2018 HBCU-UP/CREST PI/PD Meeting

FEBRUARY 21-22 | WASHINGTON, D.C.

AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE

#VanguardSTEM:

Living at the intersections, working on the STEM frontier

#VanguardSTEM is an empowered, intersectional community of women of color in STEM who are dedicated to forefronting the expertise, sharing the stories, identifying the struggles and celebrating the accomplishments of other women of color in STEM.

WHAT WE DO

- Produce a live web-series with timely and relevant content
- Celebrate women of color with weekly #WCWinSTEM features
- Publish original content written by and for women of color in STEM
- Foster support and networking via our online platform
- Convene as a community virtually and at in-person events
- Advocate for ourselves + our STEM interests

JOIN THE MOVEMENT

Volunteer! Be part of the team that makes it all happen.

Nominate a woman or non-binary person of color for #WCWinSTEM

Share your story and expertise; we're always accepting contributions.

Spread the word!

Make a donation!

Connect with us on social media: @VanguardSTEM

Vanguard STEM

#VanguardSTEM is a signature program of the STEM en Route to Change Foundation, Inc.

2018 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

AAAS
ADVANCING SCIENCE, SERVING SOCIETY

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Overview of the Meeting

2018 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, retention 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

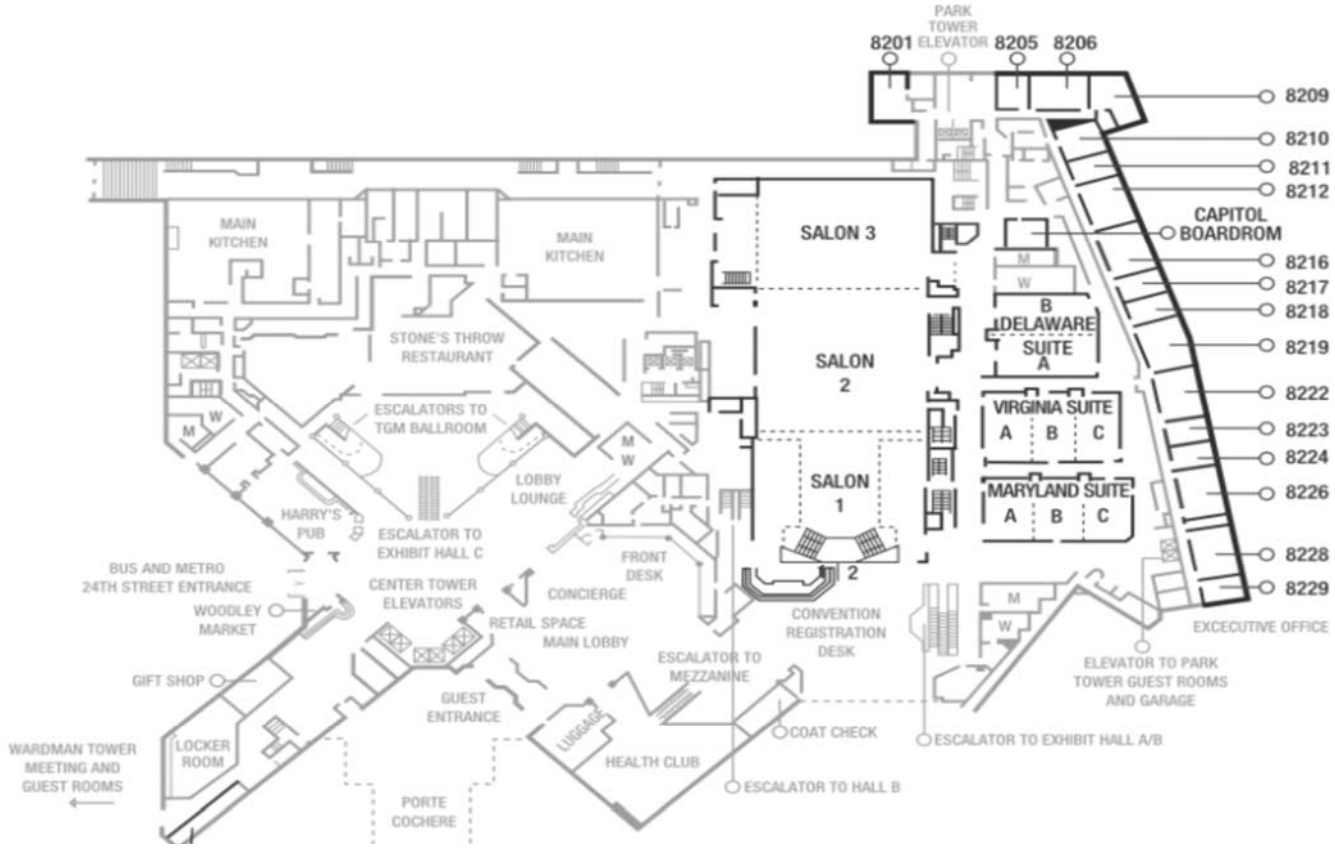
AAAS seeks to "advance science, engineering, and innovation throughout the world for the benefit of all people." To fulfill this mission, the AAAS Board has set these broad goals:

