



2019 HBCU-UP/ CREST PI/PD MEETING

FEBRUARY 20-21

WASHINGTON, D.C.



AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE



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2019 HBCU-UP/CREST PI/PD Meeting Program Book

Co-hosted by the
American Association for the Advancement of Science (AAAS)
Education and Human Resources Programs (EHR)

National Science Foundation (NSF)
Division of Human Resources Development (HRD)
Directorate of Education and Human Resources



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Overview of the Meeting

2019 HBCU-UP/CREST PI/PD Meeting

The objective of the **HBCU-UP/CREST PI/PD Meeting** is to provide Principal Investigators, Project Directors, and others with an opportunity to: (1) learn about and share STEM research results; (2) learn about and share innovative strategies for recruiting, preparing, and retaining undergraduate students; (3) learn about other grant opportunities at NSF; and (4) make new connections and create collaborations.

About the NSF Centers of Research Excellence in Science and Technology (CREST) Program

The **Centers of Research Excellence in Science and Technology (CREST)** program provides support to enhance the research capabilities of minority-serving institutions (MSI) through the establishment of centers that effectively integrate education and research. MSIs of higher education denote institutions that have undergraduate enrollments of 50% or more (based on total student enrollment) of members of minority groups underrepresented among those holding advanced degrees in science and engineering fields: African Americans, Alaska Natives, American Indians, Hispanic Americans, Native Hawaiians, and Native Pacific Islanders. CREST promotes the development of new knowledge, enhancements of the research productivity of individual faculty, and an expanded presence of students historically underrepresented in science, technology, engineering, and mathematics (STEM) disciplines. CREST Postdoctoral Research Fellowship (PRF) awards provide research experience and training for early career scientists to work at active CREST Centers to meet the CREST Program goal of building the research capacity of MSIs and advancing the nation's STEM workforce and leadership. HBCU-RISE awards specifically target HBCUs to support the expansion of institutional research capacity as well as the production of doctoral students, especially those from groups underrepresented in STEM, at those institutions.

The **CREST** program supports the following types of projects:

CREST Center awards provide multi-year support (typically 5-years) for eligible minority-serving institutions that demonstrate a strong research and education base, a compelling vision for research infrastructure improvement, and a comprehensive plan with the necessary elements to achieve and sustain national competitiveness in a clearly defined area of national significance in science or engineering research. Successful Center proposals will demonstrate a clear vision and synergy with the broad goals of the CREST Program and the Human Resource Development Division with respect to development of a diverse STEM workforce. CREST Centers are expected to provide leadership in the involvement of groups traditionally underrepresented in STEM at all levels (faculty, students, and postdoctoral researchers) within the Center. Centers are required to use either proven or innovative mechanisms to address issues such as recruitment, reten-

tion and mentorship of participants from underrepresented groups.

CREST Partnership Supplements support the establishment or strengthening of partnerships and collaborations between active CREST Centers and nationally or internationally recognized research centers including NSF-supported research centers and private sector research laboratories, K-12 entities including museums and science centers or schools, as appropriate, to enable the CREST Centers to advance knowledge and education on a research theme of national significance.

CREST Postdoctoral Research Fellowship (PRF) awards recognize beginning CREST Center investigators with significant potential and provide them with research experiences that broaden perspectives, facilitate interdisciplinary interactions and establish them in positions of leadership within the scientific community. Fellows conduct research on topics aligned with the research focus of the host CREST Center. The fellowships are also designed to provide active mentoring to the Fellows by the sponsoring CREST Center scientists who, in turn, will benefit from the incorporation of these talented scientists into their research groups.

HBCU Research Infrastructure for Science and Engineering (RISE) awards support the development of research capability at Historically Black Colleges and Universities that offer doctoral degrees in science and engineering disciplines. Supported projects must have a unifying research focus in one of the research areas supported by NSF, a direct connection to the long-term plans of the host department(s), institutional strategic plan and mission, and plans for expanding institutional research capacity as well as increasing the production of doctoral students, especially those underrepresented in STEM.

SBIR/STTR Phase IIa Diversity Collaboration Supplements provide an opportunity for existing SBIR/STTR Phase II projects to initiate collaborations with minority-serving institutions that have active CREST Center or HBCU-RISE awards. These supplemental proposals are administered by and co-funded with the NSF Directorate for Engineering Division of Industrial Innovation and Partnerships (ENG/IIP).

About the NSF Historically Black Colleges and Universities Program (HBCU-UP) Program

HBCU-UP provides awards to strengthen STEM undergraduate education and research at HBCUs. Support is available through the following tracks:

The new **HBCU Excellence in Research (EiR)** component supports projects that enable STEM and STEM education faculty to further develop research capacity at HBCUs and to conduct research. Proposals submitted to this new track will be routed for review to one of the Research and Related Activities (R&RA) directorates. Funding recommendations will be made by the relevant R&RA directorate(s). Awards will be funded by the relevant R&RA directorate(s) with co-funding from the Office of Integrative Activities (OIA). Prospective PIs are encouraged to contact the cognizant program officer from OIA for further information.

Targeted Infusion Projects (TIP), which provide support to achieve a short-term, well-defined goal for improving the quality of undergraduate STEM education at HBCUs.

Broadening Participation Research (BPR) in STEM Education projects, which provide support for research that seeks to create and study new theory-driven models and innovations related to the participation and success of underrepresented groups in STEM undergraduate education.

Research Initiation Awards (RIA), which provide support for STEM faculty with no prior or recent research funding to pursue research at the home institution, a NSF-funded research center, a research intensive institution, or a national laboratory.

Implementation Projects (IMP), which provide support to design, implement, study, and assess comprehensive institutional efforts for increasing the number of students receiving undergraduate degrees in STEM and enhancing the quality of their preparation by strengthening STEM education and research. Within this track, **Achieving Competitive Excellence (ACE) Implementation Projects** are intended for HBCUs with exemplary achievements and established institutionalized foundations from previous Implementation Project grants.

Broadening Participation Research Centers (BPRC), which provide support to conduct broadening participation research at institutions that have held three rounds of Implementation or ACE Implementation Projects and with demonstrated capability to conduct broadening participation research. Broadening Participation Research Centers are expected to represent the collective intelligence of HBCU STEM higher education, and serve as national hubs for the rigorous study and broad dissemination

of the critical pedagogies and culturally sensitive interventions that contribute to the success of HBCUs in educating African-American STEM undergraduates. Centers are expected to conduct research on STEM education and broadening participation in STEM; perform outreach to HBCUs in order to build capacity for conducting this type of research; and work to disseminate promising broadening participation research in order to enhance STEM education and research outcomes for African-American undergraduates across the country.

About NSF

The National Science Foundation (NSF) Division of Human Resource Development (HRD)

The **Division of Human Resource Development (HRD)** serves as a focal point for NSF's agency-wide commitment to enhancing the quality and excellence of STEM education and research through broadening participation by historically under-represented groups – minorities, women, and persons with disabilities. Priority is placed on investments that promise innovation and transformative strategies and that focus on creating and testing models that ensure the full participation of and provide opportunities for the educators, researchers, and institutions dedicated to serving these populations. Programs within HRD have a strong focus on partnerships and collaborations in order to maximize the preparation of a well-trained scientific and instructional workforce for the new millennium.

HRD Vision:

HRD envisions a well-prepared and competitive U.S. workforce of scientists, technologists, engineers, mathematicians, and educators that reflects the diversity of the U.S. population.

HRD Mission:

HRD's mission is to grow the innovative and competitive U.S. science, technology, engineering and mathematics (STEM) workforce that is vital for sustaining and advancing the Nation's prosperity by supporting the broader participation and success of individuals currently underrepresented in STEM and the institutions that serve them.

The American Association for the Advancement of Science (AAAS)

The **American Association for the Advancement of Science** is an international non-profit organization dedicated to advancing science around the world by serving as an educator, leader, spokesperson and professional association. In addition to organizing membership activities, AAAS publishes the journal *Science*, <http://www.sciencemag.org/>, as well as many scientific newsletters, books and reports, and spearheads programs that raise the bar of understanding for science worldwide.

AAAS was founded in 1848, and includes some 261 affiliated societies and academies of science, serving 10 million individuals. *Science* has the largest paid circulation of any peer-reviewed general science journal in the world, with an estimated total readership of one million. The non-profit AAAS is open to all and fulfills its mission to "advance science and serve society" through initiatives in science policy; international programs; science education; and more. For the latest research news, log onto EurekAlert!, <http://www.eurekalert.org/>, the premier science-news website, a service of AAAS.

Membership and Programs

Open to all, AAAS membership includes a subscription to *Science*. Four primary program areas fulfill the AAAS mission:

- Science and Policy
- International Activities
- Education and Human Resources
- Project 2061

AAAS Mission

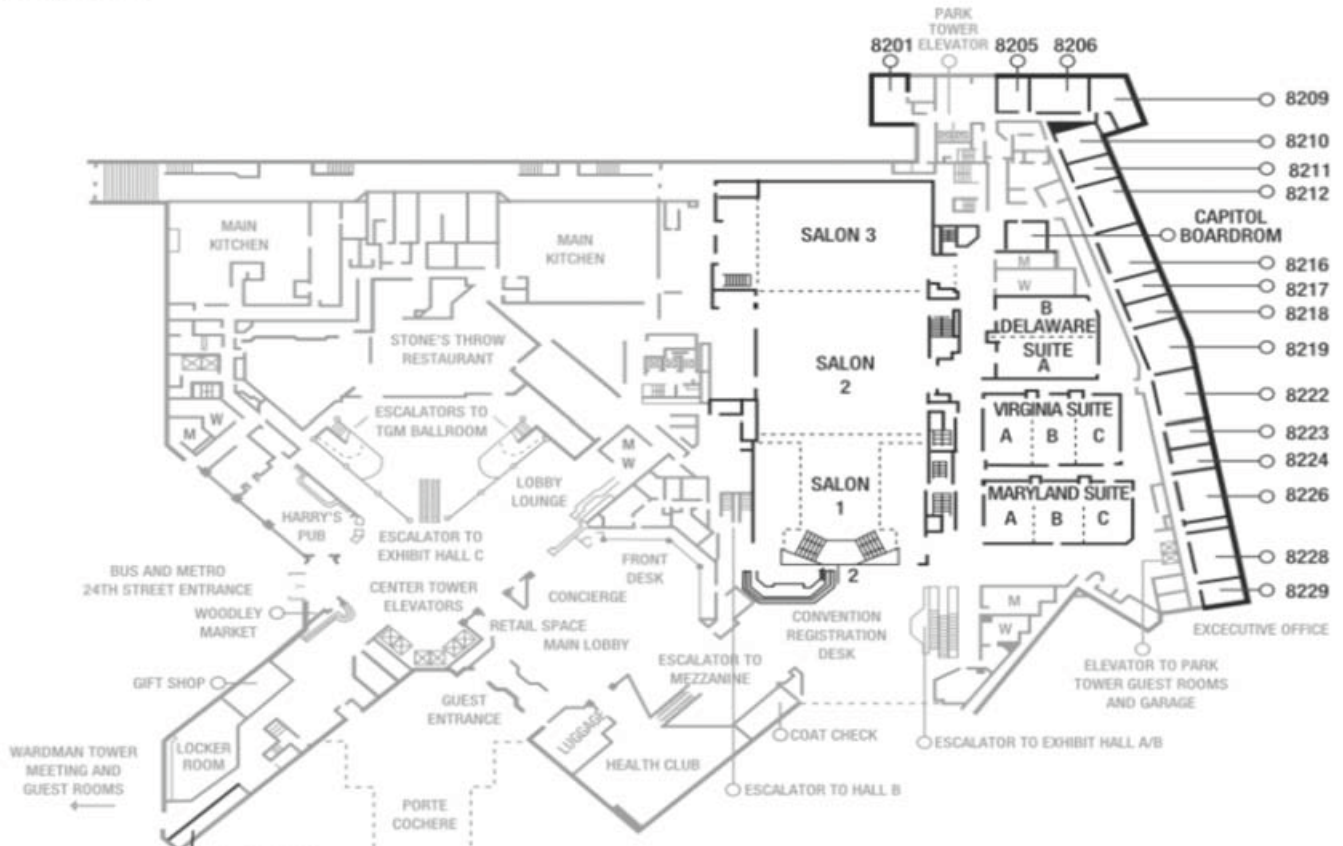
AAAS seeks to "advance science, engineering, and innovation throughout the world for the benefit of all people." To fulfill this mission, the AAAS Board has set these broad goals:

- Enhance communication among scientists, engineers, and the public;
- Promote and defend the integrity of science and its use;
- Strengthen support for the science and technology enterprise;
- Provide a voice for science on societal issues;
- Promote the responsible use of science in public policy;
- Strengthen and diversify the science and technology workforce;
- Foster education in science and technology for everyone;
- Increase public engagement with science and technology; and
- Advance international cooperation in science.

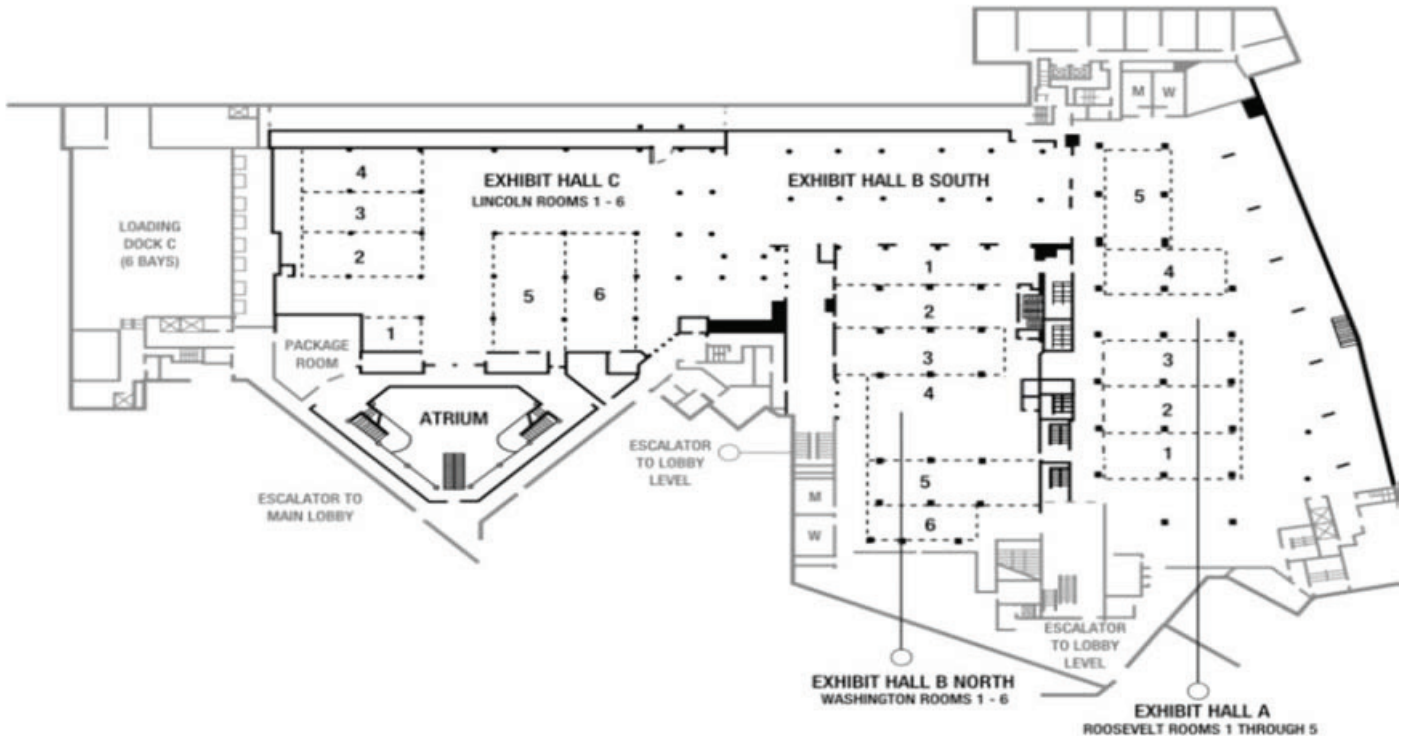
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Wednesday, February 20, 2019

- 2:00pm **Registration**
Convention Registration
- 3:00pm - 3:30pm **HBCU-UP/CREST PI/PD Meeting with Joint LSAMP Activities**
- Opening Plenary Session 1**
Maryland
- Greetings: Karen Marrongelle,**
Assistant Director, NSF EHR
- 3:30pm - 5:30pm **Concurrent Business Meetings**
- Greetings: Jermelina Tupas, HRD**
Division Director, NSF
- A.) CREST Business Meeting**
Marriott Balcony B
- Program Overview: Victor Santiago,**
Program Director, NSF
- CREST WEB: ICF Staff**
- CREST Performance Data Analysis:**
Frances Carter-Johnson, Data Scientist, NSF
- CREST Outreach: Telling Our Story, NSF OLPA**
- B.) HBCU-UP Business Meeting**
Delaware
- 20 Years of HBCU-UP: Claudia Rankins,**
Program Director, NSF
- STEM Central: Kelly Mack, VP, AAC&U**
- 5:30pm - 5:45pm **Break**
- 5:45pm - 7:00pm **Poster Session 1 and Reception**
Exhibit Hall A
- 7:00pm - 8:30pm **Poster Session 2 and Reception**
Exhibit Hall A

Thursday, February 21, 2019

- Breakfast On Your Own**
- 8:30am - 10:00am **Concurrent Breakout Session 1 Meeting of PIs by Program/Track**
- Group 1: CREST Projects**
Maryland A
- Victor Santiago, Program Director, NSF**
- Group 2: CREST Postdoctoral Research Fellows**
Maryland B
- Regina Sievert, Program Director, NSF**
- Group 3: HBCU-UP Implementation Projects**
Marriott Balcony A
- Orlando Taylor and Camille McKayle,**
Principal Investigators
- Group 4: HBCU-UP TIP and BPR Projects**
Marriott Balcony B
- Clytrice Watson, Program Director, NSF**
- Group 5: HBCU-UP RIA Projects**
Maryland C
- Claudia Rankins, Program Director, NSF**
- Group 6: LSAMP Projects**
Washington Room 4
- Martha James, LeRoy Jones, A. James Hicks, Program Directors, NSF**
- 10:00am - 10:15am **Break**
- 10:15am - Noon **Concurrent Breakout Session 2**
- A.) New PI Orientation**
Maryland A
- Andrea Johnson, Program Director, NSF, DGA**

Agenda

B.) Post Award Management

Maryland B

NSF, DGA

C.) NSF Funding Opportunities

Maryland C

NSF Program Directors

D.) Organizational Change

Virginia A

Melvin Hall, Professor, Northern Arizona University

E.) Dissemination in the Age of Social Media

Virginia C

Autumn Arnett, Senior Editor, U.S. News & World Report

Noon - 2:00pm

Plenary Session 2 and Lunch

Marriott Ballroom

Keynote Speaker:

Kamau Bobb, Senior Director, Constellations Center for Equity in Computing, Georgia Tech

2:00pm - 3:00pm

Informal Meeting of NSF PDs with PIs and Students

Marriott Ballroom

Key:

BPR Broadening Participation Research
CREST Centers for Research Excellence in Science and Technology

DGA Division of Grants and Agreements
EHR Directorate for Education and Human Resources

EiR Excellence in Research

HBCU-UP Historically Black Colleges and Universities Undergraduate Program

HRD Human Resource Development

HSI Hispanic Serving Institutions

LSAMP Louis Stokes Alliances for Minority Participation

NSF National Science Foundation

RIA Research Initiation Award

TIP Targeted Infusion Project



Autumn Arnett, Senior Editor, U.S. News & World Report

Autumn A. Arnett is a Washington, D.C.-based journalist and editor, whose work centers around issues of equity and access in education. She presently serves as senior editor for education at U.S. News & World Report, and is the author of *Let's Stop Calling It an Achievement Gap: How public education in the United States maintains disparate experiences for students of color*, now available from Information Age Publishing. A former editor of Education Dive, HBCU Digest and *Diverse: Issues In Higher Education*, Autumn's work has also appeared in *The Atlantic* and *Complex Magazine*. She has moderated and participated in numerous panels around issues of access, opportunities and outcomes for African-American students and is a passionate advocate for historically Black colleges and universities.

In 2014, Autumn founded *Out of Bounds Magazine*, a publication dedicated to exploring the political, social and economic issues in amateur, collegiate and professional athletics. In her free time, Autumn also serves as a copy editor for the *Journal of African American Males in Education* and a contributor to the *National Association of Black Journalists' NABJ Journal*. She volunteers extensively with K-12 students and serves as a mentor to several college-aged students. Autumn is a graduate of Clark Atlanta University.



Kamau Bobb, Senior Director, Constellations Center for Equity in Computing, Georgia Tech

Kamau Bobb is the Global Lead for Diversity Strategy and Research at Google and the founding Senior Director of the Constellations Center for Equity in Computing at Georgia Tech. He is an engineer and science and technology policy scholar whose work focuses on the relationship between equity for students and communities of color in the STEM enterprise, large educational systems, and the social and structural conditions that influence contemporary American life.

He brings to his current position a wealth of experience as a former Program Officer at the National Science Foundation (NSF). At NSF he was responsible for \$30 million annually of investments targeted on improving computing and STEM education. In that role Bobb worked at the highest levels of the federal government to help shape the national research agenda for effective means of delivering equitable and quality computational education to all students. He has worked with members of the Office and Science and Technology Policy in the Obama Administration to set the national strategy for STEM education at

both post-secondary and secondary school levels. He was selected as a member of President Obama's My Brother's Keeper STEM + Entrepreneurship Taskforce to help U.S. cities craft strategies to engage young men and boys of color in the STEM landscape. Prior to his federal appointment, Bobb was the Director of the STEM Initiative for the University System of Georgia, a collaborative effort with the governor's office to improve STEM education across the 30 public institutions serving approximately 325,000 students in the state.

Bobb holds a Ph.D. in Science and Technology Policy from Georgia Tech and M.S. and B.S. degrees in Mechanical Engineering from the University of California, Berkeley



Yolanda S. George, Deputy Director and Program Director, AAAS EHR

Yolanda Scott George is Deputy Director and Program Director, Education and Human Resources Programs, American Association for the Advancement of Science (AAAS). She has served as Director of Development, Association of Science-Technology Centers (ASTC), Washington, DC; Director, Professional Development Program, University of California, Berkeley; and as a research biologist at Lawrence Livermore Laboratory involved in cancer research and cell cycle studies using flow cytometer and cell sorters.

George has conducted evaluations, workshops and reviews for the National Institutes of Health and National Science Foundation (NSF), as well as for private foundation and public agencies, including the European Commission. She works with UNIFEM, UNESCO, L'Oreal USA and Paris and non-governmental organizations on gender, science, and technology initiatives related to college and university recruitment and retention and women leadership in STEM.

She serves or has served as principal investigator (PI) or co-PI on several NSF grants, including Vision and Change in Undergraduate Biology Education; National Science Education Digital Library Biological Sciences Pathways; Historically Black Colleges and Universities-Undergraduate Programs; Robert Noyce Teacher Scholarship Program; Transforming Undergraduate Education in STEM (TUES) and Virtual Faculty Workshop; and Women's International Research Collaborations at Minority Serving Institutions. In addition, George is the lead AAAS staff person for the L'Oreal USA Fellowships for Women in Science Program (postdoctoral fellowships) and the David and Lucile Packard Foundation HBCU Graduate Scholars Program (graduate school fellowships).

Biographies

George serves or has served on a number of boards or committees, including: PBS NewsHour Science Advisory Committee; Burroughs Wellcome Fund, Science Enrichment Program Grants, Advisory Board; The HistoryMakers, ScienceMakers, Advisory Board; and the National Advisory Board of the American Physical Society Physics Bridge Program.

George has authored or co-authored over 50 papers, pamphlets, and hands-on science manuals. She received her B.S. and M.S. from Xavier University of Louisiana and Atlanta University in Georgia, respectively.



