCC

Faculty Mentor: Stephen M Miller, UMBC

There is need for clean alternatives to fossil fuels and green algae have great potential as sources of renewable liquid transportation fuels. Green algae are photosynthetic organisms that can be induced to produce large amounts of neutral lipids that can be easily converted into biodiesel. The unicellular alga *Chlamydomonas reinhardtii* is the major model organism for biofuel production as it is easy to genetically modify and grows rapidly. This work focuses on the carbonic anhydrase 3 (CAH3) gene, which encodes an enzyme that converts carbonate into CO<sub>2</sub> in the pyrenoid for carbon fixation by the enzyme rubisco. We are testing the idea that overexpression of this enzyme should improve cell growth. We generated a nuclear expression vector that contains CAH3 coding sequence flanked by *C. reinhardtii* 5’ and 3’ regulatory sequences (HSP70A-RBSC3 hybrid 5’ UTR + promoter and RBSC2 3’ UTR) and transformed into *C. reinhardtii*, but we could not detect CAH3 protein in any of the transformants. We gene synthesized a bleomycin resistance gene fragment (ble) with a 3’ viral 2A peptide sequence and are inserting this fragment just upstream the CAH3 coding region in our CAH3 vector. If overexpression improves, we will attempt to overexpress in *Chorella vulgaris*.

## 7. *An Exploratory Population Genetics Study of "Jumping Gene" in BCCC Student Population Sample*

Charity Ensor<sup>1</sup>, Djeneba Sidibe<sup>2</sup>, Brianna Holmes<sup>1</sup>

Faculty Mentor: Amrita Madabushi, BCCC

Jumping genes are transposable DNA sequences that "reproduce" by copying and inserting into new chromosome locations in genomic DNA. About 10% of the human genome contains jumping genes also known as Alu insertions. Alu elements have been spread in primates' genome to more than one million copies during the past million years. Alu transposons are considered jumping genes and affect the genome differently based on their transposition causing different mutations or alterations gene expression. When a jumping gene is located on a coding region, it causes disease such as neurofibromatosis, thalassemia, cancer, heart attacks. This project was conducted as a part of hands-on workshop where Biotech club members of Baltimore City Community College (BCCC) were invited to learn about Genomic DNA extraction and analysis of Alu transposons/Jumping genes. To determine the zygosity of the Alu sequence on the PV92 locus of an individual, a Polymerase chain reaction (PCR) was done on obtained genomic DNA. The results of the study showing differences in allele frequencies in BCCC's student sample population from different backgrounds will be presented.

<sup>1</sup>Student - BCCC, <sup>2</sup>Research Asst. - Hussman Institute for Autism

## 9. *Overexpression of Carbon Concentration Mechanism Gene *lci-1* in *Chlamydomonas reinhardtii* for Biodiesel*

Villanova Kimuel, student – BCCC

Faculty Mentor: Amrita Madabushi – BCCC, Stephen Miller – UMBC

High fossil fuel consumption and global warming concerns have encouraged exploration of renewable resources, including non-polar lipids produced by algae that can be converted into biodiesel. A major problem with algae as a source of biodiesel is their slow growth rate under conditions of high lipid production. We are testing the idea that overexpression of genes that increase carbon dioxide (CO<sub>2</sub>) uptake can increase metabolic function via the Calvin Cycle, leading to improved growth. In this research we are using the model green alga *Chlamydomonas reinhardtii* to test the effect of overexpressing a Carbon Concentrating Mechanism (CCM) component. The plasma membrane carbonate transporter LCI-1 (Low Carbon Inducible) is responsible for inorganic carbon uptake into the cell. We first generated a nuclear expression vector that contained LCI-1 coding sequence under the control of 5' and 3' regulatory sequences (HSP70A-RBSC3 hybrid 5' UTR + promoter and RBSC2 3' UTR), but we could not detect LCI-1 protein in any of the transformants. To improve expression, we gene synthesized a bleomycin resistance gene fragment (ble) with a 3' viral 2A peptide sequence and inserted it directly upstream of the LCI-1 coding region in our first LCI-1 vector. Bleomycin-resistant transformants should produce LCI-1 since ble expression is coupled to the expression of the downstream gene (LCI-1). This construct will be transformed into *C. reinhardtii* and transformants will be tested via western blot for LCI-1 protein accumulation. Expressing transformants will be analyzed for growth rates in an algal multi-cultivator to compare against the wild type. If this strategy is successful we will apply it to the commonly used industrial alga *Chlorella vulgaris* for use in biodiesel production.

## 11. *Evaluation of Anticancer Drugs on Human Lung Carcinoma Cells*

Naheed Hansraj and Brianna Holmes, students – BCCC

Amrita Madabushi, faculty – BCCC

Non-small cell lung cancer (NSCLC) represent 85% of all lung cancers. A549 is a type of NSCLC cell line that have typical cellular features of type II alveolar epithelial lung cells. A549 are lung basal epithelial cells that grow 2-dimensionally in tissue culture dishes. 3-dimensional (3D) culture of human lung carcinoma cells can favorably replace the conventional 2-dimensional (2D) culture for a closer simulation of in vivo conditions. In this project, we have encapsulated and grown lung cells 3-dimensionally using alginate beads. The alginate beads encapsulating lung cells were maintained in mammalian cell culture media. We aim to utilize 2-D versus 3-D cell culture models to compare the efficacy of chemotherapeutic agents.

### **13. Isolation of *P. acnes* Specific Bacteriophages and Efficacy Testing**

Cameron Bolyard, student – FCC

Faculty Mentors: Judy Staveley – FCC, Hosan Kim – Trideum Biosciences

During my experiment I will be isolating bacteriophages from fifty different strains from our bio-repository bacterium of *P. acnes*. These bacteriophages that develop will be *Propionibacterium acnes* specified bacteriophages. These phages are then isolated and incubated with more fresh bacterium and amplified in anaerobic conditions. After amplification these phages are centrifuged and filtered to remove bacterium and create a phage stock solution. This stock solution will have the titer determined and then amplified to a concentration of  $10^9$ . After this amplification these phages will be diluted and tested against fifty strains of *P. acnes* and their efficacy will be determined based on the readings of the 96-well plate reader. The plate reader measures cell respiration, which will be inhibited by bacteriophages if they are causing lysis within the bacterium. These results will be recorded and presented in both tables and graphs. My goal is to isolate a strain of bacteriophages that antibiotic resistant strains of *P. acnes* are susceptible to.

### **15. Isolation of Bacteriophages Specific to *Staphylococcus aureus* from Environmental Sources and Test its Efficacy**

Sreyry Schaerdel, student – FCC

Faculty Mentor: Judy Staveley, FCC

The rise of antibiotic-resistant bacteria is leading our population to a pre-antibiotic era, which is a major public health concern. Efforts are being made to address this concern development of novel therapeutics against antibiotic resistant pathogens. There is a growing interest in development of new and effective phage therapies for treatment of antibiotic-resistant bacterial infections. The aim of this research was to isolate bacteriophages specific to *Staphylococcus aureus* in particular Methicillin-Resistant *Staphylococcus aureus*. Various samples including environmental sample were used for isolation of bacteriophages. Test sample suspensions were filtered through a sterile 0.22  $\mu\text{m}$  membrane filter to remove bacteria and isolate bacteriophages after incubation. Determination of bacteriophages isolate was done by a spot assay for the detection of phage plaques. Selected plaques were then isolated and amplified. The top agar overlay method was used to obtain a titer of  $1.0 \times 10^9$  PFU for a purified and final concentration of the phage stock. The phage stock will be used for further analysis and efficacy testing against MRSA. These bacteriophages may have therapeutic application for treating human MRSA infections.