- 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.

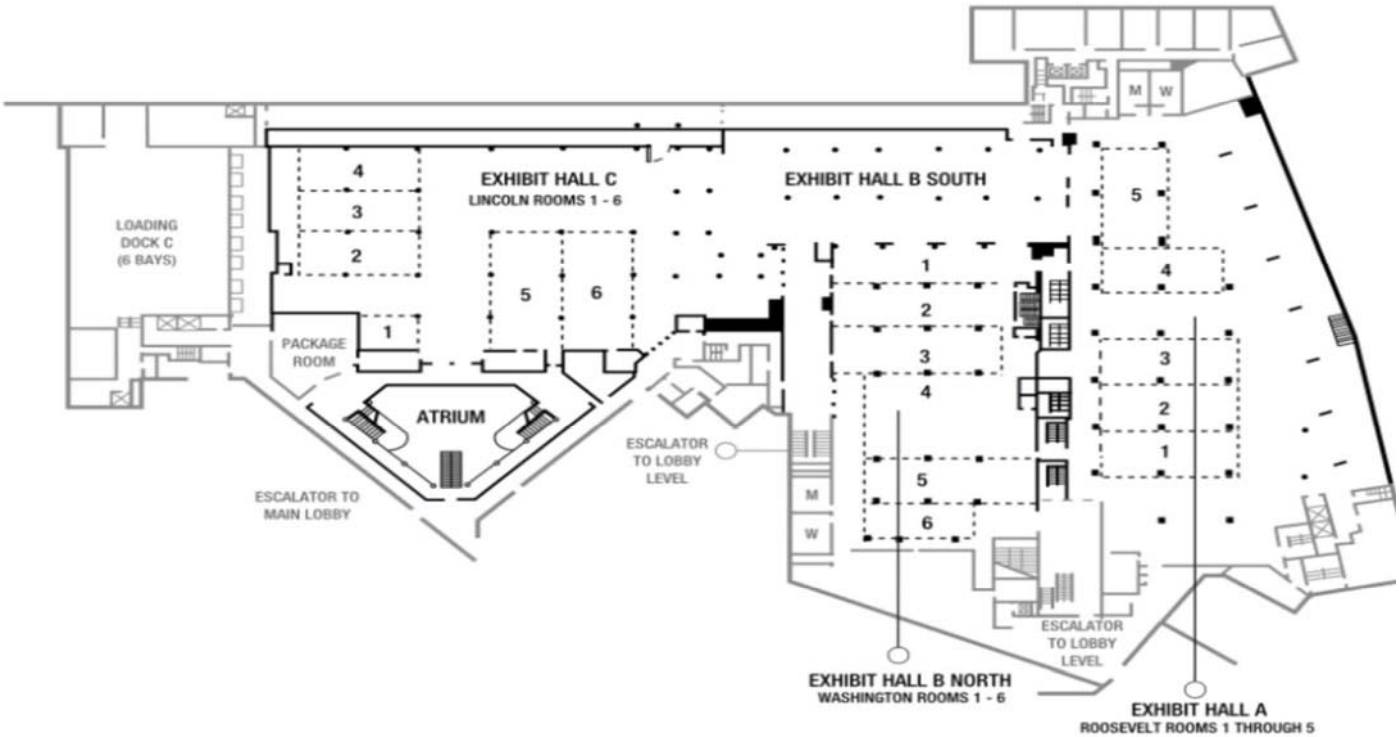
Visit the AAAS website at http://www.aaas.org/.