Melvin E. Hall, Professor of Educational Psychology, Northern Arizona University

Melvin H. Hall, PhD, is Professor of Educational Psychology at Northern Arizona University. Hall completed his BS, and PhD, degrees at the University of Illinois at Urbana Champaign in Social

Psychology and Educational Psychology respectively; and MS in Counseling at Northern Illinois University.

During a forty plus-year professional career in higher education, Hall has served in four successive appointments, as an academic dean, comprised of positions at Florida Atlantic University, University of California-Irvine, University of Maryland at College Park, and most recently Northern Arizona University (NAU). At NAU, Hall served as Dean of the College of Education and additionally was the principal investigator on two five-year US Office of Education GEAR UP grants providing dropout prevention programs and services to thousands of middle and high school students throughout Arizona.

Returning to full-time faculty life in 2002, Hall has melded teaching and scholarship in Educational Psychology with responsibility as co-principal investigator on five-years of National Science Foundation support for the Relevance of Culture in Evaluation Institute. Subsequent to the RCEI grant, Hall began a continuing appointment as affiliated faculty in the Center for Responsive Evaluation and Assessment (CREA) at the University of Illinois. As an external reviewer, Hall has served on numerous review panels and Committee of Visitors for the National Science Foundation EHR Division including an invited expert panel on the future of evaluation methodology in STEM programs. In 2015, he accepted an appointment as an intermittent expert at NSF and in that capacity serves as a program officer for the ADVANCE and HBCU UP Programs within the Human Resource Development Division of the EHR Directorate.

For several years, Hall served on the American Evaluation Association Standing Committee on Diversity, initiating the association's published statement on the importance of Cultural Competence in the field of Program Evaluation. In 2013, Hall became an elected member of the American Evaluation Association Board of Directors. In addition, he is a member of the Inclusive Excellence Commission of AAC&U and the External Advisory committee for the Collaborative for the Advancement of STEM Leadership (CASL).



Shirley M. Malcom, Senior Advisor, and Director of SEA Change, AAAS

Shirley M. Malcom, Senior Advisor, and Director of SEA Change at AAAS, has served as a program officer in the NSF Science Education Directorate; an assistant professor of biology, University of North Carolina, Wilmington; and a high

school science teacher. Malcom received her PhD in Ecology from the Pennsylvania State University; Master's in Zoology from the University of California, Los Angeles; and Bachelor's with distinction in Zoology from the University of Washington. In addition, she holds 17 honorary degrees.

Malcom serves on several boards, including the Heinz Endowments, Public Agenda, Digital Promise, and the National Mathematics and Science Initiative. She serves as a trustee of Caltech and as a Regent of Morgan State University. In 2003, Malcom received the Public Welfare Medal of the National Academy of Sciences, the highest award given by the Academy. She was a member of the National Science Board, the policy-making body of NSF, from 1994 to 1998, and of the President's Committee of Advisors on Science and Technology from 1994 to 2001.



Karen Marrongelle, Assistant Director, NSF EHR

Karen Marrongelle is the Assistant Director of the National Science Foundation (NSF) for Education and Human Resources (EHR). She leads the EHR directorate in supporting research that enhances learning and teaching to

achieve excellence in U.S. science, technology, engineering and mathematics (STEM) education. Prior to joining NSF, Marrongelle was dean of the College of Liberal Arts and Sciences at Portland State University and Professor of Mathematics and Statistics, where she oversaw 24 departments and programs across the humanities, social sciences and natural sciences.

In addition to her work as dean, Marrongelle has served as a faculty member in the Department of Mathematics and

Statistics at Portland State University since 2001. Prior to her appointment as dean, she held positions as the Vice Chancellor for Academic Strategies and Assistant Vice Chancellor for Academic Standards and Collaboration with the Oregon University System. From 2007-2009, Marrongelle served on a rotation as a program officer at NSF and led numerous grants, collaborating with researchers nationally and internationally to improve undergraduate mathematics education and K-12 mathematics professional development.

Marrongelle has a bachelor's degree in mathematics and philosophy from Albright College, a master's degree in mathematics from Lehigh University and a doctorate in mathematics education from the University of New Hampshire.



Claudia Rankins, Program Director, HRD, NSF

Claudia Rankins is a Program Officer in the Directorate for Education and Human Resources at the National Science Foundation, where she manages the Historically Black Colleges and Universities Undergraduate Program and the

Centers for Research Excellence in Science and Technology. Prior to this post, Rankins served at Hampton University for 22 years in a number of capacities, including Chair of the Department of Physics, Assistant Dean for Research, and dean of the School of Science. Rankins holds a PhD in Physics from Hampton University. She is the co-founder of the Society of STEM Women of Color, Inc.



Victor Santiago, Program Director, HRD, NSF

Victor Santiago is a Program Director in the National Science Foundation's Division of Human Resource Development (HRD). This Division implements programs and activities that enhance the quantity, quality and diversity of human capital

engaged in U.S. science, technology, engineering, and mathematics (STEM). A principal focus of HRD is to ensure access to and full participation in STEM through increased, improved and diversified opportunities; enhanced quality in the educational experience; and hands-on research experiences. In particular, HRD plays a central role in increasing opportunities in STEM education for individuals from historically underserved populations—minorities, women and persons with disabilities—and supports the development of the educators, researchers, and institutions dedicated to serving these populations. During his sixteen-year tenure at NSF, Santiago has served as Program Manager for several national STEM research and education

programs. He also served as Acting Division Director, HRD and as Deputy Division Director, HRD.

Prior to his appointment at the National Science Foundation, Santiago was an Associate Professor of Earth Science at Inter American University of Puerto Rico. There, he also held several administrative positions including Dean of Science and Technology. Santiago earned a PhD at the University of Michigan.



Jermelina Tupas, Acting Division Director, HRD, NSF

Education and Human Resources (EHR) at the National Science Foundation, and currently serves as acting Division Director for HRD. She was acting Deputy Assistant

Director for EHR from June-December 2014 before returning to her home division. Prior to coming to EHR at NSF, she held the position of Division Director for the Division of Community and Education at the National Institute of Food and Agriculture (NIFA) - U.S. Department of Agriculture from October 2009 to August 2012. Before working at NIFA she managed a portfolio of student training, fellowship and faculty research as a Program Director in the Division of Minority Opportunities in Research at the National Institute of General Medical Sciences, NIH from August 2006 to September 2009. She first joined NSF in 2004 as a Program Officer for more than 2 years, at the Division of Molecular and Cellular Biosciences, Biological Science Directorate at the National Science Foundation. Thus after stints at two other federal agencies (NIH and USDA), she has returned to NSF. Before moving to NSF, Dr. Tupas was a faculty member at the University of Hawaii at Manoa (UHM), where she taught graduate courses and carried out her research in hormone signaling and transcription regulation, while managing two undergraduate student research training and student development programs focused on increasing diversity in biomedical sciences. Jermelina Tupas holds a Bachelor's degree in Zoology and a Master's degree in Microbiology from the University of the Philippines, and a Ph.D. in Molecular Biology from the Institute of Medical Sciences, University of Tokyo, Japan.



Iris R. Wagstaff, AAAS Program Director, EHR, AAAS

Iris R. Wagstaff is a STEM Program Director in Education and Human Resources Programs at the American Association for the Advancement of Science (AAAS). She is a former 2015-2017 AAAS Science and Technology Policy Fellow at the National

Institute of Justice Office of Investigative and Forensic Sciences

Biographies

where she led an agency-wide strategic diversity and inclusion initiative. She is a native of Goldsboro, NC and has a BS and MS in Chemistry from UNC-Greensboro and NC A&T State Universities respectively.

She has over 20 years of STEM outreach and advocacy developing informal science programs, mentoring, resourcing parents, and working with K-12 science teachers to develop culturally relevant and engaging lessons with real-world applications. She has advocated for students at the K-20 levels and built strategic partnerships between industry, educators, and researchers. She worked as a research chemist at the Rohm and Haas Company (now Dow Chemical) for 15 years where she led project teams.

She obtained a PhD in STEM education research and policy analysis from NC State University in 2014 where she examined factors that predict science self-efficacy, science identity, and STEM career intent in a nationally representative sample of high school students. She is the founder of the SMART Scholars initiative for middle school girls that provide hands-on STEM outreach, role models, and parent resources in NC and the metropolitan Washington, DC area. She is a long-time member of the National Organization of Black Chemists and Chemical Engineers and serves on the National Executive Board.

She is also a long-time member of the American Chemical Society where she serves as Manager and STEM Education Chair of the Chemical Society of Washington. She has received several acknowledgements for her STEM outreach that include a 2016 nomination for the Presidential Award for Excellence in Science, Math, and Engineering Mentoring (PAESMEM), and the 2017 Women of Color in STEM Promotion of Education Award.

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Biological Sciences

1

Poster Category: STEM Research

Enhancement of Jarvis Christian College Course-based Undergraduate Research Experiences (J-CURE) Program in the Biological Sciences

Shakhawat Bhuiyan, Jarvis Christian College

Co-Author(s): Glendora Carter, Jarvis Christian College

The Historically Black Colleges and Universities Undergraduate Program (HBCU-UP) through Targeted Infusion Projects (TIP) supports the development, implementation, and study of evidence-based innovative models and approaches for improving the preparation and success of HBCU undergraduate students so that they may pursue STEM graduate programs and/or careers. The TIP project at Jarvis Christian College (JCC) seeks to develop and implement course-based undergraduate research experiences (CURE) in the biology curriculum, provide access to scientific research experiences for undergraduate students and increase the research capacity in the biological sciences. To prepare students for active learning and problem solving in the classroom, we proposed an extensive collection of online activities for students. We utilized the free online interactive resources and Pearson Campbell's MasteringBiology to enhance the biology curriculum. The online resources provided dynamic study modules/powerpoints to enhance students' self-paced study for solving quizzes and periodic tests that improved students' overall grade. The J-CURE program sought to draw the Biology/Chemistry students into the research program in the biological sciences. The participants were required to conduct an independent research project on biological sciences with a member of the Jarvis faculty and to present their results in scientific regional and national conferences. The J-CURE program recruited five students in each summer, 2017 and 2018, for 8 weeks, and three students in each Fall and Spring semester. Students were employed to work with one of the participating research mentors at the institution and received a stipend for 8-weeks summer research and academic year. This exposure allowed undergraduate students a greater understanding of research and increased the students' interest in biological sciences.

During the summers of 2017 and 2018, a total of 10 undergraduate students completed their undergraduate research projects, published research abstracts in the conference database, and presented their research at the Annual Biomedical Research Conference for Minority Students (ABRCMS) or/and Emerging Researchers National (ERN) Conference in STEM. The overall students' research engagement and presentations at national conferences were

increased significantly in 2017 and 2018 as compared to the previous years. In conclusion, the proposed program is a strategy for increasing the capacity of JCC to produce more STEM graduates who are competitive for graduate school and STEM careers.

Funder Acknowledgement: National Science Foundation grant: Award #1719607

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Poster Category: STEM Research

Synthesis of C-2 Functionalized Ribofuranosylpurine Analogues as Potential Antiviral Agents

Eric Bonsu, Bowie State University

Co-Author(s): Isata Yokie and Christ Warren Tessofo

There is no debate about the importance of critical research and development, pertaining to both the present and future of new and improved antiviral drugs. The world is constantly at the mercy of current and emerging infectious diseases, particularly viral infections. More modern examples include: Ebola virus, Zika virus, Dengue Fever virus, Influenza A virus, and the other variants and mutants they will later present. This research involves investigation, literature research, critical structure-activity study, multi-step synthesis of some structurally and mechanistically-designed C-2 functionalized ribofuranosylpurine nucleosides as antiviral compounds targeting the inhibition of IMPDH (Inosine Monophosphate Dehydrogenase). IMPDH is a choice target for antiviral chemotherapy because it is involved in the first committed and rate-limiting step in the de-novo biosynthesis of guanine nucleotides. Thus, IMPDH inhibition depletes the guanylate pools (GMP, GDP, GTP and dGTP), and since GTP is a co-factor in the conversion of IMP to AMP (via adenylosuccinate), ATP and dATP pools are also depleted. This retards cellular functions such as DNA replication, RNA synthesis and signal transduction, which subsequently leads to anticancer, antiviral, immunosuppressive, and anti-parasitic chemotherapy. Students will have hands-on experience in modern synthetic chemistry and the use of modern state-of-the-art instruments such as ¹H-NMR and ¹³C-NMR, UV, IR, MS, and HPLC to validate synthesized compounds.

Funder Acknowledgement: National Science Foundation

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Poster Category: STEM Research

Evaluating the Impact of Course Redesign on Student Success in Biological Sciences at FVSU

Seema Dhir, Fort Valley State University

Co-Author(s): Celia Dodd, Fort Valley State University
Kaneatra Simmons, Fort Valley State University

Student opinion of instruction (SOI) is sought as an instrument to assess the impact of curricular enhancements in three upper level biology courses. Based on feedback received from student surveys, pedagogical changes will be made in these courses. One of the objectives of the targeted infusion project is to integrate biotechnology concepts in laboratory exercises to strengthen student's mastery of core concepts in biological sciences. Introduction of a new course in scientific communication, mentored undergraduate research, mobile computing for data acquisition and integration of cyber-instruction to offer instructional modules and supplemental resources through Brightspace are likely to yield improved student success.

Funder Acknowledgement: NSF award no. 1818695.

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Poster Category: STEM Science and Mathematics Education

HBCU-UP TIP: Introducing Computational Chemistry and Computational Biology for Undergraduates

Tandabany Dinadayalane, Clark Atlanta University

Co-Author(s): Nathan J. Bowen, Clark Atlanta University

Computation is now regarded as an equal and essential element along with theory and experiment in the advancement of scientific knowledge and engineering practice. Currently, enormous opportunities are available in computational and data-enabled science, and the demand in this area is expected to increase significantly in coming years. It is important to educate the next generation of undergraduate students to confront the challenges in computational and data science. At Clark Atlanta University (CAU), we have developed and pilot-tested two (2) new undergraduate courses: 'Introduction to Computational Chemistry and Molecular Modeling' and 'Introduction to Computational Biology and Bioinformatics' correspondingly in the Departments of Chemistry and Biological Sciences. The NSF funded HBCU-UP Targeted Infusion Project (TIP) enhances CAU's academic cyberinfrastructure by adding computers and scientific software for computational chemistry and biology education integrated with research for undergraduate students. By the support of an external evaluator, formative evaluation for the course development was undertaken to evaluate project elements which are relevant to project implementation. Findings from this evaluation are used to improve the course development products and process. Student perceptions regarding key areas of the course/laboratory were ascertained through a focus group type interview conducted with students enrolled in the newly developed courses. The findings of the students' interviews will be presented. Students were unanimous in their agreement that they had learned a lot in these courses. The cumulative effect of newly developed courses ensures that they would be able to achieve the goal of being prepared to engage in advanced study and/or entry level employment in the area of computational chemistry and molecular modeling, as well as computational biology.

Funder Acknowledgement: NSF HBCU-UP TIP (Grant number 1623287).

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Poster Category: STEM Research

Antimicrobial Resistance and Biofilm Formation by Commensal Neisseria Species

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Co-Author(s): Symone Thompson, Candace Carter, Megalya Marquez-Lopez, Taylor Lattimore, Biology Department, Spelman College

Bacteria develop mechanisms to survive in competitive and complex environments. Common mechanisms of survival include the production of antibiotic compounds, the expression and regulation of resistance mechanisms to antimicrobials, and the formation of biofilms. While these mechanisms are often studied in environmental and in pathogenic bacteria, the diversity of these mechanisms among human commensal bacteria is overlooked. Through the support of NSF, we analyze the growth profile, the antimicrobial resistance profile, and the biofilm formation of 4 commensal *Neisseria* spp, *N. lactamica*, *N. cinerea*, *N. mucosa*, and *N. elongata*, often found in the human oral and nasopharynx. These commensal *Neisseria* may be potential reservoirs of novel antimicrobial resistance mechanisms for pathogenic *N. gonorrhoeae*, a sexually-transmitted bacterium, and in *N. meningitidis*, a causative agent of meningitis. Interestingly, we found that while the commensal *Neisseria* share more than 98% identity at the nucleotide level, they diverge in their behaviors of growth, antimicrobial resistance, and biofilm formation. In the future, we aim to identify genes and regulatory mechanisms associated with these differences, e.g., via gene deletion and complementation and differential gene expression to assess the phenotypic and fitness impacts of candidate genes. Currently, through the support of NSF, 5 undergraduate female students at Spelman College enhanced their scientific and technical skills, while improving their reading and analytical skills.

Funder Acknowledgement: BIO-HBCU-UP: Research Initiation Award

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Poster Category: STEM Science and Mathematics Education

Outcomes of the Targeted Infusion Project: Developing Quantitative Expertise in the Undergraduate Biology Curriculum (QEUBiC)

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The study of life, biology, can contribute solutions to major societal challenges in food, environment, energy and health. Several national reports including “A New Biology for the 21st Century” as well as “Vision and Change in Undergraduate Biology Education” have recognized the continuous need to equip students with deep expertise in a specific discipline of biology and highly developed computational and quantitative skills. The National Science Foundation award to Bethune-Cookman University titled “Targeted Infusion Project: Developing Quantitative Expertise in the Undergraduate Biology Curriculum (QEUBiC)” from August 2014 to July 2018 was designed in response to the need to develop biology graduates who can address societal challenges using bio-based solutions. The project facilitated faculty collaboration to integrate evidence-based teaching and learning approaches to develop a new undergraduate biology curriculum at Bethune-Cookman University. The four-year 124 semester hours biology undergraduate curriculum at Bethune-Cookman University became effective in August 2018. The design of the curriculum promotes comprehensive student academic success. Students are supported to become expert learners and gain professional expertise in biology. In addition to the General Education courses, the new biology curriculum at Bethune-Cookman University includes: (1) Three-course series on fundamental principles of biology; (2) Four-course series of seminar courses to shape career intentions; (3) Second-year courses for entry into diverse sub-disciplines of biology; (4) Courses for biological research methods, internship in biology and biological research experiences; and (5) Third- and fourth- year courses for developing deep expertise in sub-disciplines of biology. Learning technologies including internet-based intelligent tutoring systems are now integral components of several courses to promote learning behaviors that ensure long-term retention of biological knowledge and the transfer of learning to career settings. Diverse types of faculty collaborations such as interdisciplinary and transdisciplinary collaborations were established and sustained. The Transdisciplinary Data Scholars Development Program (TSDSP) (<https://bit.ly/tdsdp>) was established and implemented with the goal to provide learning experiences that develop participants into professionals who are capable of working effectively with data.

Funder Acknowledgement: National Science Foundation HBCU-UP Award 1435186, 1623371; Department of Education Title III Program at Bethune-Cookman University; National Science Foundation IUSE Award 1626602; National Science Foundation CyberTraining Award 1829717; National Science Foundation REU Site Award 1755561.

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Poster Category: STEM Research

Time Course Human Blood Identification and Human Autosomal DNA Typing from Bed Bugs Fed on Human Female, Male, and Pooled Blood

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Research shows that human DNA can be isolated, amplified and sequenced from *Cimex lectularius* L., the bed bug. Bed bugs (Bb) are important in forensics because once they feed, they remain in the vicinity. The objectives of this study were to establish a time-course human specific blood identification, human specific DNA quantitation and to generate human autosomal DNA profile(s) of a host and/or multiple hosts from a Bb that fed on human blood. Bed bugs were fed on human (female and male, and 1:1; pooled) blood. The insects were sacrificed at post meal feeding (PMF) times of 0, 12, 24, and up to 108 hrs PMF. Rapid Stain Identification results confirmed the identification of human specific Glycophorin A protein, 0 hour being the strongest with 2+, 12 hours 4+, 24 hours 5+, and 48-108 hours showing trace. Human genomic DNA was isolated and was quantified by real time polymerase chain reaction. Female human genomic DNA concentrations ranged from 18.370 to 0.195 ng/Bb at 0 to 108 PBM, male human genomic DNA concentrations ranged from 5.4 to 0.105 ng/Bb, and pooled human female and male blood ranged from 5.49 to 0.135 ng/Bb levels at 0 to 96 hours. Human autosomal STR complete profiles were obtained until 72 hrs PBM for female, male, and pooled human blood. Therefore, this research demonstrates that bed bugs can be used as reliable physical evidence in temporal and spatial predictions to match suspects and/or victims to specific locations in criminal investigations.

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Poster Category: STEM Research

Genomic Comparisons of Endophytic *Periconia* from North American and European Grasslands

Keerthi Mandyam, Alcorn State University

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Plants are associated with a suite of microbial symbioses, with roots offering a unique niche for fungal endophytes. Among root fungal symbionts, dark septate endophytic (DSE) fungi are common, sometimes abundant but enigmatic with poor clarity on their functional roles. Biogeographical distinctions likely exist in DSE communities from forests and grasslands, with North American and European grasslands predominantly represented by *Periconia macrospinoso*. To understand their endophytic roles, the genome of dark septate *P. macrospinoso* and *Cadophora* isolated from *Festuca vaginata* from semi-arid European grassland were sequenced. To further comprehend DSE functional roles, the objective of this study was to compare the North American *P. macrospinoso* genome with that of the European *P. macrospinoso*. *Periconia* was isolated from a stand of Freedom Giant *Miscanthus* cultivated in Lorman, MS and was confirmed to be a DSE. We hypothesized that despite the geographical distinctions and diverse grass hosts, *P. macrospinoso* associated with grasses would have similar functional roles. *Periconia* genome was sequenced using Illumina and PacBio platforms. Our *Periconia* genome was determined to be ~ 53.5 MB in size with 45% GC content. At least 12,059 ORFs with 9,086 ORFs with introns were identified and nearly 35% of the ORFs were assigned functions. As expected, several plant cell wall degrading enzymes (PCWDEs) like cellulases (12 ORFs), amylases (2 ORFs), pectin esterase (1 ORF), tannase (2 ORFs), laccase (6 ORFs) were identified along with several sugar transport systems such as maltose, lactate, sucrose, maltose, xylose isomaltose, palatinose, etc. However, ORFs for lignin peroxidase, manganese peroxidase, glyoxal oxidase were not observed. As hypothesized, the *Periconia* genomes were comparable. *Periconia macrospinoso* genomics data will be discussed to draw big picture inferences regarding DSE symbiosis.

Funder Acknowledgement: NSF HBCU UP RIA to KM; USDA AFRI grant to KM; USDA NIFA Evans Allen grant to AN

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Poster Category: STEM Research

Resource Consumer Relationship along a Gradient of Water Flow

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Co-Author(s): Joel Trexler

Periphyton is an association of autotrophs and saprophytes that is the primary source of energy and elements for many aquatic food webs. Periphyton-mat structure affects consumer access to food elements, also limiting resource transfer from basal to consumer portions of the food web. Few studies evaluate the relationship between environmental gradients and periphyton nutritional quality in wetlands, limiting our capacity to link it to population, and ultimately, ecosystem function. This work describes a field experiment evaluating the impact of increasing water velocity on resource quality and resource-consumer relationships in the Everglades. We created a food-web fragment within enclosures established at three locations experimentally differing in water velocity (0 cm/s, 3-4 cm/s, 5-7 cm/s). The food web consisted of primary producers (periphyton mats and biofilm), a grazer (Ramshorn snail), an omnivorous fish (Eastern Mosquitofish), and a carnivorous fish (Blue-Spotted Sunfish). The resource-consumer relationship across locations was evaluated using nutrient and fatty acid profiles, tools that relate the dietary sources of energy from basal resources to consumers. We found that in periphyton mats the percentages of phosphorous (P) and polyunsaturated fatty acids (PUFA) increased with water flow. In biofilm, P followed the same pattern as that of periphyton mats. Nevertheless, PUFA was highest under mid-velocity conditions. These results will be discussed within the context of the trophic relationship of the components of the food web.