### **17. Detecting HIV with Enzyme Linked Immunosorbent Assay (ELISA) Test**

Cindy Wong Lema, student – FCC

Faculty Mentor: Judy Staveley, FCC

An enzyme-linked immunosorbent assay (ELISA) was used to investigate the identification of HIV using an ELISA assay. People may unknowingly be carrying the HIV virus unless their blood is tested using an ELISA assay. The test identifies if they carry the Immunoglobulin G within their serum (IgG). IgG is a specific type of antibody, directed towards the viral HIV antigen. The goal of the ELISA assay was to detect specific HIV antibody proteins which indicate a positive presence of the HIV disease. The ELISA assay technique uses a microtiter plate with 96 wells and specific IgG proteins for detection. Each of these wells have a special surface that binds strongly with proteins. The enzyme that is linked to the secondary antibody facilitates a chemical reaction that changes the color of the assay. The results of our experiment showed a color change which indicated that the patient possesses antibodies to the antigen and has tested positive for HIV. If a no change in color had occurred, that would indicate that the patient would be negative for HIV. Positive results were determined by ELISA assay during the clinical investigation. It was concluded that the antigenic ELISA immunoassay can be positivity adapted to successfully detect samples of serum that contain IgG antigens for HIV.

### **19. *Antimicrobial Properties of Four Essential Oils***

Michelle Ramos, student – FCC

Faculty Mentor: Judy Staveley, FCC

The use of essential oils for therapeutic purposes has become increasingly popular over the years. Many believe certain oils hold antimicrobial properties. In this study, we will look at the antimicrobial properties of four essential oils (Tea Tree, Eucalyptus, Oregano and Garlic) and their ability to inhibit growth as well as cause cell death in two microbes, *B. cereus* and *S. marcescens*. *B. cereus* is a microbe known for causing food poisoning but is becoming an increasing risk in life threatening gastrointestinal infections as well as nosocomial infections of post-surgical patients. *S. marcescens* was once considered to be a harmless microbe but has now been recognized as an important nosocomial pathogen that has been associated with hospital infectious outbreaks. The scope of this study is to see how essential oils can potentially inhibit the growth of these bacteria as well as cause cell death to occur. Each microbe was plated and before allowed to incubate was inoculated with sterile disks soaked in each essential oil. Preliminary results showed that Tea Tree oil produced the largest area of inhibition where Oregano showed the smallest. Next, we will test the effects of these oils after growth has been established. Agar plates have been inoculated with the organisms and after incubation sterile disks soaked with essential oils will be placed on the growth, incubated further and then observed for changes.

### **21. *Affordable Resonance Tube***

Miguel Rodriguez, student – FCC

Faculty Mentor: Perry Wood, FCC

A resonance tube is a piece of lab equipment used to study the speed of sound through standing waves. This lab equipment is fairly expensive preventing smaller institutions and/or programs to afford it. Frederick Community College's STEM Club designed and produced a resonance tube that is well under the cost of a commercially made product while maintaining its core functions. A construction guide will be presented so that any institutions and/or program can affordable make the resonance tube.

### **23. *Identifying a Natural Insect Repellent Derived from an Unknown Plant***

Kevin Mancuso, student – ACM

Faculty Mentor: Michael Hands, ACM

In order to simulate how chemical companies develop natural products, a potential insect repellent was purified and identified. Beginning with an unknown plant containing an active ingredient that was reported as effective, an essential oil was extracted from plant material through steam distillation. The essential oil was then isolated and tested for effectiveness. To identify the unknown plant, the essential oil was tested for the presence of different functional groups and analyzed with infrared spectroscopy (IR) and mass spectrometry (MS) to determine its structure. The results from the IR were similar to the results from the functional group test. The MS indicated a molecular weight for the essential oil of approximately 165 g/mol that was cross-referenced with the results from the functional group tests and IR to determine the identity of the essential oil and the plant. The essential oil was also tested comparatively to commercially available insect repellents to determine its effectiveness and feasibility as a new product. The natural repellent worked as well as if not better than the commercially available repellent.

**25. Chemiluminescence: A Glow Stick in a Beaker**

Kayla Garland, student – ACM

Faculty Mentor: Michael Hands, ACM

Glow sticks are a well-known childhood object that lights up when cracked. What really happens chemically when a glowstick is cracked? The mixing of chemicals from the two compartments of the glow stick results in a glow from releasing a photon. This is called a chemiluminescence reaction. These reactions excite electrons to higher energy levels and the electrons relax, giving off energy in the form of light while moving back down to the ground level.

Chemiluminescence reactions in the presence of other molecules that could potentially absorb the light given off in the reaction were performed to identify any sensitizers or dark quenchers. Sensitizers are molecules that absorb photons from the reaction and then emit a photon at a different wavelength. A dark quencher is a molecule that absorbs photons and relaxes by losing excess energy as transfer energy to another molecule or releasing heat. In the experiment, different molecules were tested as potential sensitizers and dark quenchers for both oxalyl chloride and luminol reactions. Oxalyl chloride emits UV light, so potential sensitizers were tested to emit visible light. Several sensitizers and one dark quencher were identified.

**27. Determination of the Charge to Mass Ratio of the Electron**

Cameron Bohrer, student – ACM

Faculty Mentor: Michael Hands, ACM

For my presentation I will be reviewing and explaining a lab conducted in my physics 2 class during this spring semester. The basis of this lab revolves around the electron, what it does in a vacuum, and how it reacts when certain variables are changed. The experiment is conducted in an apparatus where the electrons are accelerated through a potential difference and gain kinetic energy before traveling through a nearly uniform magnetic field where the beam of electrons experiences a magnetic force and is bent into a curved path. Once the electron curved beam was visible, the radius of the beam was measured with different combinations of current and voltage. This data was used to find a mass to charge ( $e/m$ ) ratio for the charged particles. Then, the experimental value was compared with the known value and the percent error was calculated. Experimental results were fairly close to the theoretical result, with a very small percent error.

**29. PSR1913+16: The Binary Pulsar, Mathematical Reproduction and Extension**

Kathleen Hamilton and Ye Hie (Joy) Cho, students - HowardCC

Faculty Mentor: Alex Barr, HowardCC

The discovery of PSR1913+16, a binary pulsar system, brought light to the first indirect detection of gravitational waves in the early 1970s. This work, conducted by Joseph Taylor's research team which included graduate student Russell Hulse, led to the 1993 Nobel Prize in Physics. Our research aims to reproduce some of their calculations, then extend beyond those to analyze the eventual collision. Using differential equations, we predicted when coalescence will occur and are working on refining this prediction by modeling the orbital eccentricity more accurately. To compare with current detections at LIGO, we also calculated the current strain – the strength of the gravitational waves produced by the system. Through calculus and astrophysics concepts, the mathematical assumptions and equations underlying Hulse and Taylor's work were verified and compared with their data. Furthermore, the mathematical models and predictions of the binary pulsar collision will be represented graphically and, soon, visually with simulations.

**31. *How Do Material Properties Affect the Tone Quality of a Violin?***

Taylor Woodhead, student – HowardCC

Faculty Mentors: Mark Edelen and Alexander Barr, HowardCC

My question is "How Do Material Properties Affect the Tone Quality of a Violin?". The purpose is to determine what about a material makes it good to be used in a violin to see if there are materials with more potential than wood. To measure this I would explore this concept theoretically and experimentally. For measurements I would measure Fourier graphs between my three violins of various qualities, and I would do some tensile tests on my plastic to get its material properties. For theoretical exploration I would observe roughly how carbon fiber violins compare to wood violins (or other materials if I can find them) and use their material properties to draw conclusions. I have already 3D printed a full violin and begun testing.