Hotel Floor Plans

LOBBY LEVEL



EXHIBITION LEVEL



Wednesday, February 21, 2018

2:00pm — **HBCU-UP/CREST PI/PD Meeting Registration**
Convention Registration

2:00pm - 3:00pm — **CREST-PRF: Reception for Fellows and Mentors**
Marriott Balcony A

3:00pm - 3:30pm — **Opening Plenary Session 1**
Maryland

Welcome:
Sylvia James, *Deputy Assistant Director (Acting), EHR, NSF*

3:30pm - 5:30pm — **Concurrent Business Meetings**

Greetings:
Jermelina Tupas, *Division Director (Acting), HRD, NSF*

A. CREST Business Meeting
Marriott Balcony B

Andrea Johnson and Victor Santiago, *Program Directors, NSF*

B. HBCU-UP Business Meeting
Virginia

Claudia Rankins and Clytrice Watson, *Program Directors, NSF*

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 22, 2018

Breakfast On Your Own

8:30am - 9:30am — **Concurrent Breakouts Session 1 Meeting with PIs by Program/Track**

Group 1: CREST Panel "Effective Partnerships"
Maryland A

Victor Santiago, Eduardo Misawa, Erik Jones, and Jesus Soriano Molla, *Program Directors, NSF*

Group 2: HBCU-UP Implementation Projects
Maryland B

Clytrice Watson, *Program Director, NSF*

Group 3: HBCU-UP TIP and BPR Projects
Maryland C

Claudia Rankins, *Program Director, NSF*

Group 4: HBCU-UP RIA Projects
Virginia A

Andrea Johnson, *Program Director, NSF*
Chantel Fuqua, *AAAS Fellow*

9:30am - 9:45am — **Break**

9:45am - 10:45am — **Concurrent Breakouts Session 2 Meeting with PIs by Program/Track**

Group 1: CREST Panel "Post-Award Management"
Maryland A

Victor Santiago and Andrea Johnson, *Program Directors, NSF*

Rashawn Farrior, *Team Leader, DGA*
Janelle Gosey, *Grants Management Specialist, DGA*
Denise Martin, *Branch Leader, DGA*