Funder Acknowledgement: National Science Foundation; US Army Corps of Engineers

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Poster Category: STEM Research

Molecular Interactions Driving the CD44-ICD-mediated Signaling Pathway

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Co-Author(s): Jalen Wilcher, Alexa Smith, Wendy Anyon and Karl E. Miletti-Gonzalez, Delaware State University

CD44 is a cell membrane receptor which undergoes a proteolytic cleavage within the cell membrane to produce a 74 residues peptide known as the CD44 intracytoplasmic domain (CD44-ICD). This peptide can be translocated into the nucleus where it has the ability to regulate transcription. This transcriptional regulatory mechanism is not completely understood but published chromatin immunoprecipitation (ChIP) assays data demonstrated that a GFP-tagged CD44-ICD is present in a complex with Runx2 in the MMP-9 gene promoter. We are interested in validating this data but analyzing the wild-type (wt) CD44-ICD peptide. Therefore, we hypothesize that the wt CD44-ICD interacts with Runx2 in the MMP-9 gene promoter. To test this hypothesis, we carried out assays to detect protein-DNA (ChIP) and protein-protein [proximity ligation assays (PLA) and co-immunoprecipitations (co-IP)] interactions. For the ChIP assays, MCF-7/CD44 (CD44 positive) cells were treated with

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formaldehyde (a protein-DNA crosslinker) and with DSG (a protein-protein crosslinker). The ChIP DNA was PCR amplified with primers flanking the CD44-ICD response element (CIRE) in the promoter region of the MMP-9 gene. The PCR amplicon was of the expected 360 bp in size. For the PLAs, MCF-7/vector (CD44 negative) and MCF-7/CD44 cells were grown on chambered slides. An anti-CD44-ICD antibody (Abcam) and an anti-Runx2 antibody (Santa Cruz Biotechnology) were used to generate the PLA data. Unexpectedly, this PLA assay detected the hypothesized wt CD44-ICD/Runx2 interaction in the nucleus as well as in the cytoplasm. For the co-IPs, we used the same set of antibodies as for the PLAs and even though the data is not conclusive, it appears to confirm that the wt CD44-ICD does interact with Runx2. Altogether, these experiments suggest a validation of our hypothesis and point to a set of molecular interactions that drive the CD44-ICD-mediated signaling pathway in the regulation of the MMP-9 gene.

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Poster Category: STEM Research

Yeast Transcriptomics During Bioprocessing: A Powerful Tool in Cellulosic Ethanol Production and Process Optimization

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Yeast, *saccharomyces cerevisiae*, is very critical for ethanol production and its performance determines whether a process is economical or not. At first glance, ethanol production appears simple with dosing of yeast to a sugar rich medium where yeast produces ethanol through a fermentation process. But a closer look reveals a much complex biochemical processes involved in ethanol production. During fermentation, yeast will be growing in a high solid medium in presence of inhibitors such as ethanol and furfurals. Also there will be mass transfer limitations such as depletion of oxygen which creates stress for the yeast. In order to optimize the ideal conditions for the yeast growth and ethanol production, it is critical to understand the yeast behavior at transcriptional level. The present study employed leading cellulosic feedstock miscanthus for ethanol production in a benchtop bioreactor. Samples were collected at 24, 48 and

72h and analyzed for yeast behavior during fermentation. Transcriptional analysis of yeast indicated that yeast behaves differently in different time points. Transcriptional information of important biochemical pathways as influenced by the fermentation conditions will be discussed.

Funder Acknowledgement: The primary author Ananda Nanjundaswamy would like to acknowledge National Science Foundation (NSF) HBCU-UP for funding support.

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Poster Category: STEM Research

The Multidisciplinary Fisk University CREST Center for Biological Signatures and Sensing

Brian Nelms, Fisk University

Co-Author(s): Arnold Burger, Steven Damo, Steven Morgan, and Qingxia Li, Fisk University

Fisk University has established the multidisciplinary CREST Center for Biological Signatures and Sensing (BioSS). The CREST BioSS Center brings together research teams on three different projects around the overarching theme of novel biosensors to address biological testing needs. All three projects, although approached from the disciplines of biology, chemistry, and physics, include expertise from multiple disciplines and incorporate personnel also from mathematics and computer science. Subprojects include in vivo sensing by dopamine neurons (and other neurons) in *C. elegans*, development of a manganese sensor and characterization of the role of manganese in cellular processes, and development of novel radiation sensors for biological applications. In addition to our research impact, integral aspects of this Center include training and professional skills development activities for graduate student trainees in the Fisk-Vanderbilt Masters-to-PhD Bridge Program, postdocs, and undergraduate students at Fisk and a partnering community college, with a goal of engaging students from groups that are underrepresented in research careers, and developing and preparing a diverse workforce and the next generation of scientific leaders.

Funder Acknowledgement: NSF HRD-1547757

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Poster Category: STEM Science and Mathematics Education

Integrating Undergraduate Research to Enhance Academic Curriculum and Faculty Research

Carleitta Paige-Anderson, Virginia Union University

Co-Author(s): Vernon Ruffin, Virginia Union University; Falcon Rankins, PRISSEM Academic Services

Undergraduate research has been identified as a high impact practice, serving as an experiential learning opportunity that

advances students' critical thinking capacities. With support from the National Science Foundation, the Virginia Union University Undergraduate Research Training Program in the Biological Sciences Targeted Infusion Project (NSF Award #1623357) seeks to enhance the biology curriculum by targeting the classroom via course-based undergraduate research experiences (CUREs), bolstering the biology faculty research capacity, and implementing an undergraduate research certificate to improve student competitiveness for graduate/professional schools and/or gainful employment. Herein, we describe the impact of this initiative, specifically highlighting the increase in the number of undergraduate students engaged in research endeavors and the increase in the number of faculty developing formal research programs. Through a multi-pronged approach, we report changes in student perceptions of research and the extent of their individual contributions to scientific knowledge. In addition, we outline strategies for adjusting to institutional and administrative transitions that impact faculty growth and development.

Funder Acknowledgement: NSF HBCU-UP

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Poster Category: STEM Research

Cause and Consequences of MAGE-B2 Gene Expression

Saumya Ramanathan, Fisk University

Co-Author(s): Ashley Colemon and Richala Jackson, Fisk University; Taylor Harris, Washington University, St. Louis

Melanoma Antigen Genes (MAGEs) are a family of tumor-associated genes. MAGE-A, -B and -C genes belong to the Type I MAGE subfamily. They are typically expressed in the male germline and then aberrantly expressed in many cancers and therefore referred to as cancer-testis antigens. Their expression in tumors is often associated with poor patient prognosis. There is a significant gap in understanding the mechanisms that regulate the expression of Type I MAGE genes. While cancers often express more than one MAGE gene, this study focusses on MAGE-B2, an exemplary member of the Type I gene family and a bona fide cancer-testis antigen. We hypothesized that epigenetic mechanisms such as DNA methylation, which regulates the expression of many germline genes, also regulates MAGE-B2 gene expression. Using DNA methyltransferase (DNMT) inhibitors and bioinformatics analysis of MAGE-B2 promoter, we have determined that while CpG methylation does regulate gene expression, remarkably, when "normal" cells are threatened with toxins and DNA damage, they resort to expressing the MAGE-B2. In addition, we show that expressing MAGE-B2 provides non-transformed cells with a proliferative advantage and allows cells to grow in an anchorage-independent manner. Taken together our data indicate that cells use epigenetic memory to express MAGE-B2 resulting in shift of the cell's gene signature to a pro-proliferative, anti-

apoptotic state that firmly places cells in the path to transformation.

Funder Acknowledgement: NSF HBCU-UP Research Initiation Award HRD1764201 to S.R.

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Poster Category: STEM Research

Implementing a Course-based Undergraduate Research Experience (CURE) Focusing on Neurophysiology Research

Vernon Ruffin, Virginia Union University

During the second year of the Virginia Union University (VUU) Undergraduate Research Training Program in the Biological Sciences Target Infusion Project (NSF Award #1623357), the second course-based undergraduate research experience (CURE)-infused course was implemented focusing on the neurophysiology research being conducted by the co-PI, Dr. Vernon A. Ruffin. Undergraduate Biology majors enrolled in two courses were given opportunities to process C57/BL6 mouse brains obtained from collaborating using immunohistochemistry and Western Blot techniques. The CURE-infused section of general biology also employed a comprehensive approach to aid student comprehension of key concepts. Reading was emphasized and regular formative assessment was employed to monitor student progress. A suite of supplemental materials (including PowerPoint lecture slides, videos, and practice questions) were also made available to reinforce concepts introduced in lectures. Students are examined using the standardized test that accompanies the required text. In the laboratory section of the CURE, the co-PI's research involving transmembrane proteins was drawn upon to reinforce neurophysiology concepts from the lecture. CURE students were also required to find and review scientific journal articles on relevant neuropsychology topics. Students summarized the journal articles in a written document and were encouraged to present the journals as part of the STEM Research Journal Club, another initiative of this TIP grant. Students successfully mastered key skills associated with performing the Western blot technique, including weighing chemicals, making solutions, pH calibration, pipetting, and spectrophotometry. In addition, some students learned tissue sectioning and immunohistochemistry. As a result of exposure to authentic research at an early stage in their careers, two students from the General Biology course who originally identified having interests in veterinarian science persisted in research after the semester ended and participated in summer research activities. These students presented posters on their research findings at the 2018 Annual Biomedical Research Conference for Minority Students (ABRCMS). As a result of these efforts and growing student interest in research, the co-PI has been able to establish a functional neurophysiology laboratory at VUU.

Funder Acknowledgement: NSF Award #1623357

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Poster Category: *STEM Science and Mathematics Education*

Student-Led App Development

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Co-Author(s): Haydar Teymourlouei, Kameron Hayman, Fopefoluwas Gbosibo, Foluso Akinlade, Ria Dudley, Brianna Blake, and Timeka Thompson, Lincoln University

We are creating an app for math application problems in biology that is being developed primarily by students with guidance from faculty. While the ultimate goal of the project is to develop a user-friendly app that reflects the student perspective, another goal is to give students experience in approaching a problem that has limited parameters and requires creative and critical thinking on the part of the students. Over the past three years, there has been turn-over in students on the project as they have graduated or left for other reasons. This creates opportunities for new students to gain this experience and offer their insights, but also creates its own challenges. More experienced students have to train the new students, and they have to learn to listen to each other and respect each other's ideas. Initially, students had envisioned this project to be similar to their experiences in classes, where faculty defined the problem and gave them limits and a lot of guidance. Instead, the students were given limited guidance, such as some app content problems and a template for how the problems would appear in the app. The students quickly realized that the app development students would have to work with the app content students, and both would have to work with faculty, including letting faculty know when changes would need to be made to the faculty-driven template. One challenge students are still working through is the different pace of app development versus content creation. Sometimes content is created but not immediately coded or coding difficulties arise, delaying implementation of new content. Initially, the students were frustrated, however they have come to enjoy the challenge of the project and the ability to work with faculty in an atmosphere that is very different from that in a classroom.

Funder Acknowledgement: NSF Award Number 1623208

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Poster Category: *STEM Research*

Genetic Engineering of Cupin Proteins in *Arabidopsis thaliana* for Increased Production of Seed Storage Compounds

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Co-Author(s): Edgar Cahoon, Bagyalakshmi Muthan, and Tawna Heath, West Virginia State University

The majority of sources of food and alternative energy are obtained from plants, especially seeds. The storage compounds in seeds are predominantly carbohydrates, oils (triacylglycerols,

TAGs), and proteins, which are synthesized and stored in specialized tissues during seed development. There is a great need to understand the mechanisms that regulate storage compounds in seeds to make more rapid advances in this field. Our global transcriptomic analysis of the model oilseed plant *Arabidopsis thaliana* has revealed a large number of previously unidentified genes that are involved in primary metabolic nutrient storage pathways. Further, genetic analysis showed that cupin proteins uniquely expressed during plant metabolic developmental stages. We have developed sucrose mutant screening technology for *Arabidopsis cupins*, identified potential 3-5 candidates' genes to study further to understand mechanism of storage compound metabolism in plants. By use of *Agrobacterium*-mediated flower dip, we have generated transgenic *Arabidopsis* plants overexpressing/RNAi cupin proteins. Overexpression of two potential candidate cupins with seed specific promoter in *Arabidopsis* developed larger seed phenotype and increased the total fatty acids and proteins accumulation.

Funder Acknowledgement: National Science Foundation HRD - 1600988.

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Poster Category: *STEM Research*

Biomass Gasification, Pyrolysis, and Fischer Tropsch Synthesis

Abolghasem Shahbazi, North Carolina A&T State University

Biomass gasification and subsequent Fischer–Tropsch (FT) synthesis is a promising pathway to produce renewable, low carbon liquid fuels and chemicals. Biomass gasification in a fluidized bed gasifier involves complicated physicochemical reactions and reactive gas-particle interactions. This project investigates an integrated biomass gasification and FT synthetic process to produce liquid fuels from biomass. Five studies have been conducted, which include (1) experimental determination of physicochemical reactions and structural evolution of biomass particles during gasification; (2) computational fluid dynamics (CFD) modeling of the multiphase reactive gas-particle flow behavior in a biomass fluidized bed gasifier; (3) Dry reforming of methane which converts two greenhouse gases (CH₄ and CO₂) into synthesis gas (CO and H₂); (4) study of Fe-based catalyst for the FT synthesis of liquid fuels from biomass-derived syngas with enriched CO₂ and (5) analysis of a novel chemical looping process for upgrading syngas within a gasification system for the production of high-quality syngas from biomass. Advanced experimental and mathematical modeling techniques are used to generate fundamental knowledge and tools necessary for the development of a biomass-to-liquid fuel refinery based on gasification and FT synthesis. Specifically, experimental techniques including TGA-DSC, Frontier micro-pyrolyzer, elemental analyzer, GC-MS and infrared spectrometry are used to uncover the physicochemical evolution of biomass particles during gasification. Also, a two-

phase theory model in conjunction with detailed kinetics of biomass pyrolysis and gasification was developed to simulate the hydrodynamics of a bubbling fluidized bed gasifier. Effect of heat transfer between bubble and emulsion phase on composition and concentration of different classes of tars is shown at different operating conditions. A mathematical model is developed in Aspen Plus and Gabi 6 to analyze the techno-economics and assess the environmental impacts of the refinery.

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Poster Category: STEM Science and Mathematics Education

Undergraduate Peer Mentoring in STEM

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Co-Author(s): Mark Harvey, John Sapp, Azime Saydam, Bernell-Peltier Glaze, Texas Southern University

This Targeted Infusion Project is aimed at improving the persistence of underrepresented undergraduate students working toward a degree in the science, technology, engineering, and mathematics (STEM) fields incorporating unique STEM-based resources. The program has two components focusing on the subject material containing interesting and important core subject matter within Physics, Chemistry, Biology, and Mathematics. This project will be based on a foundation of active learning practices using trained undergraduate mentors in structured sessions for freshman STEM students using core STEM courses. In addition to peer-mentoring, undergraduates will also be exposed to faculty-mentored research experiences. Apart from a strong foundation in the critical sciences and mathematics subject matter, the translational application and understanding of these concepts via experimentation (e.g., student research internships) will reiterate key fundamentals and generate more interest in the subjects. It is the goal of this proposal that this targeted infusion will improve retention in STEM subjects, increase graduation rates and increase the number of students that go on to graduate school. Student performance will be followed and evaluated as to their GPA, persistence, retention and progression in STEM fields within the three-year time frame of the grant period.

Funder Acknowledgement: NSF-TIP grant 2017-2020

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Poster Category: STEM Research

Direct and Indirect-Heptaplex PCR Marker-Assisted Screening in Food Forensic for Detection of Meat Constituents in Processed Food Products

George Ude, Bowie State University

Co-Author(s): Kayla Adams, Jacquan Hilliard, Olukayode Komolafe, and David Igwe

With many food items being adulterated with other substances, food fraud has become a global issue. Methods of identification of these adulterated products have become important to reduce food fraud and falsification. Therefore, the purpose of this study is to identify seven commonly consumed meats (turkey, chicken, pork, beef, goat, lamb, and duck) within processed meat products as well as to ascertain the degree of adulteration and mislabeling of the meat products. For this study, 46 meat samples were purchased from markets within Prince George's County and Montgomery County. Multiplex method was modified and used to determine the components present within the processed meat samples. First, 7 pure samples of meat (pork, chicken, beef, turkey, goat, lamb, and duck) were used to create standards using a singleplex method. Next, heptaplex polymerase chain reaction (PCR), a modified multiplex method, was used to verify each sample content. Indirect methods (Cetyl trimethylammonium bromide [CTAB] and Dilution and Storage Protocol) were used to extract DNA from each meat sample, while the direct method had no DNA extraction. Both methods utilized PCR and gel electrophoresis. Singleplex PCR was used to verify the specificity of the primers (mitochondrial and nuclear) prior to multiplex. Our developed heptaplex proved to be efficient especially when we used DNA extracted with CTAB and our prepared master mix (cocktail). Food adulteration and falsification were detected to be 10% among the samples. Validation of our findings as well as completion of direct method is in progress. This approach when fully validated will become a useful tool in food industries and any agency for food safety and inspection service.

Funder Acknowledgement: National Science Foundation

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Poster Category: STEM Science and Mathematics Education

Enhancing Foundational Courses in Biology and Chemistry with PLTL and CUREs

Melanie Van Stry, Lane College

Co-Author(s): Aminah Gooch, Candace Jones, Farag Gaber, Diane Sklensky, and Mba Ude, Lane College

Lane College is a historically black college with a strong history of educating underserved minority students. Our overall goal

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for this project is to improve student learning of foundational concepts and retention of first-year students in Biology and Chemistry. We are implementing peer-led team learning strategies and course-based undergraduate research experiences (CUREs) within the General Biology and General Chemistry courses. We are implementing several active-learning strategies within our lecture courses, including online homework through Sapling Learning, reading assignments through Perusall, case-studies, 3D molecular models, puzzles, group projects and games. We are assessing student learning of core concepts in Biology and Chemistry using concept inventories and the American Chemical Society General Chemistry test, respectively. In addition, we have redesigned our laboratory courses to implement inquiry laboratory activities or CUREs, depending on faculty interests. Our strategy utilizes peer-mentors who facilitate peer-led team learning activities within the lecture component of the courses, provide tutoring services, and assist with laboratory instruction. We are assessing student learning outcomes related to understanding the scientific method using the Experimental Design Ability Test (EDAT) and the CURE survey. Interestingly, our preliminary result suggests that students who completed activities focused on experimental design, hypothesis testing, and data analysis during the lecture component of the General Biology I course had higher EDAT scores than students who completed the inquiry labs but had limited exposure to hypothesis testing in lecture. This project is transformative for Lane College, with more faculty using active-learning within their courses and a significant increase in the numbers of students participating in research projects each semester.

Funder Acknowledgement: NSF HBCU-UP TIP HRD#1623340

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Poster Category: STEM Research

Initiative in NanoBioengineering Undergraduate Research and Education for Minority Students (INBUREM)

Komal Vig, Alabama State University

Co-Author(s): Shree R. Singh

Alabama State University (ASU) is operating a HBCU-UP Implementation Project, "Initiative in NanoBioengineering Undergraduate Research and Education for Minority Students (INBUREM)," that is aimed at strengthening the undergraduate curricula, research, recruitment and retention activities in STEM disciplines with emphasis in the area of bioengineering and nanobiotechnology. The program is currently supporting 6 interns working on multidisciplinary projects under the supervision of STEM mentors. The students are provided with "hands-on experience" in nanobiotechnology, bioengineering, biomedical sciences, microbiology and computational sciences along with other enrichment activities. The program will result in new interdisciplinary research collaborations, new interdisciplinary STEM curricula that will strengthen students'

knowledge and analytical skills, and new partnerships with governmental agencies. A leadership team of the STEM faculty members and internal and external advisory committees (consisting of distinguished scientists, administrators and community leaders) are monitoring and reviewing the program outcomes. An external evaluator will conduct an annual evaluation and prepare formative and summative reports about the program. The results of the project will be disseminated widely through conferences, meetings and publications and program website (www.alasu.edu/hbcuup). This project will have a broad impact by engaging ~3,600 university students who will benefit from enhanced curriculum, tutoring, and seminars. This project will advance the mission of the University through its provision of high quality degree programs that increase the participation of individuals from minority groups in higher education.

Funder Acknowledgement: NSF-HBCU-UP

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Poster Category: STEM Research

Mechanisms of Heat-Induced Loss of Plant Resistance to Insects--A Collaborative Effort

Lieceng Zhu, Fayetteville State University

Co-Author(s): JiaZheng (John) Yuan, Jordan Oneal, and Daria Brown; Fayetteville State University; Ming-Shun Chen, USDA-ARS and Kansas State University; Fred Gould, North Carolina State University

This HBCU-UP-NIA project aims to reveal the molecular mechanisms of heat-induced loss of wheat resistance to Hessian fly (HF) using RNA Sequencing (RNA-Seq). The project has been implemented by Fayetteville State University (FSU) in collaboration with Kansas State University (KSU) and North Carolina State University (NCSSU) in research and/or student engagement. In this study, a wheat cultivar 'Molly' containing a resistance gene (R-gene) H13 was infested by an avirulent HF population mainly composed of biotype GP. Molly exhibits an incompatible (resistant) reaction to the avirulent HF population under 'normal' temperature but becomes susceptible under higher temperature. The experiment included four treatments: The control plants growing at 18°C without HF infestation (CK), the plants heat stressed at 35°C for 6 h without infestation (Heat), the HF infested, normal temperature plants (HF_CK), and the HF infested and heat-stressed plants (HF_Heat). Samples for RNA isolation and RNA-Seq analysis were collected from the second leaf sheath sites in wheat seedlings that are typically attacked by the HF. The combined analyses of differential gene expression, gene ontology (GO) enrichment, Kegg pathway enrichment, and MapMan revealed the following: 1) short period of heat stress, alone or in combination with HF infestation, caused dramatic changes in gene expression at feeding site tissues of wheat plants; 2) heat stress makes wheat plants more responsive to Hessian fly infestation in terms of

gene expression; 3) pathways of phenylalanine metabolism, phenylpropanoid biosynthesis, and secondary metabolism may play critical roles in the early responses of wheat resistance to HF; 4) the regulation of HSP20 family protein seems to be associated with the heat-induced loss of wheat resistance, among many other genes. Our results also provide additional evidences to support the importance of 12-Oxo-phytodienoic acid (OPDA) in wheat resistance to HF and the heat-induced loss of wheat resistance. This research is a student-centered project through which four FSU undergraduate students have been trained in research and scientific communication since fall 2017.

Funder Acknowledgement: NSF-HBCU-UP-RIA Program Award #1664409

Chemistry & Chemical Sciences

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Poster Category: STEM Science and Mathematics Education

Infusing Evidence-based Instructional Practices into the STEM Curriculum at Alcorn State University

Sandra Barnes, Alcorn State University, Lorman, MS

Co-Author(s): Yolanda Jones, Voletta Williams, Ping Zhang, and La Toya Hart, Alcorn State University; Heather Boyd, Boyd Research and Evaluation

This poster presents results from implementation of a Targeted Infusion grant based on infusion of evidence-based instructional practices, namely active learning, into STEM courses (General Biology, General Biology Lab, Honors Biology, Honor Biology Lab, Instrumental Methods of Analysis Lab, Physical Chemistry, Introduction to Programming, College Algebra, Statistics, Organic Chemistry II, and Modern Physics) at Alcorn State University. Project goals include development of faculty expertise in active learning instructional practices and implementation of Peer-led Team Learning (PLTL) activities in select STEM courses. The ultimate goal of this project is to produce graduates with deeper understanding of scientific principles and better critical thinking, laboratory, and instrumentation skills, and thus better prepared for the STEM workforce. Based upon student assessment, student feedback, and project evaluation, the goals of the project were achieved.