In addition to the poster, I will bring my 3D printed violin, and the other two wood ones.

**33. *3D Printed Alpha Stirling Engine: What is it and How Does it Work?***

Valentina Villota and Katherine Sanie, students - HowardCC

Faculty Mentor: Alex Barr, HowardCC

We will describe the construction and operation of our working 3-D printed Alpha Stirling engine. We outline the materials used and steps for construction and troubleshooting as well as illustrate the cyclic compression and expansion of air that drives the engine. We will also present initial results for measurements of revolutions per minute, power output, internal friction, efficiency, and torque. A number of calculations were needed to evaluate the efficiency, power output and torque. This was achieved by finding the maximum volume as well as the minimum volume of the two pistons, RPM and mass of the flywheel, heat output of the candle that was used as a heat source. The torque was also found with the means of a prony brake. This project demonstrates an accessible, hands-on opportunity for introductory physics students to apply concepts such as mechanical energy, engine efficiency, and the first law of thermodynamics while also learning about engineering and 3-D printing.

**35. *Are Notch Proteins Involved in Neuritogenesis in Mouse N1E-115 Neuroblastoma?***

Hanna Greffie, student – MC

Faculty Mentor: James W. Cosgrove, MC

Montgomery College provides opportunities for its STEM students to conduct undergraduate research. Our laboratory studies the mechanisms underlying neuritogenesis in cultured mammalian neuroblastoma cells. Neuritogenesis was induced in mouse N1E-115 neuroblastoma cells by serum deprivation. Serum deprivation leads to a switch from undifferentiated dividing cells to differentiated non-dividing cells that, after 4-6 hours in serum free media, send out membrane spikes that develop into long processes called neuritis, the precursors of axons and dendrites. Previous studies in vivo have suggested a possible correlation between neurogenesis/neuritogenesis and expression of the Notch family of transmembrane proteins. There are four distinct Notch proteins and their roles in neural development are not completely understood. This study focused on the role of Notch-3 protein in these processes. Total proteins were analyzed using gel electrophoresis. Western blotting was combined with immune-detection using an anti-Notch-3 protein antibody. We are also analyzing total RNA from control and serum deprived cells in order to detect any changes in Notch expression at the RNA level. We are analyzing these changes at various times after serum deprivation.

## Session B – Even numbered abstracts

### 2. *Smartphone Use: Unintended Long-term Effects*

Richard Esposito, student – BCCC

Faculty Mentor: Malathi Radhakrishnan, BCCC

Recent studies in 2017 found that more than 92 percent of 18-to 29-year-olds in the U.S. own a smartphone with use totaling up to 3 to 5 hours per day. Extended daily phone use can cause persistent bone and joint complaints and postural deformity. Smartphone users can incur a financial loss since working 5 hours/day at a part-time job, with an hourly rate of \$9.50, would earn a gross salary of \$326.00 and net income of \$226.00 per week after taxes. Depositing \$226.00 in a Roth IRA or other account that can grow at 3% per year will earn \$137,315 after 10 years and \$322,158 after 20 years. A 2015 Kent State University study of student smartphone users found that as usage hours increased, college GPA decreased. Students enrolled in Baltimore City Community College's Principles of Biology course sections tracked their smartphone usage via Apple's Moment application and generated usage printouts. The average usage statistics eclipsed the hours recommended for daily course study time. Smartphone usage detracts from academic and earning initiatives. Yet, the efforts to collect data across institutions may stimulate the creation of sorely needed specific interventions that refocus the student's attention toward productive and goal-directed activities.

### 4. *Antibacterial Potential of *Lentinula edodes* and *Rhizopus stolonifer**

Thashanna Lyle, student – BCCC

Faculty Mentor: Malathi Radhakrishnan, BCCC

When observed at face value, some fungi may seem useless or unnecessary to us humans however, like many other multi-cellular organisms, fungi also hold unexpected medicinal properties. This study was carried out with the objective of investigating the antibacterial properties of *Lentinula edodes* (shiitake mushroom) and *Rhizopus stolonifer* (bread mold). The antibacterial properties of these fungi were tested against *Bacillus megaterium*- which is a bacterium found in soil and *Pseudomonas aeruginosa*- which is a human pathogenic bacteria. The agar diffusion method was used to determine the antibacterial/antimicrobial activity via the measurement of the field of inhibition for each extract/solution. The field of inhibition of the mushroom extract and *Rhizopus* were later compared to that of distilled water. This study found that both the *Rhizopus* and Shiitake mushrooms possessed antibacterial properties. The mushroom extract was more effective against both types of bacteria that were used. It was also observed that no zone of inhibition was produced for the bread mold (*Rhizopus stolonifer*) treated paper disc that was incubated with *Pseudomonas aeruginosa*. Furthermore the *Rhizopus* solution did not inhibit the growth of *Pseudomonas aeruginosa*.

### 6. *Photosynthesis and Light*

Vanessa Anegbode, student - BCCC

Faculty Mentor: Malathi Radhakrishnan, BCCC

Plants are autotrophs and they produce their food and nutrients through the process of photosynthesis. Photosynthesis is the process by which green plants and some other organisms use carbon dioxide and water to produce glucose and water in the presence of sunlight. This study was carried out with the sole purpose of investigating how the limiting factors such as the wavelength of light, light intensity and type of light affected the rate of photosynthesis. Elodea plant was inserted in a beaker with a test tube inverted downwards and immersed into the beaker with some amount of sodium carbonate which served as a source of carbon dioxide, and a light source which varied at different distances until the perfect distance for photosynthesis was reached. At different distances, bubbles were released which also varied as time proceeded. The bubbles released were proof of the presence of carbon dioxide and at different time intervals the amount of bubbles released was recorded. This process was repeated with the several colors of light and they were all compared.



### **8. Differentiating Human Induced Pluripotent Stem Cells (iPSCs) into Cardiomyocytes (CMs)**

Josiah Owoyemi, student – BCCC

Faculty Mentors: Maria K. Traficante and Ivy E. Dick, University of Maryland, Baltimore

Induced pluripotent stem cells (also known as iPSCs) are unique stem cells that are derived from patient skin and blood. They have the capability to differentiate into different cell types like nerve cells, and cardiomyocytes (CMs) or heart cells. This research will focus on how (iPSCs) can be differentiated into cardiomyocytes. We created beating (CMs) in-vitro derived from iPSCs. The process of differentiation takes 7-10 days after which the cells start to beat. The beating cells are then used to study different diseases of the heart. We have cell lines from both wild-type (WT) and Timothy Syndrome (TS) patients. Timothy syndrome is a rare disease that is caused by a calcium channel mutation. The disease affects different parts of the body, but most severely affects the heart by causing long QT syndrome and lengthening the heart action potential. By differentiating CMs from both WT and TS patients, we hope to understand how the calcium channel mutation changes the heart action potential and create possible treatments for the patients.