Group 2: HBCU-UP Implementation Projects
Maryland B

Clytrice Watson, *Program Director, NSF*

Group 3: HBCU-UP TIP and BPR Projects
Maryland C

Claudia Rankins, *Program Director, NSF*

Group 4: HBCU-UP RIA Projects
Virginia A

Moderator: Chantel Fuqua, *AAAS Fellow*

Agenda

	Robert Cave, Edmundo Garcia-Solis, Kwabena Gyimah-Brempong, Casonya Johnson, Brandon Jones, Guebre Tessema, Fay Cobb Payton, Luke Hanley, and Michelle Jenkins, *Program Directors, NSF*
10:45am - 11:00am	**Break**
11:00am - Noon	**Concurrent Breakouts Session 3**
	A. New PI Orientation *Maryland A* **Clytrice Watson,** *Program Director, NSF*
	B. Post-Award Management *Maryland B* **Rashawn Farrior**, *Team Leader, DGA* **Janelle Gosey**, *Grants Management Specialist, DGA* **Denise Martin**, *Branch Leader, DGA*
	C. HSI Program *Maryland C* **Andrea Johnson and Talitha Washington,** *Program Directors, NSF*
	D. HBCU-EiR Track *Virginia A* **Moderator: Chantel Fuqua**, *AAAS Fellow* **Robert Cave, Edmundo Garcia-Solis, Kwabena Gyimah-Brempong, Casonya Johnson, Brandon Jones, Guebre Tessema, Fay Cobb Payton, Luke Hanley, and Michelle Jenkins**, *Program Directors, NSF*
Noon - 2:00pm	**Plenary Session 2 and Lunch** *Marriott Salon 1* **Keynote Speaker:** **Melvin Hall,** *Professor of Educational Psychology, Northern Arizona University*
2:00pm - 3:00pm	**Informal Meeting of NSF PDs with PIs and Students** *Marriott Salon 1*

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**
NSF	**National Science Foundation**
RIA	**Research Initiation Award**
TIP	**Targeted Infusion Project**

Yolanda S. George, *Deputy Director, Education and Human Resources, AAAS*

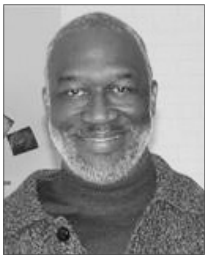
Yolanda Scott George is Deputy Director and Program Director, Education and Human Resources Programs, American Association for the Advancement of Science (AAAS). She has served as Director of Development, Association of Science-Technology Centers (ASTC), Washington, DC; Director, Professional Development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

George conducts evaluations, workshops and reviews for the National Institutes of Health and National Science Foundation, 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 National Science Foundation (NSF) grants, including Vision and Change in Undergraduate Biology Education; National Science Education Digital Library (NSDL) Biological Sciences Pathways; Historically Black Colleges and Universities-Undergraduate Programs (HBCU-UP); 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).

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 BS and MS 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).

Biographies

Sylvia M. James, *Deputy Assistant Director (Acting), EHR, NSF*

Sylvia M. James is the Acting Deputy Assistant Director of the National Science Foundation's (NSF) Directorate for Education and Human Resources (EHR). During her 15 year tenure at NSF, she has served as the Division Director of HRD, Acting Director and Acting Deputy Division Director of the Division of Research on Learning in Formal and Informal Settings, and the Lifelong Learning Cluster Coordinator. She has served as a program officer for the ISE, ITEST, Faculty Early Career (CAREER), and the Advanced Technological Education (ATE) programs. She also worked with the Innovation through Institutional Integration (I^3) and Academies for Young Scientists (AYS) programs. James previously served as the Lead Program Officer for ITEST, and its predecessor, the After School Centers for Exploration and New Discovery (ASCEND). She currently serves as the Co-Chair of the Federal Coordination in STEM (FC-STEM) Broadening Participation Interagency Working Group, the NSF liaison to the Liaison to President's Board of Advisors (PBA) on HBCUs, and has been a member of the Burroughs Wellcome Fund, Student Science Enrichment Program (SSEP) Advisory Committee since 2012. She is a member of the interagency working group for the White House Initiative on Educational Excellence for Hispanics (WHIEEH). She previously served on the Interagency Working Group for Youth Programs (2012-2014) and the 21st Century Community Learning Centers, Interagency Technical Working Group (2011-2014). Prior to coming to NSF, she was the Director of Education at the National Aquarium in Baltimore. She holds a Bachelor of Science degree in Biology from Loyola University, a Master of Science degree from the Johns Hopkins University, and a Doctorate in Science Education from Morgan State University, all located in Baltimore, Maryland.