Funder Acknowledgement: National Science Foundation Award HBCU-UP Targeted Infusion Project HRD 1623230

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Poster Category: STEM Research

Impact of a UCP2 Inhibitor on Amylin in Pancreatic Beta Cells

Tameka Clemons, Spelman College

Uncoupling protein 2 (UCP2) has been shown to be present on pancreatic alpha and beta cells. A function of UCP2 on pancreatic beta cells is to serve as a protector, which has been demonstrated by increasing UCP2 and seeing a decrease in cytokine-induced production of ROS in pancreatic beta cells. Pancreatic beta-cells are well known for insulin secretion. However, amylin is co-secreted alongside insulin and is responsible for sending satiety signals to the brain. The role of amylin in metabolism is suggested to be significant because of its ability to contribute to glucose homeostasis. Likewise, UCP2 contributes to metabolism traditionally by impacting ATP release during cellular respiration. However, a new role for UCP2 that is specific to cell signaling on pancreatic beta cells may involve UCP2 influencing amylin's function. The objective of this study is to analyze the relationship between UCP2 and amylin. This analysis includes employing methods such as ELISA in order to analyze the activity levels of amylin, as well as Western blot analysis in order to understand if UCP2 influences change in amylin protein expression. An understanding of the activity level and protein expression level of amylin when UCP2 has been inhibited will elucidate whether the two proteins communicate with one another. The experiments conducted center around the hypothesis that inhibiting UCP2 increases the activity level and protein expression level of amylin. The studies were conducted in pancreatic beta cells stimulated with either 11mM or 30 mM glucose and compared to control.

Funder Acknowledgement: National Science Foundation

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Poster Category: STEM Research

Widening the STEM Pipeline through CREST-Funded Research and Mentoring

Kimberley Cousins, California State University, San Bernardino

Co-Author(s): Sara Callori, California State University San Bernardino

During the past five years, over 200 community college and four-year institution undergraduate students have participated in CREST-sponsored research experiences at multiple sites: CSUSB, UNL, UB, and two local community colleges (CC). In addition, five graduate students, 25 high school students, 2 high school teachers, and 4 community college faculty members have undertaken research at CSUSB. One new faculty member joined the five original members at CSUSB; she was attracted to campus, in part, by research and collaboration opportunities

afforded by CREST. By involving participants from a wide range of institutions and levels of experience, the CSUSB CREST collaboration has taken steps to widen the STEM pipeline at multiple stages. The high school through undergraduate (starting at either community college or at CSUSB) pipeline has been enhanced for largely minority, low income, first generation students, with some students entering CSUSB from our high school and CC partners. Application and matriculation at graduate school, largely Ph.D. programs, has been nearly 50% among CREST graduates, with several applying to and/or attending our partner institutions. Visiting graduate students from UNL and UB have strengthened our research collaborations, while providing unique training opportunities for the visiting students, including mentored teaching and undergraduate research advising in an HSI/MSI. Our newest faculty member was given access to existing partnerships and resources, enabling her to contribute quickly to Center goals, while strengthening her own professional portfolio. Overall, participants at all levels have benefitted from internal and external collaborations, which have worked in concert to maximize professional and educational opportunities.

Funder Acknowledgement: NSF CREST, HRD 1345163 (PI Usher)

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Poster Category: STEM Research

Development of Carbon-Carbon Bond Formation Reactions in N, S – Heterocycles Synthesis

Fenghai Guo, Winston Salem State University

Co-Author(s): Dynasty Parker, Shekinah Bass, and Tania Bellinger, Winston Salem State University

Carbon-carbon bond formation reactions are important in that they provide key steps in building complex, bioactive molecules from simple starting materials. Conjugate addition reaction is one of the most reliable carbon-carbon bond forming strategies. Conjugate addition reactions of N, S containing Michael acceptors with Organometallic reagents catalyzed by Copper salts, Zinc (II) salts are investigated in the synthesis of N-containing heterocycles, organosulfur compounds with rich bioactivities. Excellent yields of 1,4-adducts can be isolated (> 90%). The use of commercially available or easily prepared organometallic reagents will expedite the synthesis of a large library of these N-containing heterocycles, organosulfur compounds for further synthetic applications and biological studies.

Funder Acknowledgement: NSF HBCU-UP RIA (no. 1600987).

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Poster Category: STEM Research

Interdisciplinary Nanotoxicity Center

Jerzy Leszczynski, Jackson State University

Among the leading challenge of the 21st century are the environmental effects of chemical compounds. Notably, applications and production of nano-scale materials have exploded in the past 50 years. Currently there are at least 1400 commercial products based on nanomaterials. Understanding of structures, characteristics, and biological activities of man-made nanomaterials is critical to prediction of their impacts on the environment and human health. Nanoparticle exposure is common, but short- and long-term exposure effects are currently not fully understood, especially since the primary and agglomerate sizes, surface area, and the characteristics of the surface play such important roles. Conversely, nanotechnology can also be used to create new nanomedicines, sensors, pollutant filters, and nanocatalysts with important societal benefits. There is a compelling need of studying potential toxicity of nanomaterials and advancing efficient, fast and inexpensive computational approaches able to predict toxicity of new species before their industrial applications. The collaborative activities of the Nanotoxicity Center's faculty, staff and students focus on investigation of structures and properties of various nanomaterials, study of their potential applications and evaluation of their toxicity. This is accomplished by development of prominent interactions among experimental and computational groups and execution of joined research that would not be possible without the Center's organization. The Center's activities are essential to support safety advance of nanotechnology by providing tools for evaluation of toxicity of new nanomaterials before their commercial applications. The students supported by the Center are involved in training which combines the state-of-the-art experimental and computational techniques applied to nanomaterials. The educational and research activities are strengthened by interaction with the Jackson, MS K-12 school system, the NSF Center for Chemical Evolution at Georgia Tech and various international groups. The Center is a leader in the area of prediction of toxicity of nanomaterials and one of the largest producer of African-American chemistry Ph.D. graduates in the nation. The Center combines research and educational activities with well-designed outreach initiatives. There are two annual conference series that have been initiated and executed. For the last twenty-five years we have been organizing and securing funding for a series of Conferences on Current Trends in Computational Chemistry (CTCC). This is supplemented by the 18th Southern School on Chemistry and Engineering (SSC&E) Conference.

Funder Acknowledgement: National Science Foundation

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*Poster Category: STEM Science and Mathematics Education***Building Quantitative and Computational Life Sciences at Fisk University****Lee Limbird, Fisk University**

Co-Author(s): Sajid Hussain, Brian Nelms, Princilla Evans Morris, Fisk University; Patricia Campbell, Campbell-Kibler; Tam'ra Ray Francis, University of Washington

Fisk University, based on outcomes of our Phase I Implementation Award and faculty-initiated curricular and pedagogical innovations, has strategically designated achieving confidence and competence in QCLS (Quantitative and Computational Life Sciences) (broadly defined) as the focus of our Phase II Implementation Project. This selection is based both on expectations for competencies in computational thinking and skills application for college graduates in the 21st Century as well as national initiatives for enhancing undergraduate education in the biological sciences (e.g. Vision and Change 2010 and 2015 follow-up) to reflect the large data interrogation that is now part of life sciences discovery. Three interdependent strategies are underway: 1) Faculty Development will be achieved via a Community of Practice where Fisk faculty learn reciprocally from one another, with life sciences faculty learning quantitative/modeling and computational skills from Fisk colleagues, and – reciprocally- faculty in mathematics and computer science are schooled in contemporary problems in Life Sciences to incorporate into math and CS courses. Dr. Patricia Campbell, PI for the aligned research project, will test the hypothesis that a modified, reciprocally based interdisciplinary Community of Practice, will serve to increase application of computational/quantitative projects and assignments within life science courses, and contemporary life science problems into math and CS courses, as well as to increase interdisciplinary research productivity at Fisk University. 2) Student confidence and competence in QCLS will include the launch of a new Technology Literacy course, including introduction to programming in Python, to be taken in one of the students' first two semesters at Fisk. Faculty will then incrementally incorporate QCLS problems, projects, and course-associated research in subsequent targeted courses within all STEM majors. Students also will participate in interdisciplinary research during the academic year and summers related to QCLS. 3) Student academic performance and persistence in STEM will be enhanced by inclusion of supplementary instruction in the new Technology Literacy course, while continuing this pedagogical academic support system in other STEM gatekeeper courses. Progress to date and program details will be shared as part of the poster presentation.

Funder Acknowledgement: NSF HRD HBCU-UP Implementation Award

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*Poster Category: STEM Research***Unusual DNA G4/C4 Ligands: A Comparative Study on a Flavonol Morin and Banana Peel Extract with Nicotine****Bidisha Sengupta, Tougaloo College**

Co-Author(s): Enleyona Weir

Quadruplex (G4/C4) forming sequences in telomeric DNA and promoter regions of oncogenes are associated with tumorigenesis. Stabilizing these unusual tetraplex structures in DNA can prevent tumor cell proliferation, which have been regarded as potential pathways for cancer therapy. In our previous studies we have proved plant flavonols as useful G4/C4 binders. In the present study, we have prepared an isopropanol extract from banana peel (BE) and performed a comparative study on the binding of BE and a flavonol morin with G4/C4 using steady state absorption, fluorescence, circular dichroism and size exclusion chromatography (SEC) measurements. Two complementary G4 and C4 single stranded oligonucleotide along with the duplex (made by hybridizing the G4/C4) were used. We noticed that in C18 HPLC the retention time of BE and morin are the same, indicating similar sizes of the two. BE shows significant solvent dipolar relaxation when studied in solvents of different polarity. BE also exhibits excited state intra-molecular proton transfer (ESPT) similar to common flavonol-like fisetin. We extended our studies on G4/C4 in the presence of nicotine (NIC), which is a potent oxidative stress inducer. BE and morin exhibited different characteristics in the presence of NIC. We observed BE as a better extrinsic probe than morin. Dynamic light scattering (DLS) studies determined the size of DNA molecules in bound and free states. Further studies using NMR and FTIR are underway.

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*Poster Category: STEM Research***Microwave Synthesis of Novel Imidazole Compounds to Understand Cellular Repair****Jacqueline Smith, Bowie State University**

Co-Author(s): Brenda Tankeu and Marissa Savory, Bowie State University

There are many biological processes on which the scientific community is still working to fully understand. Due to their stability, reversibility and selectivity, small molecules can be used to understand how specific proteins play a role in cellular pathways. The cell has many adaptive mechanisms used for the

cellular repair during endoplasmic reticulum (ER) stress. If proteostasis is not re-established, unfolded proteins are tagged for clearance through the ubiquitin-proteasome system (UPS). Aberrant cells have been shown to exploit these prosurvival mechanisms as a way to circumvent cell death. However, proteasome disruption leads to cell death. Valosin-containing protein (VCP) is a key component of the UPS which can be targeted to investigate its role in proteostasis. Small molecule heterocycles such as imidazoles have the potential to allosterically bind to VCP to disrupt the UPS in rogue cells. We propose a two-step synthesis of a library of novel imidazole compounds through microwave-assisted multicomponent reactions. Using microwave energy, this method will allow a variety of imidazole compounds to be rapidly synthesized. Ultimately these compounds will be used to identify the structural features which are key for allosteric binding to VCP. Understanding how these small molecules affect proteins involved in cellular stress and repair can help scientists understand and control cell death.

Funder Acknowledgement: National Science Foundation Award #1800165

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Poster Category: STEM Research

Preparation and Characterization of Nanocomposites Incorporating Lignin-Coated Cellulose Nanocrystals in Polypropylene and High-Density Polyethylene

Kennedi Trice, Clark Atlanta University

Co-Author(s): Sade Rhodes and Eric Mintz, Clark Atlanta University

We have prepared nanocomposites by the incorporation of lignin-coated nanocellulose (L-CNCs) in Polypropylene (PP) and High-Density Polyethylene (HDPE) via high torque melt mixing to determine the thermal properties of these new nanocomposites. We hypothesized that the incorporation of L-CNCs would serve to reinforce the polymer matrix, thus increasing the thermomechanical properties of the nanocomposite relative to neat polymers, with the lignin serving as an interface between the CNCs and the polyolefin. L-CNCs were incorporated into polypropylene at 0, 0.5, 1, 2 and 5% weight percent loading. DSC, DMA, and TGA were used to characterize the thermomechanical properties of these nanocomposites.

Funder Acknowledgement: NSF HRD 1818682

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Poster Category: STEM Research

New Electrochemical Reaction and Selective Adsorption on the Ionic Liquid-electric Interface

Zhe Wang, Xavier University of Louisiana

Co-Author(s): Kevin Riley, Xavier University of Louisiana

Accomplishing highly selective and efficient electrochemical CO₂ reduction is essential for a sustainable utilization of fossil energy resources. Here, we report ultra-fast CO₂ reduction in ionic liquids (ILs) performed in aerobic environments. CO₂ reduction to CO is observed at a very low over-potentials, namely, >90% faradic efficiency and near 100% carbon selectivity. In the present article, we show that this general approach can be conducted on three conventional electrodes (Pt, Au and carbon). The reduction process is initiated by an electrochemical generation of superoxide radicals (O₂⁻) and followed by an efficient CO₂ activation through N-heterocyclic carbene (NHC) CO₂ adducts in 1-Butyl-3-methylimidazolium bis (trifluoromethylsulfonyl) imide (BmimNTf₂) IL. The observed experimental results, supported by a first principle computational modeling, suggest an ECE mechanism where O₂⁻ superoxide efficiently transforms Bmim cations into NHC structures and activates CO₂ into NHC-CO₂. This work offers a green approach for CO₂ reduction under simple conditions, with potential applications in a broad range of platforms, catalytic systems, and biological processes involving O₂.

Funder Acknowledgement: NSF HRD-1700429; NSF CHE-1832167

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Poster Category: STEM Research

High Resolution Electronic Spectroscopy of N-Methylcarbazole in the Gas Phase

John Yi, Winston Salem State University

Co-Author(s): Leonardo Alvarez-Valtierra, University of Guanajuato, Mexico; David F. Plusquellic, National Institute of Standards and Technology, Boulder; David W. Pratt, University of Vermont

Rotationally resolved fluorescence excitation spectra of N-Methylcarbazole (NMC) has been obtained using a CW laser/molecular beam spectrometer. The band exhibits perturbation originating from the coupling of the hindered torsional motion of the methyl group and the rotation of the entire molecule. The derived values of the rotational parameters show that NMC itself has a planar heavy-atom structure with a methyl group in both electronic states. From analysis of the torsional bands obtained, several remarkable issues were found and the torsional barrier heights were calculated. For instance, the values of this type (V₆, six-fold) of torsional energy barrier

depend significantly on the position of the methyl group with respect to the chromophore and the barriers decrease from ground to excited electronic states. The molecule also exhibits structural changes when the molecule absorbs light, owing to photon-induced changes in the electronic distribution of the molecule. The orientations of the S1-S0 transition moment is parallel to the b-inertial axis and coincident with the methyl group. A detailed discussion of the relevant effects derived from our findings will be provided.

Funder Acknowledgement: Work supported by NSF HBCU RIA-1505311

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Poster Category: STEM Research

Synthesis of Copper Doped Melanin-like Nanoparticles for Imaging Guided Photothermal Therapy

Yongfeng Zhao, Jackson State University

Co-Author(s): Devin M. Guillory and Pohlee Cheah, Jackson State University; Abhishek Sethi, Gyu Seong Heo, and Yongjian Liu, Washington University

Imaging guided therapy integrates imaging tools with therapy to provide substantial benefit for treatment of a disease such as cancer. Imaging can evaluate the disease before therapy and monitor the prognosis of the treatment. Under the guidance of the imaging information, therapeutical strategies will be optimized. The toxicity of the therapy will be further reduced. Imaging guided therapy can improve the efficacy and reduce side effects. Photothermal therapy is a new noninvasive treatment technique, which employs light absorbers to convert light energy into heat. In the past two decades, intensive studies have been done to develop nanoparticles for photothermal effect. The majority of these materials are inorganic nanomaterials. These effective systems include gold nanorods, gold nanoshells, gold nanocage, gold tripods, graphene oxide, and CuS nanoparticles. Although they have been demonstrated to be very efficient in various animal studies, they are usually not biodegradable. They tend to remain in the body for a long period of time and cannot be excreted from biological systems. This situation raises the concerns of potential long-term toxicity which hampers future application. In the search for a biocompatible platform with photothermal properties, melanin-like nanoparticles have caught great interests. Melanin-like nanoparticles have been used as photothermal agents because they can efficiently convert light energy to heat. Among different imaging modalities, positron emission tomography (PET) has emerged as one of the most frequently used techniques for early stage diagnosis and staging of cancer and other diseases. PET uses positron emitting radiotracers to attain an image. The advantage is very high sensitivity (up to 10-12 mol/L). PET is non-invasive, highly sensitive nature, and high patient compliance. In this study, biodegradable melanin-like

nanoparticles with different sizes were prepared and studied for PET imaging guided photothermal therapy for the first time to the best of our knowledge. The nanoparticles were PEGylated to improve the stability. Then the nanoparticles were chelated with copper ion and showed highly colloidal stability. In vitro photothermal study show that the particles have high photo-heat conversion effect.

Funder Acknowledgement: This work was supported by the National Science Foundation under Award No. HRD-1700390.

Computer Sciences & Information Management

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Poster Category: STEM Research

Deep Learning for Named Entity Recognition on Electronic Medical Record

Shanta Chowdhury, Prairie View A&M University

Co-Author(s): Xiangfang Li and Lijun Qian, Prairie View A&M University

Electronic Medical Record (EMR) is a digital version of storing patients' medical history in textual format. It has shaped medical domain in such a promising way that it can gather all information into one place for physicians and patients. In order to handle these overwhelming EMR data, Named Entity Recognition (NER) is aimed at retrieving the entity terms which are related to disease, test, symptom, genes, terms, etc. Such type of information extraction can be a relief for providers and medical specialists to extract information automatically by avoiding unnecessary and unrelated information in EMR. However, challenges like incomplete syntax, numerous abbreviations, make the recognition task very difficult. In this research project, novel deep learning methods are explored to address these challenges. Specifically, a multitask bi-directional recurrent neural network model is proposed for NER and the results show that it outperforms the state-of-the-art. The proposed model will be improved further by using a joint loss function and joint optimizer to reduce the training time and increase the prediction accuracy.

Funder Acknowledgement: NSF

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Poster Category: STEM Science and Mathematics Education

Integrating Big Data and Cloud Computing Topics at Upper Level CS Courses

Debzani Deb, Winston-Salem State University

Big data and cloud computing collectively offer a paradigm shift in the way businesses are now acquiring, using and managing information technology. This creates the need for every CS student to be equipped with foundation knowledge in this collective paradigm and to possess some hands-on-experience in deploying and managing big data applications in the cloud. We argue that, for substantial coverage of big data and cloud computing concepts and skills, the relevant topics need to be integrated into multiple core courses of undergraduate CS curriculum rather than creating additional standalone core or elective courses. Our approach to including these topics is to develop learning modules for specific core courses in which their coverage might find an appropriate context. In this poster, three such modules are presented and our classroom experiences during these interventions are documented. Our objective is to share our experience and to receive feedback about our approach.

Funder Acknowledgement: This research was supported by National Science Foundation Award # 1600864.

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Poster Category: STEM Science and Mathematics Education

Increasing Student Engagement in STEM Courses through Gamification

Darina Dicheva, Winston Salem State University

Co-Author(s): Keith Irwin, Christo Dichev, and Xiuping Tao, Elva Jones, Winston Salem State University

Gamification – the use of game design elements in non-game contexts – increasingly attracts the interest of educators due to its promise to foster motivation and behavioral changes in learning contexts. However, a major obstacle that instructors face is the lack of software that could be used to support course gamification. To address this problem we implemented an educational gamification platform, OneUp Learning, which is aimed at facilitating the gamification of academic courses and fostering experimental research on gamifying learning. The platform enables instructors to define course activities and create exercise problems for practicing and self-assessment, as well as tests or quizzes for testing particular skills. Moreover, it enables gamifying these practice activities. It is highly configurable and supports tailoring gamification features to meet the vision of the instructor. In particular, it supports the choice of game elements to be used along with specifying

gaming rules for them. OneUp currently offers the following game elements: points (challenge points, skill points, and activity points), progress bar, virtual currency, badges, leaderboards, skill boards, learning dashboard and avatars. The gaming rules define the conditions upon which certain game elements are awarded. In this poster we describe OneUp by presenting its principles, architecture and the results of an initial evaluation. Special attention is given to the gamification configuration, learning analytics and visualization modules of the platform. The configuration module provides support for the instructors to select and configure the game elements they want to incorporate in the organization of a specific course. The visualization module displays the results of the learning analytics which summarize the class and individual learners' performance, progress and achievements. The aggregated information informs the instructors about all aspects of the student use of the platform thus allowing them to efficiently manage and adjust the instructional process. The platform gives the instructors flexibility and freedom to choose how to apply gamification to their courses which is essential for an appropriate and effective use of this promising intervention for improving student motivation and engagement in the learning process. The poster also presents the results of a case study of using OneUp to gamify a Data Structures course.

Funder Acknowledgement: NSF HBCU-UP TIP #1623236

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Poster Category: STEM Research

Enhanced Energy-Aware Standby-Sparing Techniques for Fixed-Priority Hard Real-Time Systems

Linwei Niu, West Virginia State University

Co-Author(s): Jonathan Musselwhite, West Virginia State University; Wei Li, California State University Bakersfield

For real-time computing systems, energy efficiency and reliability are two primary design concerns. In this research work, we study the problem of enhanced energy-aware standby - sparing for fixed-priority (FP) hard real-time systems under reliability requirement. The standby-sparing system adopts a primary processor and a spare processor to provide fault tolerance for both permanent and transient faults. In order to keep the energy consumption for such kind of systems under control, we explore enhanced fixed-priority scheduling schemes to minimize the overlapped concurrent executions of the workloads on the primary processor and on the spare processor, enabling energy savings. Moreover, efficient online scheduling techniques are under development to boost the energy savings during run-time while preserving the system reliability.

Funder Acknowledgement: National Science Foundation.

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Poster Category: STEM Research

Towards a SMART Grid

Enrico Pontelli, New Mexico State University

Co-Author(s): Satish Ranade, New Mexico State University

The proposed poster will explore the current research directions pursued by the iCREDITS CREST Center. The research project has embraced the vision of developing the future infrastructure of energy delivery and management as a SMART grid (Sustainably, Modular, Adaptable, Resilient and Transactional). The vision builds on the idea of viewing a grid as a network of networks, each centered on a distribution feeder (i.e., distribution feeder microgrids). The research integrates strands focused on secure communication, stochastic modeling, and data-driven decision making.

Funder Acknowledgement: NSF CREST

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Poster Category: STEM Research

Identify Blockchain Authentication Vulnerabilities

Haydar Teymourlouei, Bowie State University

Co-Author(s): Jordan Philp

Blockchain is being compared to the internet because of the potential it has to change current and past business structures. Blockchain technology is a decentralized network that run on a consensus-based protocol to make trusted decisions. Blockchain eliminates third party entities from making any type of validation on a network or business. Our focus is on identifying vulnerabilities in the Blockchain wallet. We propose a new two-step authentication method to eliminate session hijacking and implement a new Random Number Pin Method.

Funder Acknowledgement: National Science Foundation Research Experiences for Undergraduates in Cybersecurity

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Poster Category: STEM Research

Cyber Threat Intelligence Discovery in the Dark Net

Azene Zenebe, Bowie State University

Co-Author(s): Andrei Carillo and Mufaro Shumba

In the dark net, many hackers are always sharing information and learning from each other in forum posts. Manual analysis of the data on these fora may be hard for a human to do because these forum posts are big data. Using the forum dataset

provided by the University of Arizona, we explored the existence of intelligence related to valuable cyber threats. We used the decision tree and random forest machine learning algorithms to classify exploit types. We found that analyzing dark net forum posts provides intelligence that could contribute to defending the cyberspace.