### **10. Evaluation of Mitochondria in Persistent Pro-Inflammatory Activated Microglia**

Rae Elkasabany and Ayodele Jaiyesimi, students – BCCC

Faculty Mentor: Brian Polster, University of Maryland, Baltimore

Microglia, the brain's resident immune cells, help maintain brain health by clearing debris and supporting development. Persistent pro-inflammatory activation of microglia may result in neurodegeneration through the release of reactive oxygen species and toxic levels of cytokines. Because mitochondrial function is impaired upon microglial activation, our goal is to understand the role they play in the transformation of microglia to a pro-inflammatory phenotype. Mitochondria are involved in a number of cellular activities, including energy production through oxidative phosphorylation. We looked at the expression of a number of several proteins involved in oxidative phosphorylation (OxPhos), as well as proteins involved in mitophagy, a mitochondrial quality control process, to evaluate whether they were altered by upon microglial activation. Oxygen has the potential to influence intracellular signaling, because ambient air greatly exceeds the brain physiological oxygen levels through reactive oxygen species. To study how oxygen influences microglia, we cultured cells under different oxygen levels (3% oxygen, low physiological; 5% oxygen, physiological; and 21% oxygen, atmospheric). Cells were treated with/without a pro-inflammatory stimulus for eight hours. Additionally, they were treated with/without mdivi-1, a drug previously found by our group to affect mitochondrial function and pro-inflammatory activation. Preliminary results indicate that proteins of mitochondrial electron transport chain OxPhos Complexes I and II, as well as the mitophagy regulator BNIP3L are, decreased upon activation at 21% and 5% oxygen but not 3% oxygen. T, and these decreases were not affected by mdivi-1. Future experiments will focus on how changes in mitochondrial function are prevented by decreasing oxygen availability.

### **12. The Importance of Technology in Education**

Sarah Wesdyk, student – AACC

Faculty Mentor:

Earning an education creates a brighter future for everyone who has one, allowing applicants to meet higher standards at job interviews, people to secure more successful and dependable careers, and people to have the resources they need to make lasting changes in the world. Unfortunately, according to The Global Partners for Education, more than 150 million children ages 3 to 5 do not have access to pre-primary education, and in some areas of conflict, less than 5% of children are able to have any form of education at all. Technology, however, can help alleviate this problem and provide many more people with an access to education. Resources like internet access and computers provide children with access to an abundance of information, and with a stark rise in online classes becoming available, students from almost anywhere in the world would be able to get an education with only internet access and some type of device to connect with. Analyzing the trends of graduation rates within colleges who have initiated online learning opportunities and those who have not, I have been able to not only measure the draw of these type of programs, but also their effectiveness of producing college graduates.

**14. *Using X-Ray Fluorescence Spectroscopy Applications to Design and Improve Scientific Experiments***

Pegah Avazpour, student – UMBC

Faculty Mentors: Perry Wood, Debra Ellis, Patricia Sheppard, Wen Nellis – FCC

Christopher Stromberg, Hood

X-ray fluorescence (XRF) spectroscopy identifies elements by illuminating a sample with X-rays. The excitation and relaxation of the electrons from the innermost atomic shells produces a spectrum to identify the elements. Incorporating XRF spectroscopy into experiments gives the students the opportunity to further understand concepts. The addition of XRF spectroscopy to the General Chemistry I precipitation reaction experiment at Frederick Community College (FCC) introduces the modern analytic technique to the students. Now students can use the solubility rule table and XRF spectrometer to predicate formation of a precipitate and identify the elements present in it. XRF spectroscopy can be used in non-STEM majors' geology labs to identify the elements present in various minerals. These results, when used with other data, will determine the properties of a given mineral. Moseley's law, an empirical law that shows the relationship between x-ray emission frequency and the atomic number of an element, can be demonstrated using the XRF spectrometer. In our designed experiment, students use the XRF spectrometer to verify Moseley's law, then use their plots to identify an unknown compound. State-of-the-art technology such as the XRF spectrometer, is a great tool for engaging non-STEM majors into the scientific method, and it will better prepare FCC STEM majors for transitioning to four-year schools.

**16. *Portable Raman Spectroscopy in the Undergraduate Curriculum***

Laura Mundy, student - FCC

Faculty Mentors: Perry Wood, Wen Nellis, Patricia Sheppard - FCC

Christopher Stromberg - Hood

Raman spectroscopy is an increasingly important tool for studying molecular samples. Like infrared (IR) spectroscopy, it measures the vibrational modes available in a molecule, but it measures those modes in a way complementary to IR spectroscopy. Thus, samples that are difficult to measure using IR spectroscopy, such as aqueous samples, are much easier to study using Raman spectroscopy. For the past three years, a collaborative team from Hood College, Mount St. Mary's University, and Frederick Community College have been developing laboratory experiments and demonstrations using Raman spectroscopy across a wide variety of disciplines. This poster will outline some of the uses of Raman spectroscopy across the undergraduate curriculum. A hand-held Raman spectrometer will also be used to demonstrate some of the uses of the technique.

**18. *Portable X-Ray Fluorescence Spectroscopy in the Undergraduate Curriculum***

Brianna Higgins, student - Hood

Faculty Mentors: Perry Wood, Wen Nellis, Patricia Sheppard - FCC

Christopher Stromberg - Hood

X-ray fluorescence (XRF) spectroscopy is an instrumental technique used to measure the elements present in a sample. It finds use in a wide variety of disciplines, from biology and chemistry to materials analysis, environmental test, and even art and archaeology. Newer, portable XRF models are now available that allow the instrument to be taken into the field to analyze samples on-site. For the past three years, a collaborative team from Hood College, Mount St. Mary's University, and Frederick Community College have been developing laboratory experiments and demonstrations using XRF spectroscopy across a wide variety of disciplines. This poster will outline some of the uses of XRF spectroscopy across the undergraduate curriculum. A hand-held XRF spectrometer will also be used to demonstrate some of the uses of the technique.

## **20. *Katie's Triangle: A Re-Imagined Pascal's Triangle***

Charles Lundelius and Jacob Hoffman, students - HowardCC  
Faculty Mentors: Mike Long and Loretta Tokoly, HowardCC

A triangular array, known as Katie's Triangle, was derived from Pascal's Triangle. The array was initially derived directly using the elements in Pascal's Triangle, but later a general form that uses an iterative process with the elements of Katie's Triangle was derived. For any element in Katie's Triangle, a term in the  $n + 1$  row takes the larger numerator and denominator of the adjacent upper left and upper right terms of the  $n$ th row. Once a derivation for Katie's Triangle was found, the structure of it was studied and compared to that of Pascal's Triangle to determine if there were similar properties. Some of the properties were found to exist in both: including the flowers and the Triangular Numbers. While the flowers property held exactly the same for both triangles, the Triangular Numbers exist albeit in a different arrangement than in Pascal's Triangle. Other properties were found to either not exist at all, or were not one-to-one matches with Pascal's properties. These include Sum of the Rows, Hockey Sticks, and the existence of most figurate numbers. Despite being derived initially from Pascal's Triangle, Katie's Triangle stands on its own due to discrepancies between the properties of these triangles, while still being similar to its parent triangle.

## **22. *"Fee--fo--fum": Deriving e, "phi", and "pi" from Pascal's Triangle***

Russell Schwartz, student - HowardCC  
Faculty Mentors: Mike Long and Loretta Tokoly, HowardCC

Recent findings were used in conjunction with the definitions of classic mathematical constants in order to derive  $e$ ,  $\phi$ , and  $\pi$  from elements of Pascal's Triangle, a famous structure constructed from the binomial coefficients.  $e$  was found by examining the products of the rows of Pascal's Triangle. A pattern involving  $e$  is found in the limit of these products. This relationship is then proven. Next,  $\phi$ 's relationship to the fibonacci numbers was shown, and the presence of these numbers in Pascal's triangle was demonstrated. Finally, a recent discovery by mathematician Jonas Castillo Toloza connecting the triangular numbers to  $\pi$  via an alternating series is proven. This result is subsequently used to derive  $\pi$  from the triangular numbers in Pascal's triangle. These findings demonstrate the richness of Pascal's Triangle and expand its list of known properties.