Andrea Johnson, *Program Director, HRD, NSF*

Andrea Johnson joined the National Science Foundation in 2014 as a rotator Program Director in the Division of Human Resource Development (HRD) in the Directorate of Education and Human Resources (EHR). She manages the Historically Black Colleges and Universities Undergraduate Program (HBCU-UP) and the Centers of Research Excellence in Science and Technology (CREST) program. Prior to coming to NSF, she was a Research Assistant Professor in the NOAA Living Marine Resources Cooperative Science Center (LMRCSC) at the University of Maryland Eastern Shore (UMES) where she conducted research in the areas of physiology, reproductive biology and life history of marine and estuarine fish species. During her tenure at UMES, she served as the Associate Director for the National Science Foundation's CREST Center for the Integrated Study of Coastal Ecosystem Processes and Dynamics in the Mid-Atlantic Region. She has also directed several K-12 STEM education and outreach activities for teachers and students. Johnson obtained her BS degree in Marine Science from the University of Miami, her MS in Marine Science from the University of South Florida and her PhD in Comparative Biomedical Sciences at the North Carolina State University College of Veterinary Medicine.

W. James "Jim" Lewis, *Assistant Director (Acting), EHR, NSF*

W. James "Jim" Lewis is the Acting Assistant Director for the Education and Human Resources Directorate at the National Science Foundation. Lewis is on leave from the University of Nebraska-Lincoln (UNL), where he is the Aaron Douglas professor of mathematics and Director of the Center for Science, Mathematics, and Computer Education. While at NSF, Lewis has served as co-chair of the P-12 Education Interagency Working Group, tasked with coordinating efforts to improve P-12 STEM instruction through efforts across federal agencies.

Lewis began his current position in January 2015. At UNL, he served as chair of the Department of Mathematics (1988-2003). During which time the department won the University-wide Department Teaching Award and an NSF Presidential Award for Excellence in Science, Mathematics and Engineering Mentoring. He also was the Principal Investigator for three major NSF grants, the Math in the Middle Institute Partnership (2004-2011), NebraskaMATH (2009-2014) and NebraskaNOYCE (2010-2014). Lewis has received many teaching awards including his university's Outstanding Teaching and Instructional Creativity Award and the Carnegie Foundation's 2010 Nebraska Professor of the Year Award. He is also the recipient of the UNL Chancellor's Commission on the Status of Women Award for his support of opportunities for women in the mathematical sciences and UNL's Louise Pound-George Howard Distinguished Career Award. In 2015, Lewis was recognized by the Mathematical Association of America's Gung and Hu Award for Distinguished Service and the American Mathematical Society's Award for Impact on the Teaching and Learning of Mathematics. He received his PhD in mathematics from Louisiana State University in 1971.

Shirley M. Malcom, *Director of Education and Human Resources (EHR) Programs at AAAS*

Shirley M. Malcom, Director of Education and Human Resources (EHR) Programs 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.

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 prog-rams 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*

Jermelina Tupas currently serves as the Acting Division Director of the Division of Human Resource Development (HRD), Directorate for Education and Human Resources (EHR) at the National Science Foundation NSF). She has worked in three different federal agencies first as a Program Director for the Division of Molecular and Cellular Biosciences, Biological Science Directorate at NSF from January 2004-July 2006. She then moved to the National Institute of General Medical Sciences-National Institutes of Health from August 2006 to September 2009 and served as a Program Director in the Division of Minority Opportunities in Research. This was followed by a move to the National Institute of Food and Agriculture at the U.S. Department of Agriculture from October 2009 to August 2012 as Division Director for Community and Education. She moved back to NSF as HRD's Deputy Division Director in 2012. Her experiences in these various federal positions range from management of student training portfolios, fellowships, and faculty research portfolios to management, administration and leadership. Tupas was a faculty member at the University of Hawaii at Manoa (UHM) for about 10 years, 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. Her work has always focused on broadening participation of underrepresented groups in STEM. Tupas holds a Bachelor of Science degree in Zoology, a Master of Science degree in Microbiology, and a PhD in Molecular Biology.