Funder Acknowledgement: National Science Foundation Research Experiences for Undergraduates in Cybersecurity

Ecology, Environmental & Earth Sciences

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Poster Category: STEM Research

Effects of Acidification on the Neurosensory Biology of Red Drum (*Sciaenops ocellatus*)

Andrij Horodysky, Hampton University

Co-Author(s): Richard W. Brill, Virginia Institute of Marine Science; Sierra Williams-McLeod, Hampton University; Caroline Turner, James Madison University

The rapid uptake of carbon dioxide (CO₂) by the world's oceans since the Industrial Revolution is causing a rapid decline in ocean pH. There is thus an exigent need to explore the mechanisms at the organism-environment interface through which fish respond to ocean acidification. The OANeuro Project therefore used the auditory brainstem response technique and morphological analyses to examine the effects of projected CO₂ concentrations over the next two centuries on the form and function of the red drum (*Sciaenops ocellatus*) auditory system. This project examined the effects of both acute (two-week) and chronic (eight week) aqueous CO₂ exposure on the: (1) morphological development of otoliths, (2) ecophysiological performance of the auditory system, and (c) capability of a GABAA receptor antagonist to alter potential sensory deficits during acute and chronic acidification. Both acute and chronic exposures to CO₂ conditions projected over the next two centuries significantly increased auditory threshold, reducing response to low intensity sounds at the specific frequencies red drum use to communicate. For acute exposures, intramuscular administration of gabazine (4 ug g⁻¹) restored some, but not all, auditory function to levels demonstrated by red drum subjected to current CO₂ conditions. By contrast, gabazine administration was ineffective at restoring auditory function in chronically exposed red drum due to increased otolith dysmorphia, mass, and asymmetry relative to fish exposed to current CO₂ levels. Collectively, these results demonstrate that acute exposure to CO₂ causes significant but reversible neurotransmitter disruption, chronic exposures cause morphological changes to sensory endorgans and disruptions to auditory function that

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cannot be compensated by neurotransmitter function, with implications for communication and reproductive signaling in this soniferous coastal species.

Funder Acknowledgement: NSF-HBCU-UP-RIA

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Poster Category: STEM Research

Responses of Terrestrial Ecosystems to Global Change and Human Activities

Dafeng Hui, Tennessee State University

Co-Author(s): Dilovan Yahya, Fady Ajaboy, Adrian Harris, Dalal Almotir, Chih-Li Yu, Qi Deng, Hashim Alsadah

The Global Change and Ecosystem Ecology (GCEE) Lab at Tennessee State University is devoted to advance our knowledge and provide student research skills training in Ecology and Environmental Sciences. The major research interests are in the areas of Plant Ecology, Ecosystem Ecology, Agro-Ecology, and Biogeochemical Cycling. In this poster, three research projects are presented: 1) effects of precipitation changes on switchgrass productivity and greenhouse gas CO₂ emission; 2) the effects of agricultural practices on crop production and greenhouse gas emissions; and 3) impacts of global change and human activities on phosphorus cycling. Our research is supported by the NSF and USDA.

Funder Acknowledgement: National Science Foundation; United States Department of Agriculture

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Poster Category: STEM Research

Analysis of Front Detection Methods to Identify Gulf Stream Front Crossings from in-situ Acoustic Mooring Methods

Amanda Kaltenberg, Savannah State University

The dynamic Gulf Stream current dominates the physical oceanography of the South and Mid-Atlantic Bight regions of the US East Coast shelf and slope regions. The objective of this project was to develop and compare multiple methods of front detection algorithms for determining hydrographic fronts of the Gulf Stream as it passes over a stationary shelf point. A bio-physical mooring equipped with temperature, conductivity, depth sensors and current velocity profilers was deployed in the Gulf Stream from 2016-2017. Multiple front detection algorithms were developed using temporal changes in hydrographic properties and current velocities, as well as surface temperature derived from AVHRR satellite. These fronts indicated when the edge of the Gulf Stream current passed over the mooring location and times likely to have an impact on the abundance and distribution of mesopelagic scattering layers,

which were also measured with a Simrad WBAT echosounder. Results show numerous front crossings were recorded over the year-long deployment impacting the mesopelagic prey community.

Funder Acknowledgement: This project was funded by NSF HBCU-UP RIA (Award #1600969).

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Poster Category: STEM Research

CREST Center for Aquatic Chemistry and Environment (CREST CACHe)

Rita Teutonico, Florida International University

Co-Author(s): Todd Crowl, Piero Gardinali, and Scott Graham, Florida International University

The NSF CREST Center of Excellence for Aquatic Chemistry and Environment (CREST CACHe) at Florida International University (FIU) tackles one of the nation's most complex challenges: environmental contamination. The Center's research mission is to address the sources, transport, transformation and ecosystem responses to contaminants, pollutants and other natural stressors, under changing land-use and environmental conditions. CREST CACHe integrates faculty and students from over 10 departments and 4 colleges – including Biology, Chemistry, Computer Science, Public Health, Engineering and Architecture – to provide students with valuable experience in interdisciplinary research and professional skills for multiple STEM career pathways. Our campus-wide, collaborative research approach has led to exciting cross-disciplinary collaborations. In particular, CREST CACHe students are developing innovative solutions to environmental contamination by designing low-cost sensor components that can be assembled and programmed through robotics and digital fabrication. A primary goal of this work is to develop affordable sensor technology with custom-designed housings that can suit a range of environmental conditions and locations. These components augment the CREST CACHe capabilities provided by 3 state-of-the-art research buoys, specially-designed to be deployed in both shallow freshwater ecosystems and near-shore marine environments. Each buoy features an array of high-tech sensors that measure water quality and flow, with data collected at up to 5-minute intervals and automatically transmitted via cellular uplink every 15 minutes – making the data available to researchers and the general public (view data). With this and other data synthesized through the CREST CACHe database, our research teams can assess the effects of contaminants on South Florida's aquatic ecosystems and provide the science needed to inform stakeholders' decisions. In addition to the research components, CREST CACHe Discovery courses were developed to expose early career undergraduate students to STEM concepts and pique their interest in related research and future careers.

These courses have grown in popularity over the past two years: Discovery 1, which provides first-hand experience to students interested in research, has been completed by 52 students over 3 semesters; and 28 students have taken part in 2 semesters of Discovery 2, which prepares students for graduate school and STEM careers.

Funder Acknowledgement: National Science Foundation

Mathematics & Statistics

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Poster Category: STEM Science and Mathematics Education

Recruitment, Retention, and Completion of Underrepresented Minorities in STEM Career Pathways

Calvin Briggs, Lawson State Community College

Co-Author(s): Bruce Crawford, Lawson State Community College

Lawson State Community College (LSCC) currently houses several federal grants under its Center for Excellence in STEM, supporting recruitment, retention, and completion. This presentation will focus on the Pathways into Science, Technology, Engineering, and Mathematics, Enrichment, Engagement, Empowerment (Pi STEM E3) Program and Georgia-Alabama Louis Stokes Alliance for Minority Participation (GA-AL LSAMP) Program, funded by the National Science Foundation's Historically Black Colleges and Universities – Undergraduate Program. Both programs are designed to create pathways into professional careers in science, technology, engineering, and mathematics (STEM). Over a span of 10 years these grants have impacted nearly 1,400 middle, high school, and undergraduate students. This presentation will share recruitment, retention, completion, and programmatic data. The Pi STEM E3 and GA-AL LSAMP Programs are comprised of awareness activities, field experiences, service learning, teaching and learning through problem-based learning concepts. These activities have given students, teachers, and educational partners the opportunities to capitalize on their roles in the development of STEM career pathways. Additionally, faculty involvement in the partnership has increased their academic, technical performance, and knowledge of STEM careers. The projects are funded by the National Science Foundation, Lawson State Community College, educational partners, and business/industry. The three primary goals identified are: 1) establish a cross-curricular mentoring program with an emphasis on improving STEM persistence and efficacy in STEM courses; 2) provide STEM enrichment and academic enhancement programs for middle school, high school and undergraduate students; 3) establish the STEM Bridge Pathways to College Project and learning community.

Funder Acknowledgement: National Science Foundation: HBCU-UP Program and the Louis Stokes Alliance for Minority Participation.

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Poster Category: STEM Research

Fast Poroelastic Solvers based on FreeFEM++

Mingchao Cai, Morgan State University

Co-Author(s): Lemech Barnes, Morgan State University

We demonstrate how to use FreeFEM++, an open source software, to solve poroelastic models. Finite element discretization is adopted. We apply domain decomposition methods, which are integrated with FreeFEM++, to solve the equations. In the poster, we will show the mathematical models, the domain decomposition methods, the parallel implementation in FreeFEM++, and the numerical results.

Funder Acknowledgement: NSF-HBCU-UP RIA HRD1700328, NSF-HBCU-UP EIR DMS1831950.

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Poster Category: STEM Research

Numerical Solution of Gardner Equation by Modified Exponential Time Differencing Method

Abhinandan Chowdhury, Savannah State University

Co-Author(s): Leo Degon, Savannah State University

In this work, we seek the numerical solution of the Gardner equation (combined KdV–mKdV equation) which studies various areas of physics including plasma physics, fluid dynamics, quantum field theory, solid state physics and others. We aim to solve some initial boundary value problems constructed for the Gardner equation by the modified exponential time differencing method proposed by kassam and Trefethen. The test problems are derived from some analytical studies to validate the efficiency and accuracy of the suggested method. Accuracy of the employed numerical scheme for this class of equations is assessed in terms of global relative error and L_∞ error norms. Numerical experiments demonstrate the accuracy and robustness of the method which can be further used for solving other nonlinear problems.

Funder Acknowledgement: NSF-HBCU-UP: Catalyst Project 1-800798

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Poster Category: STEM Science and Mathematics Education

Cyber-Infused Mathematics Initiative: Mathematics Teaching Institute Year 3

Nicola Edwards, Delaware State University

Co-Author(s): Delayne Johnson and Sharon Smith, Delaware State University

Problem-based learning (PBL) helps teachers improve their teaching practices based on the act of reflection and the use of active learning modules. It also supports student development of mathematical content knowledge with emphasis on conceptual understanding. Many of our incoming college students are underprepared to be successful in college-level mathematics courses and often are placed (53%) in remedial courses. Those that do place in introductory college-level courses struggle to grasp the course content. To help address students' college-level readiness in mathematics, instructors participated in two rounds of a one-week summer professional development workshop, the Mathematics Teaching Institute (MTI). The purpose of MTI is to train teachers to better support student learning in an active learning environment. Instructors benefit from MTI because it engages them in developing and implementing alternative teaching practices that encourage the learner to develop their own reasoning skills, rather than solely relying on the reasoning of the instructor. The goal of MTI is to 1) expose instructors to alternative teaching practices that encourage students to become critical thinkers, 2) help instructors create PBL tasks that improve the quality and level of the cognitive demand for student engagement, and 3) encourage interdisciplinary collaboration among STEM instructors to produce STEM rich problems. This year, instructors implemented the PBL activities in all sections of College Algebra, and Trigonometry. They also designed some activities for Calculus I during MTI 2018 to be implemented in Spring 2019. Instructors for College Algebra and Trigonometry participated in the Professional Learning Community (PLC) during the academic year as an extension of MTI. The PLC provided space for the instructors to modify or create additional PBL tasks and analyze student assessment data to make informed decisions about course instruction and policy.

Funder Acknowledgement: NSF Targeted Infusion (1533522)

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Poster Category: STEM Science and Mathematics Education

Targeted Infusion Project: Infusion of Cyber, Research, and Peer-Led Team Learning to Enhance Minority STEM Majors' Mathematics Performance

Anna Harris, University of Arkansas at Pine Bluff

There is rising concern about America's ability to maintain its competitive position in the global economy due to lack of graduates with training and expertise in STEM fields, and one of the primary reasons students switch or drop out of STEM disciplines is mathematics instruction. In addition, College Algebra is one of major bottleneck courses for many STEM students, especially incoming first-generation minority STEM students at the University of Arkansas at Pine Bluff. To enhance minority STEM majors' mathematics performance, the PI and her Peer-Led-Team-Learning (PLTL) leaders infused cyber/web-based (CWB) and research/project-based (RPB) learning. Furthermore, the PI developed a co-requisite College Algebra class and updated course curriculum incorporating evidence-based instruction materials and activities. The PI and her PLTL leaders also created a comprehensive communal mathematics learning center for implementing evidence-based learning activities. The PLTL leaders were handpicked and trained by the PI. The results showed that students were very satisfied with their learning and their performance.

Funder Acknowledgement: NSF HBCU-UP Targeted Infusion Project

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Poster Category: STEM Research

Infusion of Computational and Biological Content into Fisk University's UG STEM Curriculum

Sanjukta Hota, Fisk University

The goal of this TIP award (2017-2020) is to enhance and strengthen Fisk University's bio-track program by introducing computational and data-enabled active learning in mathematics, biology and computer science, integrated with a faculty-mentored summer research program. This project synergizes, and does not duplicate, the institutional efforts by: 1) enhancing our recently launched bioinformatics/biomathematics emphasis area (TIP award 2013-2016) by introducing a new biology-focused pre-calculus course with the goal of fostering better understanding of the applications of algebraic and trigonometric fundamentals in biological problems; 2) developing modular programming courses that individually focus on Python, R, Linux, and Galaxy, often used for biological data processing and data analyzing; and 3) providing experiential learning opportunities via faculty-mentored interdisciplinary summer research program for students. Additionally, this project supports biomathematics research seminars and guest colloquia to emphasize the use of computing and develop new insight into solving complex biological problems.

Funder Acknowledgement: NSF-HBCU-UP

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Poster Category: STEM Research

Preparing Interdisciplinary Minority Material Scientists and Engineers of the Future

Shaik Jeelani, Tuskegee University

Co-Author(s): Willard Collier, Michael Curry, Mohammed Qazi, Vijay Rangari, Alfred Tcherbi-Narteh, and Shaik Zainuddin, Tuskegee University; Martha Escobar and Melissa McDonald, Oakland University

Materials Science and Engineering (MSE) is devoted to the discovery, design, and development of advanced engineering materials, which are crucial to new developments in Science and Engineering and impact our day-to-day lives. Historically Black Colleges and Universities (HBCUs) are not at the forefront of education in MSE, and HBCU students do not have many options to engage in this emerging multidisciplinary field, resulting in a dramatic underrepresentation of African Americans in the MSE workforce. This poster describes a ground breaking model proposed by Tuskegee University (TU) to develop, implement, study and evaluate a unique HBCU-UP Implementation program for STEM underrepresented minority (URM) undergraduate students at TU, designed to provide them with a rigorous preparation for graduate studies and careers in MSE related fields. The poster provides details of the MSE HBCU-UP program's interventions which include: (1) a minor in MSE consisting of multidisciplinary course-work; (2) use of "Learning through Making" techniques whereby students will use knowledge from their major and the proposed MSE minor to design, develop and test in a Makerspace a STEM-based product from a MSE perspective; (3) research internships at national laboratories, MSE-focused industries, and national REU sites; (4) workshops to build literature search, technical writing and proposal development skills; (5) submission of Graduate Fellowship proposals (e.g. GRFP of the NSF); and, (6) a Young Material Scientists Research Conference at TU. Currently, 34 students are enrolled in the program, which is expected to graduate its first cohort consisting of 8 students in May 2019. Over the 5-year grant period, an impressive 80 URM students will have been prepared for careers in MSE through the program. The poster also describes the study of the effectiveness of the proposed interventions through an extensive Social Science research investigation focused on the development of students' personal self-efficacy, professional efficacy and goal-directed behaviors (agency).

Funder Acknowledgement: This material is based upon work supported by the National Science Foundation Grant Nos. HRD - 1719433 HRD – 1719423

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Poster Category: STEM Science and Mathematics Education

Assuring the Integration of Mathematics into Biology through a Peer-led Learning Community

Qingxia Li, Fisk University

Co-Author(s): Thomas Gross, Western Kentucky University; Patricia McCarroll, Fisk University

The overall goal of this project is to increase academic performance, to prepare and motivate students to pursue education and careers in STEM disciplines, and to develop an assessment and STEM educational intervention that could be implemented at the national level. An academic experience survey revealed that the major reasons Fisk Biology majors switch to non-STEM disciplines are: (1) poor "faculty teaching" due to instructor's failing to link concepts to applications that are perceived as 'relevant', (2) student performance in mathematics courses, and (3) low-perceived self-efficacy. This project addressed these three issues via Intrusive Learning, achieved by creating a Learning Community (LC). To connect mathematics concepts with biology, reduce student's math anxiety, and increase student self-efficacy, intrusive learning communities for College Algebra and General Biology I were created, involving weekly sessions led by trained Peer Partnership Learning leaders to reinforce course content and work on seven mathematics projects related to biology. In addition to evaluating the efficacy of the LC, a collaborative team including STEM and social science researchers applied a Performance Pyramid model (Wedman, 2011) to examine the extent to which the LC intervention reflects the influences of Performance Pyramid support systems. The data were collected for both treatment and control sessions in Fall 2018. A discussion of the data analysis will be discussed.

Funder Acknowledgement: The project was supported by National Science Foundation HBCU-UP-BPR project with Grant number 1719262.

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Poster Category: STEM Science and Mathematics Education

STEM Enrichment by Design (STEMed) Project Preliminary Results

Jessica Lopez, St. Philip's College

Co-Author(s): Maria Rodriguez, St. Philip's College

With Calculus being the first math requirement and a prerequisite for science and engineering courses, students pursuing Science, Technology, Engineering or Mathematics (STEM) are unable to begin their degree plans until they complete a year or more of developmental math courses. This delay prolongs graduation and creates discouragement. Consequently, many students change their majors or drop out.

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Since mathematics is an interconnected network of concepts and procedures, it is sequential and successive. Thus, finding and filling in the gaps is equally as important as decreasing the amount of time in developmental mathematics to ensure success of STEM students. Therefore, the goals of the STeMed Project are to (1) fill in knowledge gaps to build a solid foundation for learning higher level mathematics and (2) decrease the amount of time spent at the developmental math level. The STeMed Project offers a modularized approach of four, four-week Modules in one semester (which later changed to 16 weekly modules) taking the student from Elementary Algebra to Precalculus so students may begin their degree requirements the following semester. ALEKS, a web-based, artificially intelligent assessment and learning system developed as the result of research in mathematical cognitive science, is used in these Modules. The continual assessment within the system allows students to fill and prevent future gaps in their skills and knowledge. The project uses an empirical style of teaching which entails on-demand assistance (and later included just-in-time mini-lectures). The project will become departmentally adopted and required for all STEM majors entering at any level of developmental mathematics. The program also helps address veteran students who are not tested for college-level readiness but enter college-level courses unprepared and ultimately finish unsuccessful. Since all students begin at the Elementary Algebra level, the ALEKS system will help everyone to fill in the gaps of knowledge so that they may learn the college-level material effectively. The structure and design could also transfer to other developmental areas such as English and/or Reading to rapidly prepare students for college-level courses. Ultimately, this project will be proposed to be implemented at all five colleges within the Alamo College District.

Funder Acknowledgement: NSF HBCU-UP

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Poster Category: STEM Research

Pullback Dynamics of Navier-Stokes Equation

Yongjin Lu, Virginia State University

We study the long-time behavior of the Navier-Stokes equation when it is subject to time dependent external force. More specifically, we (a) study the regularity of strong uniform attractors for 3D viscoelastic incompressible fluid flow subject to Kelvin-Voigt damping and a time dependent translation bounded external force; and then (b) study the pullback dynamics of 3D Navier-Stokes equations with variable viscosity and subject to time-dependent external force. The main result established is the existence of finite-dimensional pullback attractors in a general setting involving tempered universes. In addition, we present a sufficient condition on the viscosity coefficients that guarantees the nontrivial-ness of the

attractors. We also show the upper semi-continuity of pullback attractors as the non-autonomous perturbation vanishes.

Funder Acknowledgement: National Science Foundation, HBCU-UP, Research Initiation Award (No 1601127)

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Poster Category: STEM Research

Investigating Particulate Matter Concentrations: A Functional Data Analysis Approach

Eduardo Montoya, California State University, Bakersfield

Functional data analysis continues to attract attention because technological advances in many fields have permitted measurements to be made from continuous processes at finer discretizations. The effects of air pollutants continue to be a matter for concern. Particulate matter is among the most harmful air pollutants affecting public health and the environment, and levels of PM10 (particles less than 10 micrometers in diameter) for regions of California are among the highest in the US. The relatively high frequency of particulate matter sampling enables us to treat the data as functional data. In this work, we investigate the dominant modes of variation of PM10 using functional data analysis methodologies. Our analysis provides insight into the underlying data structure of PM10, and it captures the size and temporal variation of these underlying data structure potentially related to changes in climate.

Funder Acknowledgement: NSF grant HRD-1547784

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Poster Category: STEM Research

Effects of Social Experience on the Neuromodulation of the Escape Circuit: Empirical and Computational Analysis

Choongseok Park, North Carolina A&T State University

Co-Author(s): Sungwoo Ahn, Department of Mathematics; Katie N. Clements, Faith Heagy, Thomas H. Miller, and Fadi A. Issa, Department of Biology, East Carolina University

Understanding how social factors influence nervous system function is of great importance. Using zebrafish as a model system, we study how social relationship affects the neuromodulation of escape and swim circuits in zebrafish. One important neuromodulator is a dopamine, which is implicated in social regulation: aggression, depression, motivation, and motor activity. To investigate the role of a dopaminergic pathway in regulating escape in dominant and subordinate animals, we conducted a series of empirical experiments. We also constructed a neurocomputational model of the M-cell escape

circuit. We found that dopamine modifies escape behavior in a social status-dependent manner through inhibitory interneurons. As illustrated in Korn and Faber, GABAergic neurons influence the Mauthner neurons through the lateral dendrite. Blocking GABA showed a significant decrease in subordinate sensitivity while blocking Glycine increased the dominant sensitivity. Our model also suggests the possible locations of dopamine receptors. Moreover, it suggests the relationship between GABA and Glycine in the Mauthner escape circuit.

Funder Acknowledgement: NSF 1700199

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Poster Category: STEM Research

A Convergence Analysis of MCMC Algorithm for A Single-Phase Flow Problem

Arunasalam Rahunathan, Central State University

Co-Author(s): Abdullah Mamun and Felipe Pereira, Mathematical Sciences Department, University of Texas at Dallas

In subsurface characterization, the properties of the subsurface are reconstructed with a set of limited data using a history matching algorithm. A Markov Chain Monte Carlo (MCMC) algorithm is a reliable procedure for such reconstruction of a permeability field in an aquifer. The MCMC algorithm is serial in nature due to its Markovian property. Moreover, the calculation of the likelihood information in the MCMC is computationally expensive for flow problems in the aquifer. Running a long MCMC chain for a very long period makes the method less attractive for the characterization of the aquifer. In contrast, several shorter MCMC chains can substantially reduce computation time and can make the method more suitable for the characterization. However, the convergence of such MCMC chains should be carefully studied. In this poster, we consider multiple MCMC chains for a single-phase flow problem in the aquifer and analyze the convergence of the chains.

Funder Acknowledgement: The research is supported by the National Science Foundation under Grant No. HRD 1600818.

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Poster Category: STEM Science and Mathematics Education

Establishing an Undergraduate Data Science and Analytics Program at an HBCU

Guoqing Tang, North Carolina A&T State University

Co-Author(s): Margaret Kanipes and Seong-Tae Kim, North Carolina A&T State University

As one of the NSF Achieving Competitive Excellence (ACE)

Implementation Projects, this project aims to establish and implement a data science and analytics program for the next generation of undergraduate students at North Carolina Agricultural and Technical State University. The project is designed to create an integrated education and research environment, boost faculty competitiveness in data science research, and prepare undergraduate students for the emerging data science profession. This project is a pioneering data science program for undergraduate students enrolled at a Historically Black College and University (HBCU). In this presentation, we will introduce the current implementation activities of this project. The project has established a data science certificate program, a statistical computing laboratory, and a statistical and analytical consulting center, in addition to developing undergraduate data science and statistics curricula. The project has also promoted in-house and abroad research traineeship programs, hosted research colloquia and symposia, and facilitated faculty research collaboration in data science and STEM education. We will discuss the accomplishments and challenges of our program in both strategic and operational perspectives to scale up undergraduate data science programs in the HBCUs.