## **24. *Identifying Candidate Genes in Stone Cell Formation in Plum***

L. Michael<sup>1</sup>, K. Loerich<sup>1</sup>, K. Ebersole<sup>1</sup>, S. Prabhakar<sup>1</sup>, C. Dove<sup>1</sup>, A. Callahan<sup>2</sup>.  
Faculty Mentors: Savita Prabhakar, HCC; Cindy Dove, HCC; Ann Callahan, USDA-ARS

A 'Stoneless' cultivar of plum was chosen to understand the genes that control the determination and differentiation of fruit endocarp (stone cells). Fruit tissue was collected from two trees of 'Stoneless' as well as from two different plum cultivars with normal stones. RNA was extracted and sequenced (RNAseq) to look for genes that were expressed differently in normal vs abnormal stone cultivars. RNAseq data showed that a number of genes were found to have different expression levels that associated with the 'Stoneless' cultivar. To confirm these results reverse transcriptase qPCR was used. Based on the RNAseq data, nine genes were identified that varied less than 10% between samples ranging from flower buds to endocarp tissue in the different cultivars. We used geNorm qbase+ software to determine the best 'housekeeping' gene but no optimal targets were found due to the variability between the normalization factors. Thus all 4 genes were used for normalization and we analyzed the expression of 7 candidate genes using geNorm software.

<sup>1</sup>Hagerstown Community College, <sup>2</sup>Appalachian Fruit Research Station –USDA-ARS

**26. *Is Dihydroflavonol 4-reductase (DFR) Gene Responsible for Anthocyaninless Phenotype?***

Harrison Stewart<sup>1</sup>, H. Drumm<sup>1</sup>, K. Loerich<sup>1</sup>, J. Kint<sup>1</sup>, M. Hoover<sup>1</sup>, E. Martinez<sup>1</sup>, M. O'Connell<sup>1</sup>, L. Price<sup>2</sup>, S. Prabhakar<sup>1</sup>, C. Dove<sup>1</sup>, D. Puthoff<sup>2</sup>.

Faculty Mentors: Savita Prabhakar, Cindy Dove, faculty – HagerstownCC, David Puthoff, faculty – FSU

While biosynthetic pathways of anthocyanins, along with the isolation of corresponding genes, have been well characterized in species such *Arabidopsis thaliana* (L.), we have investigated the gene responsible for the green (anthocyaninless), phenotype within Wisconsin fast plants. Through the use of PCR of five different genes, designed from BAC end sequences compared to the *Arabidopsis thaliana* genome, one gene was found to be different. The dihydroflavonol 4-reductase (DFR) gene showed a point mutation within the coding region. In order to confirm that the nonfunctional DFR gene was the cause for the green phenotype, PCR product from an amplification of the wild type DFR gene was cloned into pBI121 vector. Non-purple fast plants were transformed using agrobacterium containing the DFR gene by floral dip method. The few transformed plants that were obtained did not have purple stems. Further seeds are being analyzed to confirm the results.

<sup>1</sup>Mathematics and Science Division, Hagerstown Community College, <sup>2</sup>Department of Biology, Frostburg State University

**28. *Isolation and Evaluation of Immunoglobulins Present in Egg Yolk***

Connor Johnson, student – HagerstownCC

Faculty Mentors: Savita Prabhakar, Cindy Dove – HagerstownCC

Chicken IgY is used as a generic supplement ingredient in branded food and beverage products, health products and supplements. Studies have shown successful production of egg IgY that inhibit the growth of bacteria and viruses including rotavirus, E. coli, S. aureus, C. perfringens, and V. cholera. However, studies addressing effects and interactions of IgY on microorganism species isolated in human microbiome niches associated with disease processes are lacking. Most published methods utilize polyethylene glycol ( PEG 5000) to isolate IgY. We elected to develop another method using PEG 3350 which should be less denaturing to IgY. We found that using a series of PEG precipitations at 3.5, 8 and 12% yielded a relatively pure fraction of the IgY after dialysis. The size of the IgY was confirmed by western blot analysis. Purified IgY were then tested by dot-blot assay to determine the specificity against formalin and heat killed E.Coli. These results indicate that small size PEG is usable for rapid isolation of IgY. Efforts to standardize an ELISA protocol for detection of E.coli are underway.

**30. *The Impact of Service Dogs on Students***

Alexis Lauer, Janelle Stack, Cameron Allen, Cassidy Turner, Amanda Colee, Oluwaseyi Kintunde, students – CSM

Faculty Mentor: Melanie Osterhouse, CSM

This is the College of Southern Maryland's (CSM) first year of doing undergraduate research. Six CSM students developed two implicit association tests (IAT) to determine biases students have toward various dog breeds and/dog sizes. One hundred students at the three campuses were surveyed using the IAT. Because service dogs are on campus and there is little research on how service dogs impact people who are not using the service animal, the intent of this research was to determine if certain dog breeds or dog sizes are perceived as dangerous or comforting to college students who may encounter service dogs in their learning environment.

### **32. *Synthesis of Aspirin***

Noah Simmons, Ali Khan, Skylar Luo, Kaelyn Gales, Steven Treadwell, Jack Wheaton, students – CCC  
Faculty Mentor: Raza Khan, CCC

Aspirin is a drug that inhibits prostaglandin production within the body. Because of its pain relieving effects, it is currently one of the most produced drugs in the world. For the past century, methods for improving the synthesis of Aspirin have been explored by countless scientists and engineers. It has been found that acetylsalicylic acid (Aspirin) is the product of the reaction between salicylic acid and acetic anhydride, and that this reaction is faster when catalyzed by an acid. The purpose of this project was to design a procedure that produces the highest purity and highest percent yield aspirin possible, while still considering the cost and time. In order to synthesize a purer form of acetylsalicylic acid than the published procedure given, the research group of six undergraduate students ran many procedures varying the ratio of the reactants, the type of acid catalyst, the temperature of the reaction, and the time for each step. The research group will present its findings at the Conference.

### **34. *Campus Sensor Network***

Ali Khan, Skylar Luo, Kaelyn Gales, Noah Simmons, Steven Treadwell, Jack Wheaton, students – CCC  
Faculty Mentor: Raza Khan, CCC

In this research project, Raspberry Pis are used to program, record and transmit data in various rooms around the campus of Carroll Community College. Two Raspberry Pi3 are used to sense the temperature, pressure, motion, and light within a laboratory room. A third Raspberry Pi3 is used to take pictures or videos when manually activated. A Raspberry Pi Zero is used in another location on campus to gather the data from Pi3's via network connections. College campuses do not usually have much information of rooms when no one is in there unless there are cameras and other sensors. This sensor network provides detailed information of classrooms on campus. The data recorded in lab rooms can be utilized as an environmental control during labs. The motion sensor and the camera's functionalities can be adapted in order to improve campus security. The primary challenge of this project is to develop Raspberry Pi's internal and network communications that will transmit data to an external account-protected website. The research group will present its findings at the Conference.