Funder Acknowledgement: NSF HBCU-UP Program (#1719498)

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Poster Category: STEM Science and Mathematics Education

Effects of Innovative Mathematics Instruction Methods on Student Attitude, Self-Efficacy, Effort and Performance

Guoqing Tang, North Carolina A&T State University

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In this poster, we will present the project design and implementation progress on our NSF HBCU-UP BPR project entitled, "Effects of Innovative Mathematics Instruction Methods on Student Attitude, Self-Efficacy, Effort and Performance." The overarching goal of this BPR study is to conduct a research study to examine the mutual effects of two student-centered teaching methods and self-actualization encompassing student attitude, self-efficacy, and effort, which allows a deeper understanding of students' growth mindset toward mathematics courses. The research questions for this study are: (1) What is the impact of the Math Emporium model implemented in Precalculus College Algebra I/II and SCALE-UP model implemented in Calculus I on student attitude, self-efficacy, effort towards math and math-related tasks, and performance? (2) Is there any association and/or causal

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relationship among attitude, self-efficacy, effort towards math and math-related tasks, and performance? and (3) How do the attitude, self-efficacy, effort towards math and math-related tasks, and performance in Precalculus College Algebra I/II and Calculus I, respectively, affect these same attributes in the sequence course of Calculus I and Calculus II? The conceptual framework of this study embeds its theory of change in theories of attribution, motivation, and self-efficacy. The project employs a mixed-method, pre-post test design in which a combination of both qualitative and quantitative indicators is used to answer project research study as well as short-term and long-term outcome questions. The proposed mixed methods design uses an integrating approach of analyzing both quantitative and qualitative data to investigate the extent to which the Math Emporium and SCALE UP increase students' favorable attitudes towards math, self-efficacy, time on math tasks (effort), and academic achievement. Particularly, the mixed methods design intends to explicate two latent constructs, students' attitudes towards math and self-efficacy beliefs about their ability to learn and master math and math-related tasks. The BPR research study findings will make a critical contribution to the knowledge base about the effects of innovative math instruction methods on student attitude, self-efficacy, effort and academic performance in gatekeeper math courses at an HBCU.

Funder Acknowledgement: This work is supported by the National Science Foundation under Grant HRD-1818710.

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Poster Category: STEM Research

Mathematical Models of Multistable Binocular Rivalry

Yunjiao Wang, Texas Southern University

Co-Author(s): Kresimir Josic, University of Houston

Binocular rivalry has been used as a tool to explore how our brain functions. Bistable binocular rivalry has been extensively studied, and three mechanisms were proposed to account for key features observed in the phenomena: exclusive dominance of one image every few seconds and percept switches in a stochastic fashion. The proposed mechanisms were supported by many theoretical studies using mathematical models and by experimental results in literature. On the other hand, the much less studied multistable binocular rivalry (rivalry among more than two percepts) provides extra features for studying our brains. In this work, we investigate possible ways to incorporate factors such as interocular excitatory connections into the existing models to explain experimental results of multistable binocular rivalry.

Funder Acknowledgement: HBCU-UP, RIA

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Poster Category: STEM Research

A Flexible Bivariate Distribution for Count Data Expressing Data Dispersion

Kimberly Weems, North Carolina Central University

Co-Author(s): Kimberly F. Sellers, Georgetown University

The bivariate Poisson distribution is a natural choice for modeling bivariate count data. Its constraining assumption, however, limits model flexibility in some contexts. Sellers et al. (2016) developed a bivariate Conway-Maxwell-Poisson (CMP) distribution based on the compounding method that includes the bivariate Poisson, bivariate Bernoulli, and bivariate geometric distributions as special cases. The construct, however, produces marginal forms that are not easily understood in relation to a general dispersion level. This work instead considers the trivariate reduction method to develop an alternate bivariate CMP distribution. Accordingly, this approach produces marginals that have a flexible form which includes several special case distributions for certain parameters. As a result, this bivariate CMP model is another flexible distribution for modeling bivariate count data containing data dispersion.

Funder Acknowledgement: This research was partially supported by the National Science Foundation Grant 1700235.

Nanoscience

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Poster Category: STEM Research

Progress on the Design of Nanostructures for Energy Efficient Devices

Rami Reddy Bommareddi, Alabama A&M University

Co-Author(s): Vernessa Edwards, Ashley Owens, Satilmis Budak, Eshirdanya McGhee, Ashok Batra, Matthew Edwards, and Bir Bohara, Alabama A&M University

Compositional dependence of the emission color of glasses has been investigated. A Dy³⁺ doped sodium borate glass emitted white light on exposure to 405 nm diode laser, however, Dy³⁺, Sm³⁺ and Tb³⁺ doped glasses emitted warm white light. Color coordinates and color temperature were measured. Further work is in progress. These results will be presented at SPIE 2019 Photonics West meeting. Mono and multi-layered thermoelectric thin films from Sb₂Te₃, CoAg, Sn/Sn+SnO₂, and Sb/Sb+SnO₂ were deposited using DC/RF sputtering system. They were annealed at different temperatures to cause the forming of quantum structures in the mono and multilayers to increase the thermoelectric efficiency. Further work is in progress. The results of Sb₂Te₃ and CoAg thin films were

presented during AVS-2018 meeting held in Long Beach, CA. Some remarkable results were obtained due to the effects of the heat treatments at different temperatures. A prototype 'Piezoelectric Energy Harvester Box' is designed and fabricated. It will be tested on a moving vehicles to determine its performance. A prototype 'Piezoelectric Energy Harvester Box' is designed and fabricated with PVDF based cantilevers of different lengths. This way, it could function with a variety of vibrational frequencies. Finally, it will be tested on moving vehicles to determine its performance. Later, piezoelectric nano-paint developed based cantilevers will be unitized to design and fabricate a system with required electronics. A book, "Field Guide to Crystal Growth," has been written and published by SPIE.

Funder Acknowledgement: NSF HBCU RISE grant 1546965

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Poster Category: STEM Science and Mathematics Education

A Modular Approach to Professional Development Training within the HBCU-RISE Light-Mat Program

Carl Bonner, Norfolk State University

Co-Author(s): Suely M. Black, Center for Materials Research and Department of Chemistry, and Nihal Colakoglu, School of Business, Norfolk State University

MSE 605 is a one-credit course core professional development course designed for materials science and engineering (MSE) graduate students that aims to complement students' training in the discipline by providing workplace insight to help them in their preparation for multiple career paths in MSE covering topics such as ethics of scientific investigation, guidelines in the selection of and application to different job positions, and technology transfer and commercialization. The course is delivered in a modular structure by three professors from the Center for Materials Research and School of Business at Norfolk State University. There are three modules consisting of (1) professional development including the development of a fellowship proposal, CV, and the statement of purpose; (2) technology transfer including the identification and development process for applied research and intellectual property protection process, and, (3) technology commercialization including the opportunity recognition, feasibility analysis, and market entry strategies. As part of the most recent HBCU RISE award, the course was first offered in Fall 2017 with the three modules interwoven and delivered simultaneously. A module on the introduction to ethical issues and training and an entrepreneurship module focusing more on entrepreneurship self-assessment, feasibility analysis, business plan development, and business management were offered. Based on feedback received from last year's class, the content was modified and the course modules were separated into 4-week blocks, with each block focused solely on a specific module. The first module reprised fellowship proposal. The

second module was dedicated to technology transfer. The third module increased its emphasis on technology commercialization with ethical issues and training incorporated in to the existing modules. To attest to the success of the course, after the first year, two students who had successfully completed the modules have received competitive funding awards based on the proposals prepared through the course. The current students have already provided oral and written feedback on the course. This feedback affirms the benefit of the course for the students. The students further suggested that a 3-credit subsequent course could be more beneficial for the students who want to develop their research ideas into real and successful business ventures.

Funder Acknowledgement: The authors would like to acknowledge support for the work from the National Science Foundation through award HRD-1646789.

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Poster Category: STEM Science and Mathematics Education

Effective Science Communication: An essential Tool to Engage and Prepare Students for STEM Careers

Liz M. Díaz-Vázquez, University of Puerto Rico Río Piedras

Co-Author(s): Ileana Feliciano and Carlos Cabrera, University of Puerto Rico, Río Piedras

The Center for Innovation, Research and Education in Environmental Nanotechnology at the University of Puerto Rico, Río Piedras Campus (CREST-CIRE2N) supports the development and training of students, K-12 teachers, citizens and faculty members in environmental problems and conservation, and in the development and use of environmental nanotechnology for energy and remediation applications. To be more effective in the recruitment and training of its participants, CIRE2N educates our students to communicate their research to a broader audience, such as the public, the press and funding organizations. But to communicate science in an effective manner is not an easy task. Many students and scientists are well prepared and have accomplished important research findings, but their scientific communication needs to improve to engage and impact positively their communities and the society. Even more, the development of good communication skills is essential to their success as professionals. The main goal of this research was to study the communication skills and styles of science graduate and undergraduate students in diverse educational contexts. With that in mind, a semester training in science communication was offered to CIRE2N graduate and undergraduate students to help them to develop an advanced ability to communicate their research clearly and accurately and to emphasize its value and significance to diverse audiences. The training included classroom instruction, video recordings, and different opportunities for students to practice and receive immediate, constructive feedback in a supportive environment. In addition, the student develop an interactive demonstration

based on their research, train high school students to perform their demonstration and finally present it to the public at a non-formal environment, the Mall of San Juan. Most students felt these activities improved their communication skills and enhanced their ability to work as a team, lead a team, facilitate group discussions, teach STEM concepts and techniques, and generate others' interest in STEM research and activities.

Funder Acknowledgement: NSF-CREST GRANT NUMBER HRD-1736093

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Poster Category: STEM Research

Binding of Histidine and Proline with Graphene in Gas and Aqueous Phases: Computational Study

Tandabany Dinadayalane, Clark Atlanta University

DFT calculations at M06-2X/6-31G(d) level have been performed to examine the interactions of two alpha-amino acids (histidine and proline) individually with graphene sheets of two different sizes (62 and 186 carbon atoms). The edges of graphene surfaces were terminated with hydrogen atoms. The conformational analysis was performed for both proline and histidine using MMFF force field as implemented in Spartan '16. From the conformers generated, we have chosen few low energy and one high energy conformers of proline and histidine to build the complexes with graphene. In the case of forming the complexes, we have considered various possible orientations. Binding energies with and without basis set superposition error (BSSE) were calculated. Our aim is to understand the influence of conformers of histidine and proline on binding with graphene in the gas and aqueous phases, and the effect of varying the graphene sheet on their binding affinities. In the case of histidine-graphene complexes, the competition between pi-pi and C-H/N-H...pi interactions exists. It should be noted that histidine exhibits higher binding energy than proline. This could be attributed to the presence of pi-electrons and two nitrogen atoms in the five-membered ring of histidine. The most stable complex of proline-graphene shows multiple C-H...pi interactions along with N-H...pi interactions. Graphene size effect is negligible for both amino acids. The solvation effect on binding energies was evaluated by a polarizable continuum model (PCM). Inclusion of solvent (water) reduces the binding energy, but the trend is retained. HOMO-LUMO energy gaps were calculated at the TPSSH/6-31G(d)//M06-2X/6-31G(d) level. Binding of proline or histidine does not change the band gap of graphene.

Funder Acknowledgement: NSF HBCU-UP RIA (Grant number 1601071)

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Poster Category: STEM Research

N-doped Organic Acceptors for High Performance Electronics

Harold Lee, Norfolk State University

Co-Author(s): Sam-Shajing Sun, Norfolk State University

Polymeric conjugated materials are very promising for developing future soft material-based semiconductors, conductors, electronic and optoelectronic devices due to their inherent advantages such as lightweight, flexible shape, low-cost, ease of processability, ease of scalability, etc. Like their inorganic counterparts, the addition of certain minority molecules or dopants can significantly alter the electronic and optoelectronic properties of the host conjugated polymers or composites allowing tunability for a variety of electronic/optoelectronic applications. In the case of OPVs (organic photovoltaics), p-doping of the donor material is the most prominent form of doping observed and has yielded high performance devices. On the other hand, n-doping and n-doping of the acceptor in specific, has seen limited interest due to the difficulty in creating air stable n-doped systems. Recently, researchers have been able to design air-stable n-doped organic systems for electronic applications. Here, we introduce n-doped organic acceptors into OPV systems to study how they affect overall device performance. Our results can reveal new routes into increasing overall device performance and efficiency in organic-based electronics.

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Poster Category: STEM Research

Applications of Waste Egg and Seashell Biomaterial for Tissue Engineering Scaffolds

Vijay Rangari, Tuskegee University

Co-Author(s): V.Hambrick-Holloman and Shaik Jeelani, Tuskegee University

In the medical field, there remains a strong demand for regenerative, biocompatible materials that can be fabricated into complex, patient-specific shapes. The objective of this work is to develop an inexpensive yet sustainable approach to fabricating personalized and bioactive hydroxyapatite-based scaffolds for tissue engineering applications. Nano hydroxyapatite (nHA) was derived from naturally occurring chicken eggshell and clam shell waste using an energy efficient microwave-assisted wet chemical precipitation method. XRD, FESEM, TEM, and EDS confirmed crystalline nHA particles varying in shapes, within the nanometer range, and a chemical composition matching that of naturally occurring HA. nHA based

scaffolds were fabricated by 3D printing slurry-based solutions composed of 70 wt% nHA and 30 wt% Polycaprolactone (PCL) using a unique Hyrel 30 M Printer. XRD, SEM, TGA and in vitro cell studies were conducted to determine the feasibility of the constructed scaffolds for tissue regeneration purposes. The scaffolds derived from naturally occurring waste sources showed high levels of cellular adhesion and proliferation when seeded over various periods.

Funder Acknowledgement: NSF-CREST- 1735971; NSF-RISE-1459007; NSF-EPSCoR-1655280

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Poster Category: STEM Research

CREST IDEALS: Interface Design and Engineered Assembly of Low Dimensional Systems

Maria Tamargo, The City College of New York

Co-Author(s): Gustavo Lopez, Lehman College of CUNY, New York; Swapan Gayen, Ilona Kretaschmar, and Lia Krusin-Elbaum, The City College of New York

The CCNY CREST Center IDEALS has been operating for nearly 3 years. The goals as stated in the proposal were to: (a) discover materials with new and enhanced functionalities through the control of the unique properties of interfaces and defects; (b) integrate education and research and provide leadership and professional training to enrich students' academic experience; and (c) implement "best practices" to recruit students from underrepresented groups and provide mentoring for successful completion of their doctoral program. Here we present our recent research outcomes, involving collaborations among IDEALS groups and external collaborators. We also summarize our accomplishments in student mentoring and outreach. Tunable Topological Materials and Hetero-nanostructures, (Krusin, Tamargo, Park, Gayen, Ghaemi and Begliarbekov). Advancements in this project involve the enhancement of the transport properties of a new class of materials known as topological insulators (TIs) in order to exploit their unique physical properties to enable ground breaking applications and novel materials physics discoveries. Bioinspired Reconfigurable materials, (Kretzschmar, O'Brien, Tu, Lopez, Ulijn, McGregor, Menon, Lombardi, Braunschweig, Begliarbekov). In this project novel bioinspired materials nanostructures are being explored for two applications: light harvesting and medical theranostics. Advances have been made in synthesis and modification of nanoparticles for light harvesting and theranostics applications, and development of plasmonic structures for light harvesting enhancement of materials. Defect engineering for quantum phenomena (Meriles, Menon, Lopez, Lombardi). This effort seeks to understand and implement outstanding properties of unique crystal defects for applications in quantum phenomena. New physics and implementation of the Nitrogen Vacancy (NV)

center in diamond and defects in hexagonal Boron Nitride (h-BN) will be discussed. Student mentoring and outreach. IDEALS has supported thirteen doctoral students, each working jointly with at least two mentors in complementary fields. Activities such as seminars, visits to external labs, and leadership and professional training have been implemented. Vigorous recruitment through active participation in the doctoral admissions process and through the implementation of a research experience for undergraduates has resulted in significant increase in the numbers of students from underrepresented groups in our programs.

Funder Acknowledgement: The National Science Foundation – CREST

Physics

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Poster Category: STEM Science and Mathematics Education

Implementation of a Big Data Science Summer Camp for High School Students

Corisma Akins, Grambling State University

Co-Author(s): Connie Walton and Yenumula Reddy, Grambling State University

This presentation will provide an overview of the implementation of a summer program for high school students on Big Data Analytics funded by a HBCU-UP Implementation Project awarded to Grambling State University. A Big Data Science Camp was implemented in summer 2017 with the intent to equip students with basic skills related to big data analysis in efforts to address growing workforce needs. This camp was revamped in summer 2018 to provide activities that would allow the participants to connect big data analysis to various professions, both STEM and non-STEM, through mini-projects and guest speakers. Highlighted will be the successes and lessons learned from both summer camps and strategies incorporated that increased the number of campers who would participate in the camp again from 38.5% in summer 2017 to 90% in summer 2018.

Funder Acknowledgement: National Science Foundation, HRD 1719523

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Poster Category: STEM Science and Mathematics Education

Enhancing Astronomy Education and Research in the U.S. Virgin Islands

Antonino Cucchiara, University of the Virgin Islands

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Teaching Astronomy and Astrophysics topics and performing cutting-edge research is often linked to the availability of expensive resources and faculty time. The kick-off of a newly approved B.S. in Physics with concentration in Astronomy at the University of the Virgin Islands (UVI) represents a unique opportunity to craft the teaching and undergraduate research to the most modern and highest standards not just in one of the only seven HBCUs with a 4-year physics program, but in other small-medium size institutions like UVI. The acquisition of state-of-the-art equipment, including the STARLAB inflatable planetarium and commercial telescopes, have been instrumental to expose UVI students to modern observational astronomy techniques, acquired observing skills, and the research-like struggle of top level research. In this work we summarize the current status of this effort and the outcomes within the context of the physics program as well as in the broader STEM workforce development.

Funder Acknowledgement: HBCU-UP TIP #1719265

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Poster Category: STEM Research

Holistic Development of Undergraduate Students - Concept Cartoons to Authentic Discovery

Kausik Das, University of Maryland Eastern Shore

In this poster we report development of some concept cartoons for clicker questions for classroom use. Some preliminary data on their impact and students' reaction are discussed. We are also reporting the discovery of 1) a new resistance switching mechanism in metal oxide semiconductors which has the potential to be used as a memory device and 2) a new mechanism of plasma generation using a kitchen microwave. Both of these high impact research results came out of HBCU-UP funded undergraduate research. One is published in the Nature Group of Journals, Scientific Reports and the other is featured in the MIT Technology Review as a potential game changer.

Funder Acknowledgement: NSF HBCU-UP Award # 1719425

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Poster Category: STEM Research

The TOROS Follow-up Program for the LIGO/VIRGO O3 Observational Campaign

Mario Díaz, University of Texas Rio Grande Valley

Co-Author(s): Martin Beroiz, Adam Zadrozny, Richard Camuccio, Moises Castillo, Aldo Fonrouge, University of Texas Rio Grande Valley

In this poster we present the TOROS collaboration plans to follow up the public alerts from the the third LIGO/Virgo gravitational wave observational campaign.

Funder Acknowledgement: NSF-CREST program.

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Poster Category: STEM Science and Mathematics Education

A Dramatic Impact on Student Outcomes from the DREAM STEM Project at NCCU

Caesar Jackson, North Carolina Central University

Co-Author(s): Alade Tokuta and Tanina Bradley, NC Central University

North Carolina Central University (NCCU) was awarded a grant from the Historically Black Colleges and Universities Undergraduate Program (HBCU-UP) of the National Science Foundation. The project, "DREAM STEM--Driving Research, Entrepreneurship, and Academics through Mastering STEM" aimed to address the need to increase enrollment, retention, persistence, and graduation in physical and mathematical sciences undergraduate degree programs. The innovative approach addresses development of students' identity as a scientist and expands their mindset for entrepreneurial thinking, and facilitates enhanced STEM learning by stimulating "Teaching as Research" for STEM faculty. The DREAM STEM Project provided scholarships, a Research Discovery Innovation (RDI) Summer Institute, undergraduate research experiences, summer bridge coursework, tuition for summer school catchup, book awards, conference travel, and work stipends. The "teaching-as-research" activity facilitated through mini-grants engaged STEM faculty to pursue, learn, and implement new, effective strategies to improve teaching and student learning. The RDI Summer Institute engaged students in guided R&D experiences to innovate, complemented with entrepreneurial thinking training on how to carry out market analysis and identify financing sources to fund their product. RDI students presented a business pitch and demonstration of the product they created. An entrepreneurial skills assessment administered, showed the RDI Summer Institute produced a significant positive mindset change in entrepreneurial thinking, as indicated by gains in students' personal traits; technical skills; entrepreneurial skills. The DREAM STEM Project contributed to a 17% overall enrollment increase in all STEM programs. For the Physics degree program specifically, the enrollment increase was 63%. A sample of first-time, full-time (FTFT) freshmen DREAM STEM participants was compared to a matched sample of FTFT freshman NON-DREAM STEM students. Retention rates for the DREAM STEM sample averaged 95% compared to 68% for the NON-DREAM STEM sample. DREAM STEM participants persisted toward the STEM degree at a rate that exceeded 91% whereas persistence was 40% for NON-DREAM STEM students. The 4-year graduation rate for DREAM STEM was 50% compared to 27% for non-DREAM STEM. Without the DREAM STEM Project,

more high caliber students initially interested in a STEM degree may not have persisted nor remained enrolled at NCCU.

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Poster Category: STEM Research

Subatomic Physics at VUU

Narbe Kalantarians, Virginia Union University

A research program in subatomic physics has been initiated at Virginia Union University (VUU). This RIA has allowed for the PI to establish a productive research program in experimental intermediate energy physics, in connection with nearby Jefferson Lab that engages VUU undergraduates in STEM research. The research activities include the development of a portable sensor read-out system and analysis of nuclear cross-sections. This award has helped elevate the recently reestablished VUU physics program. This poster talk will highlight the accomplishments and plans for the program.

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Poster Category: STEM Science and Mathematics Education

Infusing Quantitative Biology Methods into the Life Sciences Curriculum

Steven Morgan, Fisk University

Co-Author(s): Steven Damo and Phyllis Freeman, Fisk University

This Targeted Infusion Project at Fisk University incorporates quantitative biology methods and embeds authentic research into lecture and laboratory components of cognate and upper division life science courses. We are implementing a three objective plan to innovate the curriculum and pedagogies employed in order to better prepare students in the life sciences for an increasingly multidisciplinary research landscape: 1) develop an introductory physics for life sciences course which strikes an appropriate balance between physics core concepts and life science applications, 2) create a biophysical chemistry course that focuses on the structure, thermodynamics, and kinetics of biological macromolecules, and 3) develop modules for upper level biology courses that reinforce the connections between life and physical sciences. The introductory Physics for Life Sciences course was offered for the first time in the 2017-2018 academic year. The first semester of the course and its

associated laboratories was taught in the Fall, the second semester and associated labs were taught in the Spring. Students reported improvement in their skills in using physics and computer programming to solve biology problems, one of the goals of the revised courses, and became more apt to see biology as harder, which may be because physics methods were being taught as a way to solve biology problems and, for many, quantitative biology is seen as harder than more descriptive biology. The Biophysical Chemistry course was offered in the Fall semester of the 2017-2018 academic year. Modules for Molecular Cellular Biology, Genetics, and Biochemistry were phased in beginning Fall 2017; their development is ongoing. Undergraduate student participants are working on the development of new laboratory experiments for Physics for Life Sciences I and II. One project uses smartphone cameras and open-source image tracking software to illustrate principles of kinematics and Newton's laws by measuring human body segment parameters. A second project uses microscope videos to develop a lab experiment dealing with kinematics in the regime where viscous forces dominate.

Funder Acknowledgement: National Science Foundation, HBCU -UP TIP Award 1623280

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Poster Category: STEM Research

Understanding the Formation of Large Flocks of Sperm in Viscoelastic Fluid

Chih-Kuan Tung, North Carolina A&T State University

Co-Author(s): Jelani Lyles, Daniel Sussman, Soon Hon Cheong, Susan S. Suarez, M. Lisa Manning

When bovine sperm swim in viscoelastic fluid, they form dynamic clusters that coexist with individually swimming sperm in a steady state. By tuning the viscoelasticity of the fluid, we are able to generate clusters in the size of ~ 20 cells. By using a pulse of flow to align them upstream momentarily, we were able to generate large flocks, from a range of 60-200 cells. This large flock formation is also known as mass motility in a clinical setting, which is used for semen motility evaluation from bulls and other ruminants in the field for veterinarians, where environmental control is not available, and sperm die quickly on an optical system. We employ a numerical self-propelled particle (SPP) model to identify the factors that lead to bigger flock formation, or better mass motility. Our model includes nearby sperm orientation alignment and attraction, volume exclusion, and heterogeneity among cells. We will compare the data from the numerical model with the experiments.

Funder Acknowledgement: NSF HRD 1665004; NIH 1R15HD095411-01

Science & Mathematics Education

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Poster Category: STEM Science and Mathematics Education

Implementation of Toxicology Instruction, Research, and Career Panels at Fort Valley State University

Celia Dodd, Fort Valley State University

Co-Author(s): Robin Brigh and Tiffani Holmes, Fort Valley State University

The discipline of toxicology is critical to the protection of ecosystems, humans, and natural resources. Demand for toxicologists is at an all-time high due to expanding global threats of chemical exposure linked to increased reliance on fossil fuels, threats to food security, aging hazardous waste sites, and recent natural disasters. Moreover, while populations at a higher risk of contamination are underrepresented minorities, there remains a paucity of minorities choosing careers in toxicology. Over the course of a Targeted Infusion Project awarded to Fort Valley State University (FVSU) in 2015, the Departments of Biology and Chemistry have worked toward promoting student interest in toxicology to address the global need for qualified toxicologists through the development of two courses, Principles of Toxicology and Investigations in Toxicology, the establishment of a toxicology teaching laboratory, undergraduate research experiences in toxicology at FVSU and with collaborating institutions, and faculty development in toxicology research and course instruction. Overall, 12 males and 46 females, all underrepresented minorities, have participated in toxicology related activities including the toxicology courses, the summer research internship, and conference attendance. In addition, over 30 more FVSU students were exposed to toxicology through the Southeastern Society of Toxicology career panel held at FVSU and over 60 more FVSU students were exposed to toxicology through the keynote speakers at FVSU. In three years, 16 students have completed summer toxicology research internships. Of these 16 students, one has been accepted to an MPH program in environmental health, one has been accepted to veterinary school, one has been accepted into a MS program in biomedical sciences, two are applying to medical school, two are applying to dental school, two are applying to PA school, and five are applying to graduate school. Student surveys report an increased interest and understanding of the importance in toxicology as a discipline.

Funder Acknowledgement: NSF HBCU-UP Award#1533498

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Poster Category: STEM Science and Mathematics Education

Postdoctoral Fellows Are Productive Scientists in Training at a Liberal Arts College

Mark Lee, Spelman College

Co-Author(s): Monica Stephens

Spelman has an exemplary undergraduate science program that responds to student demand for research training. We believe in creating a research active environment that provides innovative science curricular and training resources on par with leading liberal art institutions. The science and mathematics departments emphasize conducting research as a well-established pedagogical tool. This demand for research experiences led to our consideration of incorporating postdoctoral fellows as contributors to research productivity. Herein, Spelman instituted a similar mechanism. In these models, all stakeholders benefited. Undergraduate students benefit from gaining skills and mentoring from the postdocs. Faculty benefit from increased research productivity, more time for course development/improvement, and help mentoring students. Postdocs benefit by developing independent research programs, gaining teaching experience, pedagogical skills and experience mentoring students. We can report that all 6 postdoctoral fellows at Spelman College were able to publish peer-reviewed articles (n=8) during their fellowship.

Funder Acknowledgement: Spelman College CURE Research Program- HBCU-UP Award from the National Science Foundation, Award ID:1436759.

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Poster Category: STEM Science and Mathematics Education

Scientific Literacy Summer Program for Pre-Freshmen and High School Students

Lycurgus Muldrow, Morehouse College

Co-Author(s): Alicia Thomas, Shondrieka Lamb, and Carol Shearer, Morehouse College

Utilitarian scientific literacy entails possessing the knowledge, skills, and attitudes necessary for obtaining a career in science, technology, engineering or mathematics (STEM). Prior research suggests a need for improved utilitarian scientific literacy skills among high school students interested in careers in STEM, and pre-freshmen who plan to pursue STEM majors in college. This study reports the development and evaluation of a utilitarian scientific literacy curriculum that was implemented in a high school summer program designed for students interested in pursuing STEM careers, and a pre-freshman summer program for students who will declare a STEM major upon entering college. Pre-freshmen who matriculated through this summer

program, upon entering college, had an 18% increased pass rate in core STEM courses compared to a control group. Evidence also indicates that these students had a greater understanding and heightened value for science, research, and related career opportunities, with a self-perceived enhancement of utilitarian scientific literacy skills. The high school summer program students who participated in the utilitarian scientific literacy curriculum were assessed using the Applied Learning Student Questionnaire (ALSQ) to provide information on their attitudinal, motivational, and behavioral perceptions towards science. The results from this retrospective pretest/posttest ALSQ survey documented a statistically significant increase in students' intrinsic motivation, self-management/self-regulation skills and intent to persist in STEM. In addition, 22% of the high school students changed their plans to pursue a higher level of STEM education.

Funder Acknowledgement: National Science Foundation HBCU-Undergraduate Program (1043330); Georgia Governor's Office for Student Achievement

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Poster Category: STEM Science and Mathematics Education

Investigating the Effects of Socioscientific Argumentation Development on Student Academic Success

Hector N. Torres, Bethune-Cookman University

Co-Author(s): Raphael D. Isokpehi, Bethune-Cookman University

This Broadening Participation Research (BPR) in STEM Education project is connected to a Targeted Infusion Project at Bethune-Cookman University titled "Developing Quantitative Expertise in the Undergraduate Biology Curriculum (QEUBiC) [1434186 (PI – Isokpehi RD; Co-PIs –Wollenberg Valero KC; Congdon E. 08/15/2014 - 07/31/2018). The QEUBiC curriculum enhancement framework is for biology students to develop the scientific literacy to provide biology-based solutions to societal issues of food, energy, health and environment in an era of Big Data challenges. Thus, the QEUBiC curriculum is addressing the importance of connecting science to matters of social importance also termed Socioscientific Issues. Scientific Literacy entails the ability to make informed decisions, analyze, synthesize and evaluate varied sources of data and information, use moral reasoning to attend sensibly to ethical issues, and understand the complexity of connections inherent in socioscientific issues. The BPR project expands this scientific literacy research at Bethune-Cookman beyond the biology curriculum. The Socioscientific Issues (SSI) framework for scientific literacy development requires students to engage in dialogue, discussion, debate and argumentation. Therefore the major goal of this BPR project is to investigate how to produce Science, Technology, Engineering and Mathematics (STEM) graduates with argumentation expertise to address ill-structured problems that require scientific, evidence-based

reasoning to inform decisions. Argumentation (argumentative discourse) in scientific topics is defined as the connection between claims and data through justifications or the evaluation of knowledge claims in light of evidence, either empirical or theoretical. Argumentation is now recognized as a central practice of science and thus a crucial aspect of instruction that aims to help students develop a robust understanding of science. A key reason for this research goal is that argumentation will empower students from distinguishing claims made on scientific grounds from those based solely on tradition and authority. Additionally "argumentation" is the chief cognitive activity by which a democracy, a field of study, a corporation, or a committee functions. It is vitally important that high school and college students learn both to argue well and to critique the arguments of other. Results of assessment of argumentation quality and plans for instructional intervention will be presented.

Funder Acknowledgement: National Science Foundation HBCU-UP 1623371, 1434186.

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Poster Category: STEM Research

Implementation of a STEM Peer-Community Peer Mentorship Model for Undergraduate and Graduate Minority STEM Students

Jillian Wendt, University of the District of Columbia

Co-Author(s): Amanda Rockinson-Szapkiw, University of Memphis; Ayana Conway, Virginia State University; Jaylin Cole and Shanaiya Fletcher, University of the District of Columbia

The NSF HBCU-UP BPR Project described in this abstract is a collaborative effort between two historically black institutions, University of the District of Columbia (UDC) and Virginia State University (VSU), and one public, predominately white institution with a large minority population, University of Memphis. The aim of the project is to develop, implement, and evaluate a blended (e.g. face-to-face and virtual) science, technology, engineering, and math (STEM) peer mentorship program to assist female, minority undergraduate students in developing their career self-efficacy in STEM and to improve their persistence and intent to graduate from a STEM program and ultimately to pursue a job in STEM. In this project, female, minority graduate students mentor undergraduate students both face-to-face and virtually; thus, a secondary aim is to build graduate students' mentorship skills and inspire their persistence in STEM. While all minorities may participate in this project, the project is primarily aimed at underrepresented minority females in STEM programs. The overarching goal of this project is to pilot and assess the effectiveness of a blended (i.e. face-to-face and virtual) STEM peer mentorship program to support the success and persistence of underrepresented minority females in STEM degrees and to broaden participation of underrepresented minorities in STEM fields. As noted in the

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literature, mentoring is cited again and again as an essential element in the growth and development of individuals, both male and females, in any discipline (Galbraith & Cohen, 1995). Mentoring has also been cited as an important element in assisting women in advancing progress and increasing influence in male dominated fields (Hill et al., 2010; Bova, 1995) such as STEM. However, to ensure that the mentoring relationship is effective, it is important that the mentor develop skills and understand the function of the mentor (Galbraith & Cohen, 1995). Thus, providing graduate students with formal training and experience for building mentorship competency so that they can effectively mentor undergraduate students and can develop skills relevant to the workplace is a component of this program. This poster will explain the rationale of the project, project development, and project implementation in an effort to enhance self-efficacy and intent to persist among minority STEM students.

Funder Acknowledgement: NSF award # 1717082

Social, Behavioral & Economic Sciences

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Poster Category: STEM Research

Models of Success: Identifying Factors that Contribute to Faculty Production of Minority STEM Graduates: Implications for HBCUs and Beyond

Fred Bonner, Prairie View A&M University

Co-Author(s): Aretha Marbley, Texas Tech University

As minority populations continue to increase, their participation in the STEM workforce will be critical to the health of our growing economy. Thus, one of the most important areas of focus should be on increasing minority STEM graduates. A significant facet of this is to understand the role faculty should play in preparing these students and assisting with their matriculation to graduation and ultimately their participation in the workforce. The STEM Workforce Challenge Report (2007) identified three key issues as detractors from STEM success, particularly in developing a STEM workforce: 1. Many students never make it into the STEM pipeline because of inadequate preparation in math and science or poor teacher quality in their K-12 systems. 2. Many, who are academically qualified for postsecondary studies in science and math fields at both the two- and four-year levels, don't pursue those programs. 3. The low engagement with STEM-related learning is particularly acute among minority, female, and lower-income students who comprise a growing proportion of the total college-going public.

Funder Acknowledgement: National Science Foundation (NSF)

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Poster Category: STEM Science and Mathematics Education

Infuse Data Science and Analytics (DSA) into Undergraduate Courses and Research at Bowie State University (BSU)

LaTanya Brown-Robertson, Bowie State University

Co-Author(s): Azene Zenebe and Augustin Ntembe, Bowie State University

Data science and analytics (DSA) are becoming ubiquitous as more and more employers are requiring foundational knowledge and application of data analytics and the data science process. Many disciplines such as economics, chemistry, biology, psychology and health sciences are data-driven; thus infusing data analytics into these disciplines will provide students with the skills and knowledge to analyze complex data and provide solutions to discipline specific problems. Furthermore, there is a growing need to infuse data science and analytics competencies in existing courses to satisfy the need for data analytics-enabled and data science jobs. The goal of this three-year HBCU-UP Targeted Infusion Project, is to infuse data Science and analytics (DSA) into undergraduate courses and research at BSU and set the foundation for establishing internships and research opportunities as well as an upper level undergraduate certificate in DSA. The objectives of the project are to: 1) develop DSA course modules and deliver them in the targeted disciplines: Chemistry, Biology, Computer Science and Information Systems, and Economics; 2) create new courses and integrate the DSA modules into existing courses that will eventually lead to an Undergraduate Certificate (UC) in DSA; 3) offer undergraduate research opportunities in DSA; and 4) establish a DSA Faculty Training and Learning Community. The poster will present the outcomes of the project that include a multidisciplinary and competence-based DSA Infusion Framework, lesson-learned from the active DSA faculty learning community (FLC) with members who are actively engaged in several discussions and completion of several DSA courses. Furthermore, the results of survey of the members of the DSA FLC on the faculty development opportunities and their opinions on the courses they've completed will be presented.

Funder Acknowledgement: NSF - HBCU-UP

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Poster Category: STEM Research

The Effects of Collaborative Project-Based Learning on Self-efficacy, Academic Success, and Persistence Rate

Ometha Lewis-Jack, Bowie State University

Co-Author(s): Cheryl Blackman, Shannel Blake, Maxwell Lawson, and Debora Louis

The purpose of this study was to examine the extent to which Collaborative Project-Based Learning (CPBL) impacts self-

efficacy, academic success, and persistence rates. One hundred first semester college freshmen STEM majors enrolled in a freshman seminar course participated in this study. Participants were given a survey to measure their knowledge of Robotics and a pre- and post-test that assessed their levels of self-efficacy based on their involvement in CPBL. The results indicated that the CPBL environment increased students' self-efficacy and had an impact on their GPAs and persistence rates. Future research should focus on CPBL and its usefulness for other courses and disciplines.

Funder Acknowledgement: The Department of Education
Ronald E. McNair Postbaccalaureate Achievement Program

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Poster Category: STEM Research

#MeToo: Perceived Cultural Differences in the Current Feminist Movements

Ayanna Lynch, Bowie State University

Co-Author(s): Fiona Gilpin, Sadiyah Jenkins, Malaysia Johnson, Destinee Mincy, Fatima Seasay, and Derrick Bullock

Historically, feminist movements have been criticized by intersectional feminists, such as Black and Latina women, for excluding the attitudes and experiences of women from diverse cultural backgrounds. The current study aimed to explore the level of diversity associated with the current cyberfeminist movements, specifically #MeToo and #TimesUp. Content analysis was used to qualitatively analyze the 405 independent items of feminist-themed social media and internet content associated with #MeToo, #TimesUp, #SolidarityisForWhiteWomen and #SayHerName. Overall, results indicated that the majority of the #MeToo and #TimesUp content was focused on sexually inappropriate behaviors rather than topics that may appeal to women of diverse backgrounds. By contrast, content associated with intersectional feminism, such as #SolidarityisForWhiteWomen and #SayHerName, were created by more minority users than non-minority users. However, contrary to expectations, more minority users created feminist-themed content compared to non-minorities. Overall these results support claims that the current cyberfeminist movements do not represent diverse issues that may appeal to women from diverse backgrounds. These results suggest a need for more inclusion in the current feminist movements as well as more research on this new topic.

Funder Acknowledgement: The Department of Education
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Poster Category: STEM Research

Effect of Mental Workload and Overconfidence on Distracted Driving: The Mediating Role of Mind-Wandering

Suman Niranjana, Savannah State University

Distracted driving is one of the leading causes of fatalities and accidents on the road. Distraction during driving can occur in many forms such as: inattentiveness as a result of immersive conversation (in-person or on the phone), taking eyes of the road for few seconds for changing settings in the car's center console or elsewhere, texting during driving, mind wandering as a result of work stress and mental workload, overconfidence, personality factors, planned behavior, cognitive failures etc. The objective of this research is to understand the effect of mind-wandering on distracted driving via conducting an empirical research and additionally, the indirect effect of mental workload, theory of planned behavior, and perceived overconfidence on distracted driving via mind-wandering. Data is collected from drivers who commute at least one hour every weekday in large cities (excess of 5 million population). Established scales from existing literature in transportation and psychology is utilized for conducting this study. We believe that there is an indirect relationship between planned behavior, mental workload, and overconfidence on distracted driving via mind-wandering. Multivariate statistical analysis using Structural Equation Modeling is conducted to provide deeper understanding of distracted driving.

Funder Acknowledgement: HBCU-UP: TIP-ITS

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Poster Category: STEM Science and Mathematics Education

UPRM-CREST: 10 Years of Broader Impact Across the Academic Echelon

Agnes Padovani, University of Puerto Rico, Mayagüez

Co-Author(s): Jaquelina E. Alvarez, Cristina Pomales, O. Marcelo Suárez, Myriam D. Padilla, and Adelaida Rivera University of Puerto Rico, Mayagüez

Established in 2008 at the University of Puerto Rico, Mayagüez (UPRM), the Nanotechnology Center Phase I focused on in-depth training of students from public schools and undergraduate and graduate students (UGS). Originally engaging two high schools, after 10 years, the Center's Phase II Interdisciplinary Education Group (IEG) maintains 15 Materials Science and Engineering (MSE) Clubs in middle and high schools in western Puerto Rico. This strategy is at the core of the Center's social impact, as many of their 500 student members represent economically-disadvantaged households. Mentored by a teacher, affiliated with and trained by the Center, each MSE

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Club provides an enriching venue through planned hands-on interventions by the IEG and carried out by the Center's UGS. The MSE Clubs' Annual Meeting, held at UPRM's Coliseum, serves as an entertaining activity where the participants learn by building large-scale scientific models using air balloons to demonstrate complex functionalities of nanostructured materials studied in the Center's three research groups. Meanwhile, these groups have been solidly productive and trained more than a hundred UGS, including former MSE Club members, who nowadays pertain to the STEM and Nanotechnology workforce. In the last 3 years these efforts have helped establish three engineering doctoral programs, and a Master's in Materials Science and Engineering at the host institution.

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Poster Category: STEM Science and Mathematics Education

Professional Development for STEM Women of Color

Orlando Taylor, Fielding Graduate University

Co-Author(s): Kelly Mack, Association of American Colleges and Universities; Melissa Wynn, Fielding Graduate University, Washington, DC

The most recent recommendations of the NSF Committee on Equal Opportunities in Science and Engineering (CEOSE, 2017) urges that NSF utilize its convening power to impact its broadening participation portfolio through professional development workshops and online resources. However, traditional faculty development approaches are far too insufficient to produce the levels of broadening participation necessary to make widespread, systemic differences in the representation of women and ethnic minorities in STEM. Instead, STEM faculty professional development must now be: 1) grounded in the theories, research, and best practices of leadership studies; 2) focused broadly on national coalition building; and 3) mindful of the need for leader wellbeing. Embracing leadership as a key element for broadening participation, though, requires that we first address two significant barriers – the lack of diverse STEM faculty in leadership positions and the dearth of culturally relevant leadership development opportunities that can support such faculty. To that end, Fielding Graduate University, in collaboration with the Society of STEM Women of Color, Inc., introduces the SANKOFA Leadership Development Series. SANKOFA, loosely translated to “looking back while going forward” serves as the conceptual framework upon which this professional development model – comprised of a Leadership Academy, Author Development Institute, and Well-Being Workshop – will strategically use lessons learned from

successful past performances in leadership development for STEM women faculty of color to chart a new path forward. This curriculum holistically captures the lived experiences of women of color and translates them into effective practices for professional growth and development, while foregrounding the intersectional complexity of the lived experience of women of color as the core component for individual, institutional, and social change. As such, this proposed leadership development series centralizes – and thereby confers cultural authority to – that “lived experience” and enacts it through the structure and themes of every activity. This, in turn, ensures that intersectional complexity and how it impacts the lives of women of color in STEM permeate the entire leadership development experience. This poster presentation will highlight the conceptual framework of SANKOFA, its principal components, and preliminary qualitative data that supports its structure.

Funder Acknowledgement: National Science Foundation HBCU Undergraduate Program

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Poster Category: STEM Research

The Impact of the Socio-Cybersecurity Project: HBCU-UP TIP Award 2016-2019

Carlene Turner, Norfolk State University

Co-Author(s): Claude Turner, Kianga Thomas, Yuying Shen, Robert Perkins, Cheryl Hinds, Jonathan Graham

The work that will be presented in our poster is based on the analysis of infusing cybersecurity modules within the sociology and criminal justice undergraduate curricula through experiential learning at a Historically Black College and University (HBCU). The project's research questions are: (1) How has cybersecurity infusion impacted social science students' security awareness? (2) Has experiential learning technique improved students' application of cybersecurity? and (3) Can a standardized evaluation model facilitate the analysis of cybersecurity infusion? The methodological techniques that are being used to analyze the research questions are: (1) a quasi experimental design which captures students' learning through pre- and post-tests after socio-cybersecurity module integration; (2) a quantitative descriptive analysis of the feedback from a socio-cybersecurity faculty workshop; and (3) a tracer survey on the population that was taught all the socio-cybersecurity modules from a HBCU-UP Targeted Infusion Project, projected to run from 2018-2019. T-Test analysis will be used to evaluate the data from the pre-and post-test; while multiple regression will be used to analyze the tracer study results. The learning theory that frames the research question is Vygotsky's social constructivism of learning. This will be complemented by other constructivism learning theories, such as Wankat and Oreovicz scientific learning cycle paradigm; and Sociologists W.I. and Dorothy Thomas' social construction of reality. Research

outcomes based on these theories should add to the discourse on experiential learning of non-computer science students being trained in cybersecurity. The expected outcome from this research project should demonstrate the effectiveness of experiential learning in acquiring solid cybersecurity knowledge and awareness. It will also explain the impact of faculty training on the production of experiential learning modules. The analyses will also delineate the impact of demographic and situational variables in shaping the experiences of non-computer science students at a HBCU as they were engaged in hands-on, experiential learning.

Funder Acknowledgement: NSF's HBCU-UP Targeted Infusion Project

Technology & Engineering

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Poster Category: STEM Science and Mathematics Education

CREST CREAM: Education and Outreach Activities

Messaoud Bahoura, Norfolk State University

We present the education and outreach activities for the CREST Center for Renewable Energy and Advanced Materials at Norfolk State University. We present the incorporation of CREST CREAM generated new knowledge into the course materials development and/or enhancement, particularly the research subject related to graduate courses. In addition, we have developed undergraduate and high school research training and internship programs that attracted underrepresented minority students. Professional development included postdoctoral training, invited speaker seminars, NSF-GRFP workshop, NSF postdoctoral webinar, intel workshop, PIVOT-Fastlane workshop, ethics in research workshop and many other student-led workshops. A journal club was proven beneficial to participants with a goal to ensure that both trainees and faculty under the CREST grant are broadly familiar with the current literature in all thrust areas of the grant. It helped promote collaboration and cross-pollination across thrust areas and teach trainees about collegiality and critiquing scientific literature. Outreach activities included NanoDays outreach event at children's Museum of Virginia and several successful outreach activities to K-12 institutions such as participation in career fairs and participation in Health and Science Summer Academy at Norfolk State University.

Funder Acknowledgement: This work is supported by the CREST-CREAM HRD 1547771.

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Poster Category: STEM Research

UAPB STEM Academy Model

Charles R. Colen, Jr., University of Arkansas at Pine Bluff

Co-Author(s): Anissa E. Buckner, University of Arkansas at Pine Bluff

The University of Arkansas at Pine Bluff (UAPB) is an HBCU, land grant institution located in the Arkansas Delta, home of Arkansas' largest Black population. The university has an enrollment of 2425 students. The UAPB STEM Academy is a well-integrated set of enrichment programs designed to help meet local, state and national human resource needs in STEM areas. As an HBCU with a land grant mission, the UAPB has a legacy of service to underserved, rural and minority populations. The UAPB STEM Academy Model reflects this mission and has a particular emphasis on helping to increase the pool of well-prepared underrepresented minorities in STEM majors and careers. Currently, there are three enrichment initiatives, including the NSF-funded HBCU-UP Comprehensive Implementation grant which is foundational to the STEM Academy; the NSF-funded Arkansas Louis Stokes Alliance for Minority Participation grant which is reflective of best practices learned in the HBCU-UP STEM Academy; and the U.S. Department of Education funded M.Ed. Degree in Computer Science Education Program. All are designed to help meet research, teaching and industry needs in STEM areas, with a particular emphasis on diversity in these critical sectors of education. Some key components of the STEM Academy initiatives include: guest lecture Series, advisory board, summer and Saturday academy, hands-on research/mentor experiences, internships, study groups, curricula and infrastructure upgrades. Currently, the STEM Academy is housed in a 29,000 ft facility which provides a central location for a synergistic approach to achieving STEM goals, objectives and activities.