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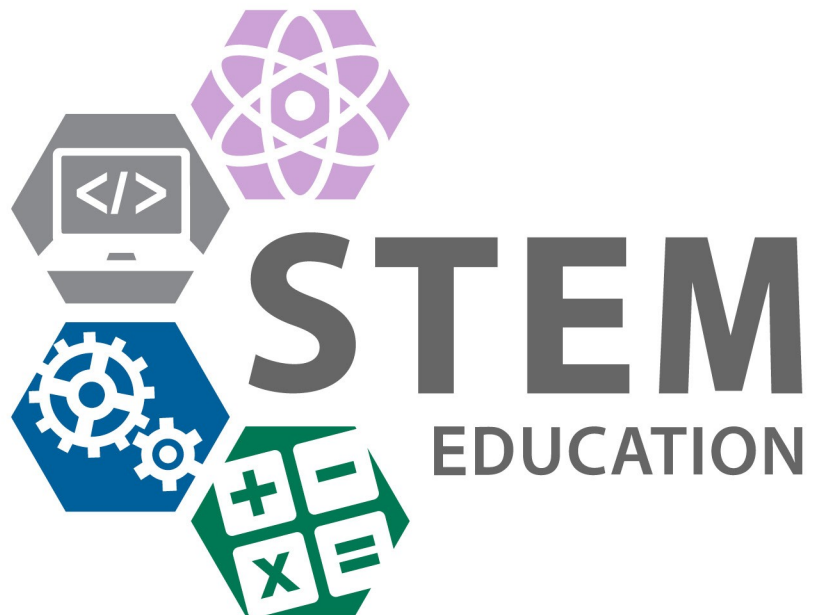
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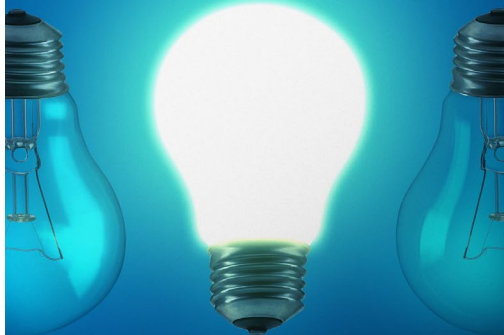
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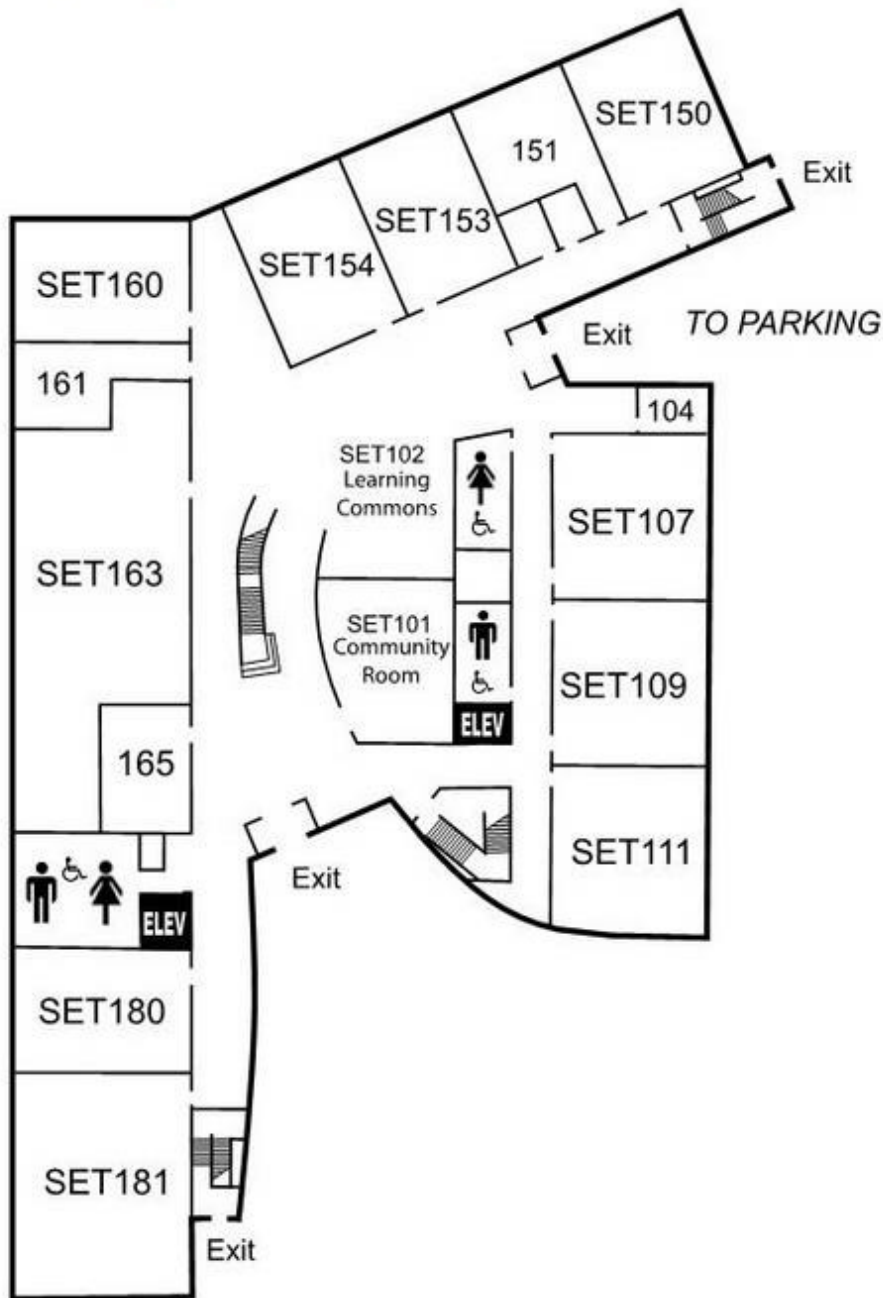
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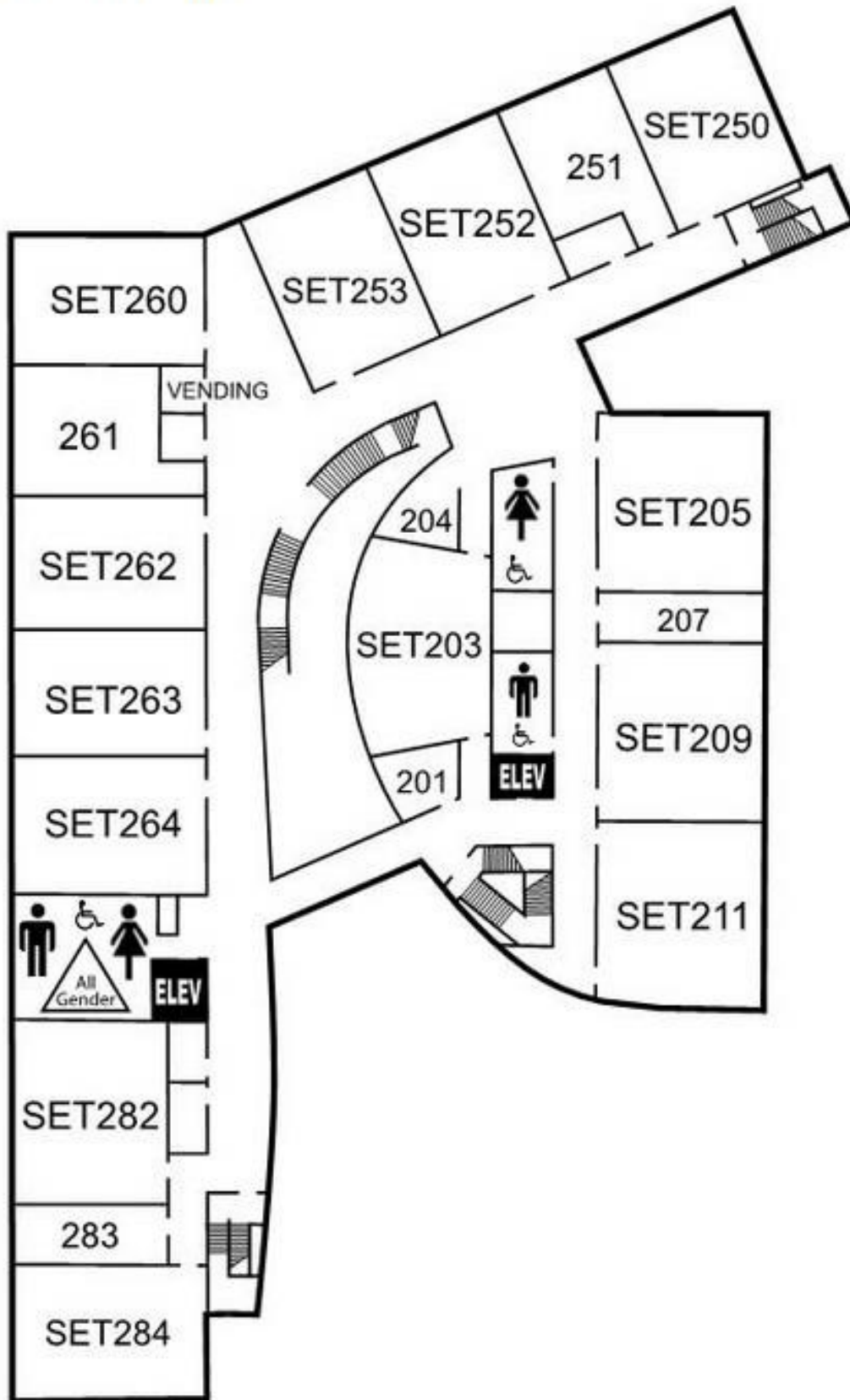