Funder Acknowledgement: National Science Foundation (NSF): HBCU-UP Program

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Poster Category: STEM Research

Process Viability of 3D Printed Solar Cells

Tarik Dickens, High-Performance Materials Institute, Florida A&M University-Florida State University College of Engineering
Co-Author(s): Sean Jackson, Florida A&M University

Energy production by renewable resources is a rapidly increasing market as groups attempt to meet current energy production requirements while reducing the impact of fossil fuel-based pollution. Solar panels comprised of 2D cells have to overcome the problem of sunlight incident angle variation which

reduces the overall efficiency of stationary solar panels and prohibits use in highly dynamic environments. The challenge of incident angle optimization can be overcome through use of wire-shaped dye-sensitized solar cells (WS DSSCs) that make use of wire-shaped solar cells with a cylindrical design, removing the dependence on an optimal sunlight incident angle. Current WS DSSCs utilize liquid electrolytes that suffer from several complications, including: electrolyte volatility, increased cell degradation, and accelerated performance deterioration over time. These issues can be addressed by using gel-based electrolytes that exhibit higher overall stability, lower solvent evaporation, and higher shape retention capabilities through addition of polymer additives such as Poly(vinylidene fluoride-co-hexafluoropropylene) (PVDF-HFP) and Poly(ethylene oxide) (PEO). Preliminary results show that combining polymer solutions of PVDF-HFP and PEO of varying concentration with liquid electrolytes increases the electrolyte/polymer blend viscosity. The fluid dynamics electrolyte/polymer blends were quantified through rheological flow curves allowing for the iterative prediction of printability of consecutive electrolyte/polymer blends when printed under varying extrusion conditions. When extruded with a nozzle diameter of 200 μm , print height of 0.2mm, and a printing pressure of 100 PSI, currently optimized prints exhibit height to width filament ratios of 0.73, 0.77, and 0.79 when printing at 1.5, 1.0, and 0.5 cm/s speeds, respectively, demonstrating our ability to effectively print polymer/electrolyte blends in a controlled manner.

Future research involves impedance testing of optimized polymer/electrolyte blends in efforts to analyze the impact of increased electrolyte viscosity on resultant ionic transfer efficiency. We aim to use a core-shell nozzle design to allow controlled extrusion of an optimized polymer/electrolyte blend around the electrode, automating the application of a more stable electrolyte around a WS DSSC and partially automating WS DSSC fabrication.

Funder Acknowledgement: CREST Award#1735968 and RISE Award #1646897

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Poster Category: STEM Research

Determining Solid Dispersion Effects on the Curing Profile and Mechanical Properties of Polymeric Composites

Jerald Dumas, Hampton University

The merger of additive manufacturing (AM) and biomaterials have great implications in tissue engineering as it allows for the customization of medical instruments, prosthetics, and in vitro models. Polymeric composite materials used in bone tissue engineering present a challenge as particles (typically at high

volume percentages) are used as fillers. Great advances have been achieved in the fabrication of biomaterials for bone tissue engineering using 3D printing. Such advanced platforms include sintered biomaterials that are based from hydroxyapatite and tricalcium phosphate, inorganic bone substitutes that resemble the mineral content of bone. However, such materials lack the organic collagen and other bone derived proteins that are critical in cell-bone matrix interactions. In this study, the dispersion of allograft bone particles in reactive polyurethane is studied to enhance its utility in AM.

Funder Acknowledgement: NSF Research Initiation Award (1700351); NSF NanoHU (1238838); NSF Partnerships in Research in Education and Materials (PREM) (1523620)

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Poster Category: STEM Science and Mathematics Education

Development of Active Learning Units for Nuclear Engineering

Stephen Egariwe, Alabama A&M University

Active learning units are important to technical skillset development in STEM disciplines. This presentation covers the development of active learning units for undergraduate nuclear engineering courses. The goal is to enhance students learning and technical skills that could improve their preparation for success in pursuing STEM graduate programs and careers in nuclear engineering. The active learning activities include 1) problem-solving units aimed at understanding fundamental concepts, and 2) hands-on laboratory-based units aimed at mastering skillset development. This presentation focuses on introduction to nuclear engineering topics such as radioactivity and half-life, binding energy, atom density, radiation interactions, radiation dose, radiation shielding, stopping power, and fission process.

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Poster Category: STEM Research

UAV Data Processing for Floodplain Mapping

Leila Hashemi Beni, North Carolina A&T State University

Co-Author(s): Jeffery Jones and Asmamaw Gebrehiwot, North Carolina A&T State University; Gary Thompson and Curt Johnson, North Carolina Geodetic Survey

Among different natural disasters, floods are the most

devastating, widespread and frequent and account for approximately 30% of the total loss caused by natural disasters. Accurate flood risk mapping is critical in reducing such damages by correctly predicting the extent of the flood, supporting emergency-response planning, developing land use plans and regulations with regards to the construction of structures and infrastructures and providing damage assessment in both spatial and temporal measurements. The reliability and accuracy of such flood risk maps significantly relies on the quality of digital elevation model (DEM) and topography information. Unmanned Aerial Vehicle (UAV) have recently been recognized as an efficient data acquisition medium to quickly deliver high temporal and spatial resolution imagery data with a great potential for fast and accurate on-demand DEM production in flood risk prediction applications. This study investigates the quality of an UAV-based DEM for spatial flood assessment mapping and evaluating the extent of a flood event in Princeville, NC during Hurricane Matthew. The challenges and problems of on-demand DEM production during a flooding event were discussed. An accuracy analysis was performed by comparing the water surface extracted from the UAV-derived DEM with the water surface/stage obtained using the nearby US Geologic Survey stream gauge station and LiDAR data.

Funder Acknowledgement: This research is based upon work supported by the National Science Foundation (NSF) under grant number 1800768.

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Poster Category: STEM Research

CREST Center for Water and the Environment

Kerry Howe, University of New Mexico

The CREST Center for Water and the Environment (CWE) has been leading a transformation in water-related research at the University of New Mexico in Albuquerque. The research activity in the Center is organized around four topics: watershed processes, water treatment technologies, water/energy interactions, and research integration. The Center is currently nearing the end of Phase I funding from NSF, and has provided research funding for over 90 participants who generated more than 140 publications, presentations, and theses, and conducted outreach about STEM to thousands of participants during visits to local K-12 schools, public events, and professional conferences using custom-designed outreach activities built by our students. The CREST CWE has also developed and taught a dual-credit (i.e., simultaneous school and college credit) class about water resources and careers in STEM at a local school with high Hispanic attendance and has sponsored an annual water conference that gathers and connects regional leaders and newcomers. This poster will give an update on the current research and outreach activities in the center, as well as plans for the future.

Funder Acknowledgement: HRD-1345169 (CREST Center for Water and the Environment)

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Poster Category: STEM Research

Direct Numerical Simulation for Shock/Turbulence Interaction with Applications to Supersonic Cavity Flows

Ovais Khan, Tuskegee University

Cavity flow occur on several aerospace applications. Examples include: aircraft missile bays, landing gear openings, etc. Most of the flow fields around a cavity falls into the category of compressible fluids. High speed cavity flow offers multitudes of flow features of interest to the field of fluid dynamics. The problem is of great interest because it involves shock waves, expansion waves, shear layers, eddies, and aero-acoustic interactions. At an experimental level, studying supersonic cavity flow can be time consuming and costly. Moreover, shock environments can be destructive and complicated to recreate. Computational Fluid Dynamics (CFD) offers advantages that mitigate experimental issues. The present study is investigating the capabilities of a high-resolution numerical scheme in characterizing high speed flow over an open cavity. The numerical solver based on a modified high-order Weighted Essentially Non-Oscillatory (WENO) has been developed to simulate the complex cavity flow field. Results predicted by the modified WENO scheme provide more details of the complex flow field. It clearly predicts the shear layer separations and subsequent impingement of the rear wall of the cavity, propagation of edge tones, and vortices inside the cavity. However, results predicted by low order numerical scheme based on Total Variation Diminishing (TVD) limiters were smeared and were not portraying accurate flow features.

It has been found that the high order numerical scheme requires less number of grid points when compared to a low order numerical scheme to predict accurate flow features. Based on the present research activity, it can be concluded that the modified high-order WENO scheme offered a multitude of advantages over the low-order TVD scheme. The computational results show that the WENO scheme provides a more accurate and detailed flow field when compared to the TVD scheme, even when the WENO scheme is using less grid points. Likewise, the WENO scheme required less computational time to accomplish these gains.

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Poster Category: STEM Research

NSF-CREST Center for Cellular and Biomolecular Machines

Carrie Kouadio, University of California, Merced

Co-Author(s): Nora Cole, Sayantani Ghosh, Kara McCloskey, Ajay Gopinathan, and Victor Muñoz, University of California, Merced

The Center for Cellular and Biomolecular Machines (CCBM), established with a \$5 million grant from the National Science Foundation, is a Center of Research Excellence in Science and Technology (NSF-CREST) at the University of California, Merced, with a focus on biophysics, bioengineering and biochemistry. The CCBM brings together more than twenty faculty members from multiple units across campus, including bioengineering, physics, chemistry and chemical biology, materials science and engineering, mechanical engineering and molecular cell biology. The CCBM uses an interdisciplinary approach combining physical, biological and engineering methods to understand and control the functioning of multi-scale assemblies of biomolecules and cells, and to design and develop novel bio-inspired functioning machines ranging from designer cells and tissue to diagnostic and therapeutic devices. The CCBM also hosts an integrated, interdisciplinary training program for graduate students that emphasizes physical and biological components and research/training experiences for undergraduate and high school students to enhance the recruitment of underrepresented groups into Science, Technology, Engineering and Mathematics (STEM) fields. The center also leads STEM-focused broadening participation and outreach activities for K-12 students and the community. The CCBM has three research areas: Thrust 1: Biomolecular Machines--Proteins are true cellular nanomachines that perform sophisticated biological functions by self-assembling into dynamic 3D structures that use thermal energy to change shape in response to specific stimuli. Amid their many functions, proteins make for excellent nanoscale instruments. Thrust 2: Macromolecular Assemblies and Hybrid Devices--The high rate of discovery in nanotechnology is permitting us to realize nanomaterials with interesting new properties that can be used for building hybrid devices in conjunction with biomolecules. We focus on several of these applications including novel therapeutic delivery systems and nanoparticle-based biosensors. Thrust 3: Cellular and Multicellular Systems--Large scale assemblies composed of multiple cells are ubiquitous, ranging from tissue to biofilms, and exhibit striking emergent behaviors controlled by cell mechanics and cell-cell interactions. We are developing new methods to study and guide the development of bacterial communities and differentiating tissue.

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Poster Category: STEM Research

Next Generation Multifunctional Composites CREST Center-Phase II

Patrick Mensah, Southern University and A&M College

Co-Author(s): Samuel Ibekwe, Guoqiang Li, Fareed Dawan, Rachel Finley, Guang-Lin Zhao, and Isiah Warner, Louisiana State University and A&M College

Southern University and A&M College (SU) in Baton Rouge, in collaboration with Louisiana State University (LSU), has begun Phase II of its Next Generation Composites CREST Center (NextGenC3). The vision of this collaboration is to further grow a strong, ongoing, collaborative, innovative, and self-sustaining research culture and educational infrastructure programs at SU and LSU. The transformational research and education activities envisioned in this Phase II CREST Center project involves promoting advancements in multifunctional smart composites and related technology development, nanocomposites, novel microstructure design, and multiscale porous polymer composites, including materials synthesis and characterization, computational modeling and simulation, and additive manufacturing and applications. This new CREST Center is titled, "NextGen Multifunctional Composites Phase II", or Phase II for short. The mission of the Phase II Center is to develop synergistic and pioneering research based on multiscale and multifunctional composite materials and computation models that will also provide excellent educational and research training opportunities to traditionally underrepresented minority (URM) students in Science, Technology, Engineering, and Mathematics (STEM) disciplines. The Center rationale is to become a nationally recognized entity that synergistically promotes integration of research and education through collaborations. The proposed Center will have the following overarching goals: 1) to develop into a self-sustaining and nationally recognized engineering and science resource Center for Next Generation Composites, 2) to strengthen the quality and national competitiveness of diversified faculty and student bodies at SU and LSU in STEM fields, and 3) to provide education and research integration and exposure to students from K-16 to doctoral level, and to the general public, including persons with disabilities. The State of Louisiana has identified advanced materials, manufacturing, and computational science as core enabling sciences and technologies. As the flagship institution of the nation's largest public HBCU system, SU has responded to the State's call by restructuring academic programs and research priorities into the NextGen Composite Phase II Center initiative.

Funder Acknowledgement: We would like to acknowledge the National Science Foundation (NSF), Award 1736136.

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Poster Category: STEM Science and Mathematics Education

Transforming the Culture of STEAM Education through a Community of Practice

Augustus Morris, Central State University

Co-Author(s): Suzanne Marie, Central State University

In higher education, the lecture has become the standard delivery mode of instruction, thus leading to the passive learning of students. Passive learning has been known to be inefficient in sustaining mastery of learning for a long time. Methods of instruction that promote active learning, such as the flipped classroom, are proven to engage student self-ownership leading to sustainable life-long learning. A greater number of universities are promoting active learning in the classroom; however, this transformation is slow. Today's student lives in a fast paced, digital world where information is easily accessible, and decisions are made quickly based on personal and tangible criteria. Students desire to learn new topics at a fast pace, in a collaborative environment, and apply what was learned to real examples. Standard methods of passive instruction combined with technology-savvy students create a gap in supporting effective learning spaces. Instructors must be facilitators in the classroom and students must take greater ownership of their learning. A need exists to cultivate this shift in learning culture both from inside and outside the classroom. Central State University continues to develop active learning practices in the classroom integrated with an evolving Community of Practice (COP) emphasizing the benefits of learning with students sharing similar education and career goals. Several courses are evolving toward a flipped classroom model to stimulate active learning by students. A Scholastics Team (COP) has been created to promote a social environment of learning and professional development. Through aggressive marketing, a transformation in the general culture of students toward self-directed learning is taking place.

Funder Acknowledgement: NSF HBCU-UP

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Poster Category: STEM Research

Fractional-order-based System Identification for Heat Exchange Systems

Arturo Pacheco-Vega, California State University, Los Angeles

Co-Author(s): Kin. M. Li, California State University, Los Angeles; Mihir Sen, University of Notre Dame

We present a system identification (SI) procedure to build linear time-dependent fractional-order differential equation (FDE) models, that are able to describe time-dependent behavior of heat exchangers. The SI operation is carried out via global

regression of an error-cost function by a simulated annealing optimization algorithm. The parameters in the models are: the order of the equation, the coefficients in it and – when necessary – the derivative of the initial condition. The Caputo definition of the fractional derivative and the Mittag-Leffler function are used to obtain the corresponding solutions. To test the SI approach, we consider a number of time-dependent analytical problems and experimental data from a shell-and-tube heat exchanger. In all cases, the resulting fractional-order model represents behavior of the system more accurately than typical integer-order models.

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Poster Category: STEM Research

CREST Center for Complex Materials Design for Multidimensional Additive Processing (CoManD)

Subramanian Ramakrishnan, Florida A&M University (FAMU)

Co-Author(s): Tarik Dickens, Mandip Sachdeva, FAMU

With CREST program support, Florida Agricultural and Mechanical University (FAMU) will establish the Center for Complex Materials Design for Multidimensional Additive Processing. The Center will promote advancements in the manufacture of novel combined materials in the micrometer scale for applications in magnetic shielding, energy and bio-medical technology. The ability to pattern multiple materials on micrometer length scales in three dimensions is critical for several technological applications including composites, microfluidics, photonics, and tissue engineering. The Center will be comprised of an interdisciplinary team of faculty from Chemical and Biomedical Engineering, Industrial Engineering, Biological and Agricultural Systems Engineering, Chemistry, Pharmaceutical Sciences and Physics. Simulations coupled with experiments will result in a molecular level understanding of the forces governing self-assembly in different materials. Printing of three dimensional tumor cell cultures on a chip using appropriate hydrogels will allow evaluation of the cytotoxicity of anticancer drugs and nanoparticles. Enhanced cell efficiency of printed photovoltaic cells will impact applications in portable electronics and power generation in automotive and space applications. The combined effect of flow and magnetic field-induced orientation of novel nanoparticles will result in lightweight materials with enhanced dielectric properties for shielding and sensing applications. Undergraduate courses based on fundamentals of self-assembly, nanoparticle synthesis and characterization, additive manufacturing, nanomaterials in biology, and nanoparticles in medicine will be developed and offered to FAMU. A laboratory course in materials will be offered to graduate and undergraduate students involved in materials research. In the poster we will report on our progress

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on research and education over last year and a half and our plans for the future.

Funder Acknowledgement: NSF Award # 1735968

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Poster Category: STEM Research

Targeted Infusion Project: Enhancement of Materials Science Education through Active Learning at FAMU

Subramanian Ramakrishnan, Florida A&M University (FAMU)

Co-Author(s): John Telotte, FAMU

The aim of the TIP proposal is to leverage the department of chemical and biomedical engineering strengths in material science to develop a sustained and coordinated effort in attracting, retaining, and mentoring underrepresented minority students. The specific goals of this proposal include: 1) increasing the number of pre-engineering students that pick an engineering major, specifically chemical engineering; 2) increasing the number of students that pick the materials option; 3) increasing the number of students participating in an undergraduate research project; and 4) motivating and encouraging students to pursue graduate studies. The work proposed first utilizes active learning in demonstration laboratory experiments to increase the number of students that transition from a first-year engineering course to engineering major with a focus on chemical engineering and materials. Once students have taken the chemical engineering track, course and laboratory exercises are used right through the curriculum (consistent sustained effort) to direct students to the study of Materials Science. We will report on the three different experiments that we have developed – Differential Scanning Calorimeter, Brookfield Rheometer and the Corrosion Equipment. Videos have been created for equipment operation, sample preparation, data acquisition and subsequent processing and analysis. A website has been created for the NSF project which will house the information and aid in disseminating the information to other departments and universities. To further increase the likelihood of successful completion of a degree, a summer research experience will be offered to a select number of students. This will involve direct interaction with the faculty and mentoring by a graduate student. Finally, to expose the students to the professional world of Materials Science, an American Chemical Society (ACS) student chapter has been established for the first time at FAMU and students involved in research will be given an opportunity to present at the Florida ACS meeting and participate in the Polymers Division activities.

Funder Acknowledgement: NSF Award #1623206

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Poster Category: STEM Research

10 Years of Transformative Research on Nanotechnology: The Highlights of UPRM-CREST

Oscar Marcelo Suarez, University of Puerto Rico - Mayaguez

Co-Author(s): Agnes M. Padovani-Blanco, Madeline Torres-Lugo, Arturo Hernández-Maldonado, and Oscar Perales-Pérez
University of Puerto Rico - Mayaguez

Established in 2008 at the University of Puerto Rico – Mayagüez (UPRM), the Nanotechnology Center focuses on in-depth training of students from public schools, undergraduate and graduate students through research-intensive interdisciplinary activities. The Center's research structure encompasses four Interdisciplinary Research Groups (IRGs) focused on specific subjects but linked by the exploitation of new phenomena at the nanoscale in areas related to nanomedicine, water cleaning and disinfection, and materials for sustainable applications. The outcomes of Phase I and II of the Center led to more than 500 posters and oral presentations, as well as near 150 peer-reviewed publications and graduation of dozens of graduate students. Through these ten years, the Center members obtained more than \$25 million from federal agencies to expand the research and education impact.

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Poster Category: STEM Research

Enable Digital Thread and Digital Twin Learning Environment for Cybermanufacturing Education

Zhenhua Wu, Virginia State University

In the era of Industry 4.0, cybermanufacturing is an emerging technology based on cyber-physical systems (CPS), Industrial Internet of Things (IIoT), data analytics, and high performance computing drive the “digital thread” to optimize productivity, product quality, and business feedback. This is echoed by the “Report to the President Accelerating US Advanced Manufacturing” that includes: 1) advanced sensing, control and platform for manufacturing, 2) visualization, information, and digital manufacturing, are two emerging technologies of national importance. However, cybermanufacturing education is not addressed in the current manufacturing education knowledge model. Virginia State University (VSU) received an NSF grant on cybermanufacturing education in 2018. This is the work-in-progress on how to enable digital thread and digital twin cyberlearning environment at VSU.

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Poster Category: STEM Research

Excellence in Research: Fast Functional Imaging of Neural Networks with Nanoelectrode Arrays

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The objective of this collaborative research project is to develop a novel Electrical Impedance Tomography (EIT) imaging system which can simultaneously image multiple areas of the brain including deep brain structures in behaving animals. This will enable, for the first time, chronic imaging of fast neural activity for deep brain structures and neuronal networks with spatio-temporal resolution of 1 ms and 100 micrometer. We will validate it in a neuronal network in deep limbic and brainstem structures, but once developed it could be used anywhere in the brain. This EIT imaging technology for fast neural activity could lead to radical advances in understanding brain function and enable quantitative mathematical modeling and analysis of neural systems. This could aid the development of new treatment for neurological disorders like schizophrenia, depression and epilepsy, as well as advancing cognitive and computational neuroscience. This interdisciplinary research project will also enhance research capacity and promote the participation of underrepresented minority (URM) students in STEM education. Overall, this project will implement new technology and approaches that support our goal of increasing the participation and contributions of URM populations in neural engineering and in STEM, in general.

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Poster Category: STEM Research

Targeted Infusion Project: Integrative Makers Course and Laboratory for STEM Undergraduates

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STEM education is based on the idea of preparing students in four disciplines, namely, Science, Technology, Engineering and Mathematics, in an interdisciplinary and applied approach.

Research on STEM education advocates that the four disciplines be taught in a cohesive integrative way based on real world applications. Yet, the vast majority of institutions in the US offer STEM programs as distinct compartmentalized courses that focus on rules, procedures, laws, theorems, and formulas to memorize rather than emphasize a unified approach to STEM learning. As a result, STEM majors rarely get an opportunity in their undergraduate education to experience how STEM concepts can be made to interact to solve contemporary real-world industry-like problems. To make STEM learning purposeful and fulfilling, this proposed TIP effort is synergized with a HBCU-UP Implementation grant to provide STEM juniors and seniors with experiences that are aligned with industry practices through a new and novel Makers Course and associated Makers Laboratory (MC&ML) called "Conducting Integrative STEM Research in a Makerspace". The novelty of the MC&ML lies in its framework of the "Makerspace", a dedicated physical area where students from different STEM disciplines will convene for work on collaborative hands-on research projects in advanced multidisciplinary fields such as nanocomposites, biomaterials, smart materials, and computation modeling. The MC&ML is designed to provide students with industry-like experiences needed for STEM workforce readiness and will have adequate space and equipment to serve 140 STEM upperclassmen during the life of the TIP grant out of which 60 will be supported through the TIP effort (TIP Scholars). The HBCU-UP TIP program interventions include: (1) establishment of the MC&ML; (2) use of "Learning through Lectures and Making" whereby teams of multidisciplinary faculty give lectures, mentor students and supervise projects on dedicated STEM-focused topics; (3) presentations and workshops from invited industry personnel; (4) research experiences for TIP Scholars in the MC&ML during summers; and, (5) immersion of TIP Scholars in all interventions on the HBCU-UP Implementation grant and vice-versa, which will provide synergy between both projects.

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Poster Category: STEM Research

Water Management for Hydrocarbon Development in the Permian Basin: Understanding Linkages Between Stakeholder Behavior and Public Perception

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Unconventional Oil and Gas Development (UOGD) has led to unprecedented growth in hydrocarbon production in the arid Permian Basin (NM, TX). However, continued growth is

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dependent upon the efficient management of the water required for hydraulic fracturing and the large volumes of produced water. How this water is managed is dependent upon stakeholder choices, which are influenced by economics, available infrastructure, perception of risk, and public sentiment. This poster describes a three-pronged approach to quantify the factors that drive stakeholder decision-making: 1) expert interviews of stakeholders including producers, water sellers, midstream companies, and regulators; 2) narrative analysis of media coverage in local and national news outlets; 3) evaluation of public sentiment of UOGD in the region using social media data. Understanding the major influences and feedbacks between choices and perceptions will provide inputs to a hybrid agent based and system dynamics model linking stakeholder behavior and resource allocation within the Permian Basin. Model simulations will evaluate outcomes of regulatory scenarios for future potential impacts on regional water resources, infrastructure, and economies. These results will generate critical information to both stakeholders and the public about opportunities to improve system resiliency and reduce risk.

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