# Science, Engineering and Technology Building

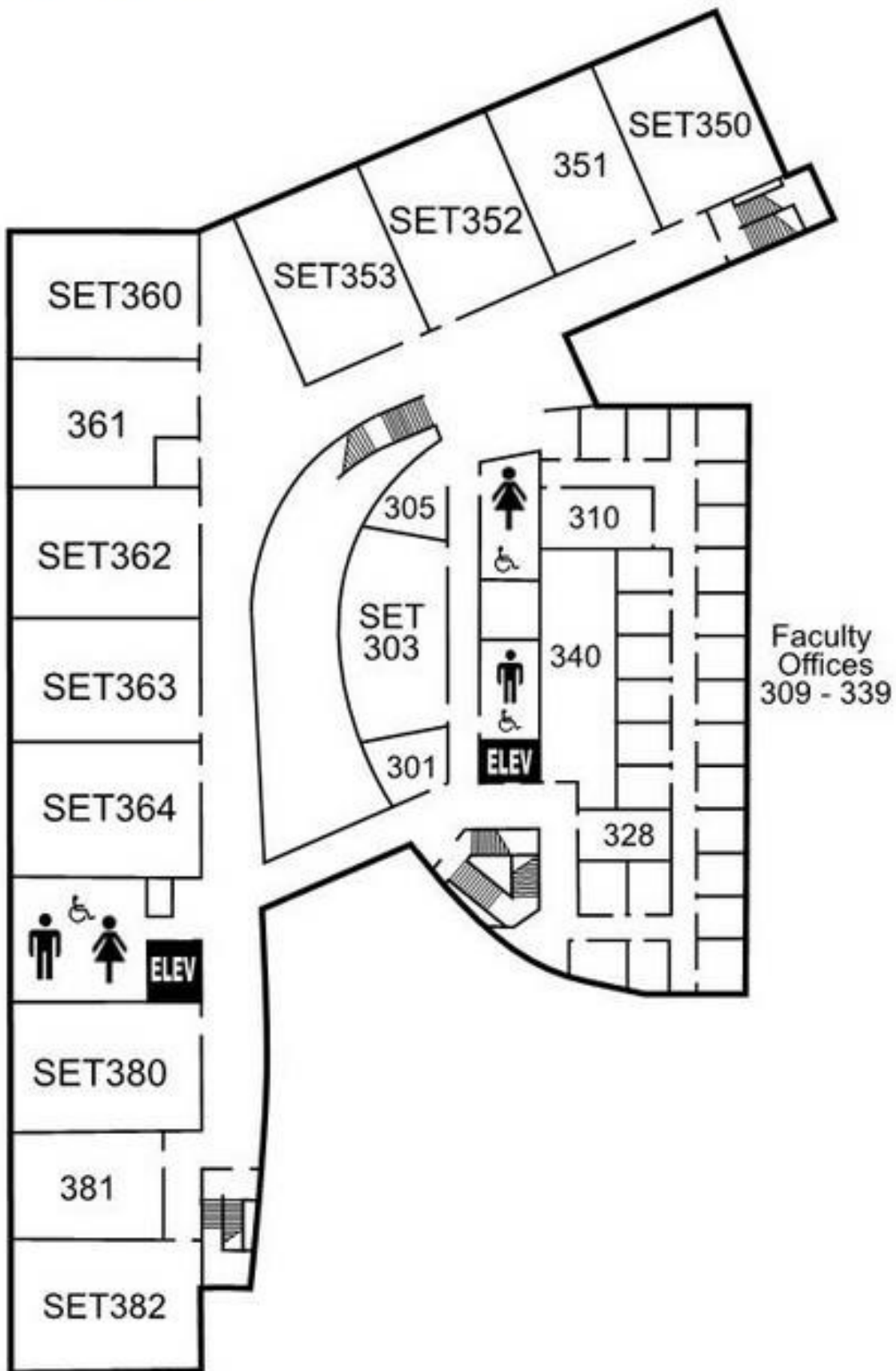
## First Floor



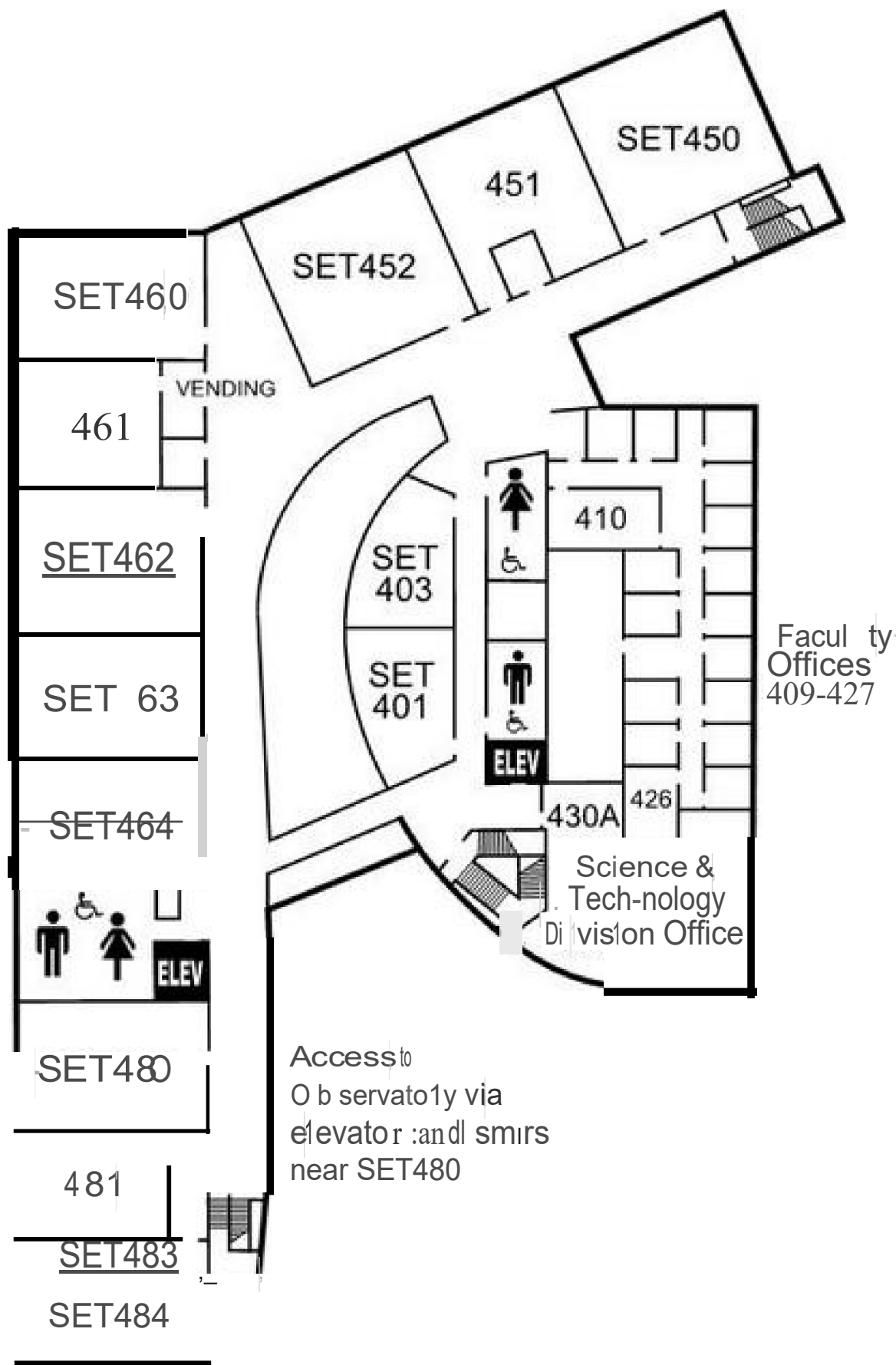
Second Floor



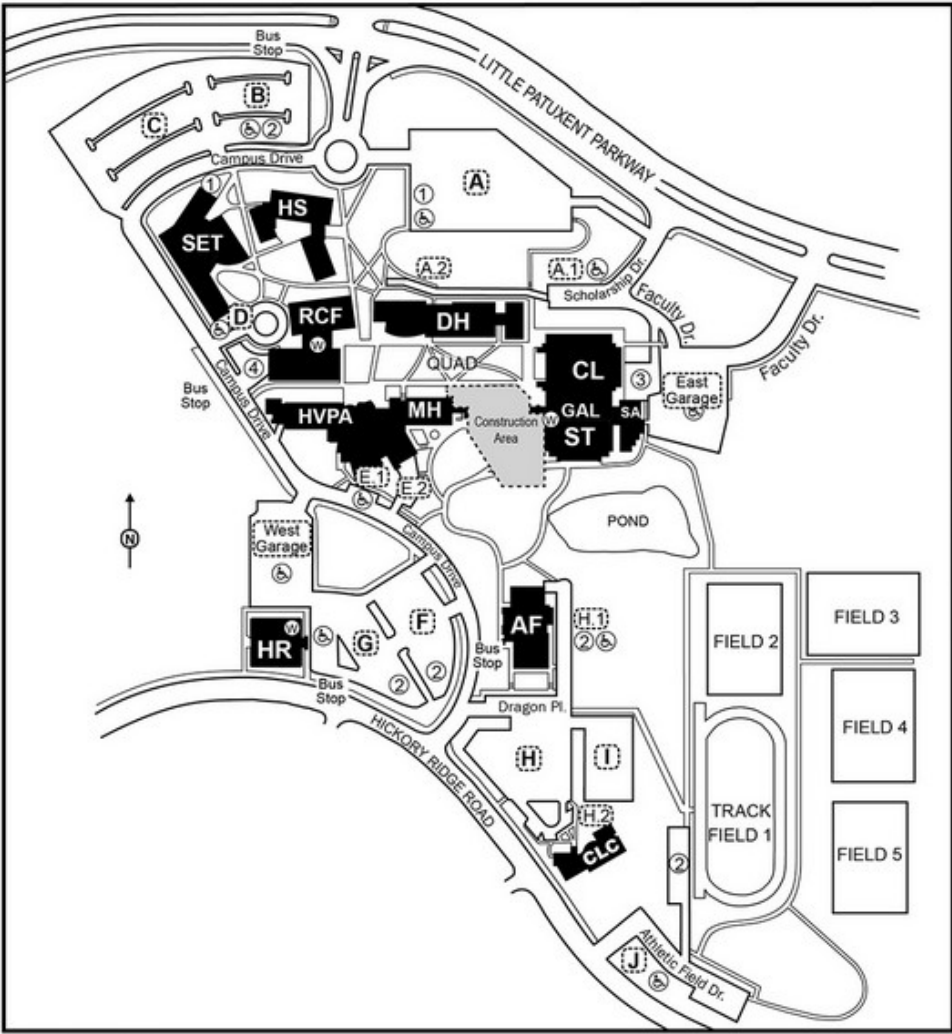
# Third Floor



# Fourth Floor



# Campus Site Map



### BUILDING LOCATION CODES

- AF .... Athletics & Fitness Center
- CL .... James Clark Jr. Library Hall
- CLC .. Children's Learning Center
- DH .... Mary Ellen Duncan Hall for English, Languages & Business
- GAL .. Dwight A. Burrill Galleria
- HR ... Hickory Ridge Building
- HS... Health Sciences Building
- HVPA Peter & Elizabeth Horowitz Visual and Performing Arts Center
- MH ... Patrick & Jill McCuan Hall
- N ..... N Building
- RCF .. The Rouse Company Foundation Student Services Hall
- SA .... Student Activities Building
- SET .. Science Engineering Technology Bldg
- ST .... ST Building

### Legend

- Ⓟ - Accessible Parking
- Ⓜ - Welcome Center
- ① - Drop off / pick up
- ② - Employees Only - Yellow Striped
- ③ - Main Receiving
- ④ - Food Services and Bookstore Deliveries
- Bus Stop - Regional Transit Authority (RTA) Howard Transit GREEN 401 and ORANGE 404 lines.

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## **PROGRAM SNAPSHOT**

### **STUDENT FOCUS:**

8:00 am – 9:00 am: Breakfast and Registration  
9:00 am – 9:05 am: Welcoming Remarks  
9:05 am – 9:20 am: Remarks from Lt. Governor Boyd K. Rutherford  
9:20 am – 10:00 am: Student Centered Keynote  
10:10 am – 10:40 am: Student Session #1  
10:50 am – 11:20 am: Student Session #2  
11:30 pm – 1:30 pm: Lunch (SET 101) and Poster Sessions  
    A – 11:30-12:30pm  
    B – 12:30-1:30pm  
1:40 pm – 2:40 pm: Faculty Centered Keynote  
2:50 pm – 3:20 pm: Student and Faculty Session

### **FACULTY FOCUS:**

11:00 am: Registration for faculty and staff who are attending the afternoon session only  
11:30 pm – 1:30 pm: Lunch (SET 101) and Poster Sessions  
    A – 11:30-12:30pm  
    B – 12:30-1:30pm  
1:40 pm – 2:40 pm: Faculty Centered Keynote  
2:50 pm – 3:20 pm: Student and Faculty Session  
3:30 pm – 4:00 pm: Faculty Session #1  
4:10 pm – 4:40 pm: Faculty Session #2  
4:50 pm – 5:20 pm: Open Forum for Faculty by Discipline