Biographies

Clytrice Watson, *Program Director, NSF*

Clytrice Watson is a Program Officer for the Historically Black Colleges and Universities Undergraduate Program (HBCU-UP) in the Directorate for Education and Human Resources at the National Science Foundation. Prior to joining NSF, she served as the Interim Dean for the College of Mathematics, Natural Sciences and Technology and is a Professor of Biology at Delaware State University.

Watson received her Bachelor's degree in Biology from Norfolk State University, Master's Degree in Biology from Delaware State University and PhD from the University of Maryland Eastern Shore in Food Science and Technology/Microbiology. As an aspiring leader in the HBCU community, she completed a certificate of Academic Leadership via the NSF-funded Opportunities for Under Represented Scholars (OURS) graduate certificate program at The Chicago School of Professional Psychology. Her research interest focuses on the retention and academic success of minority students in STEM disciplines.

Poster Abstracts

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Poster Abstracts

Biological Sciences

1

Poster Category: STEM Research

CREST Center of Aquatic Chemistry and the Environment (CAChE)

Todd Crowl, Florida International University
Co-Author(s): Rita Teutonico and Piero Gardinali, FIU, Miami FL

The CREST Center for Aquatic Chemistry & Environment (CAChE) at Florida International University (FIU) tackles one of the region's most complex challenges: environmental contamination. Pollutants – such as pesticides, industrial chemicals, pharmaceuticals, nutrients, oil, and metals – are having devastating effects on ecosystems and the humans, animals, and plants that depend on them. CREST CAChE's 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 is transforming cutting-edge research into technological and science-based solutions for various forms of water contamination, using a framework that includes three collaborative Research Focus Areas (RFAs). The first RFA focuses on detection and identification of contaminants, by extending our current technologies and approaches for measuring anthropogenic contaminants, pollutants and other chemical stressors. The second RFA deals with transport and fate in complex ecosystems, by using new sensing techniques to determine biogeochemical cycles, contaminant sources, storage, transport and transformations across South Florida's natural, agricultural, and human/urban landscapes. Finally, the third RFA involves risk assessment and measuring ecosystem response(s) through data synthesis and visualization, with the goal of communicating this information to decision-makers. All of the RFAs work across 3 key ecosystems: inland freshwater, mangrove habitats, and near shore coastal marine. The education activities of CREST CAChE integrate undergraduate and graduate programs across 10 departments and 4 colleges at FIU, from Biology and Chemistry to Computer Sciences and Public Health. We have developed 2 new innovative Discovery learning courses for undergraduates to engage them with CAChE-related problem solving, as well as introduce them to potential career pathways. Engaging FIU students – 75% of whom are from historically underrepresented minorities – in socially relevant environmental research aims to foster their development as future professionals in STEM (Science, Technology, Engineering, and Mathematics) fields. The guiding principle behind CREST CAChE is to understand nature, "one molecule at a time" and to train the next generation of scientists who will carry this initiative forward!

Funder Acknowledgement: National Science Foundation

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Poster Category: STEM Science and Mathematics Education

Increasing STEM Student Retention and Graduation through Organized Mentoring Programs

Freddie Dixon, University of the District of Columbia
Co-Author(s): Carolyn Cousin, University of the District of Columbia

Increasing STEM Student Retention through Organized Mentoring Programs The University of the District of Columbia (UDC) Science, Technology, Engineering, and Mathematics (STEM) Center for Research and Development was established to promote initiatives, strategies and activities that improve student academic performance. The major focus of the Center is to increase the overall academic proficiency of UDC STEM majors and to increase the number of minority students pursuing careers in STEM. The Center provides enrichment activities; summer programs; seminars, workshops, and lectures from distinguished scientists, mathematicians, engineers, and psychologists; and academic workshops for students to enhance their academic skills. Additionally, students are exposed to research experiences in UDC STEM faculty laboratories, as well as research-intensive universities and facilities throughout the nation and are provided opportunities to present their work at STEM conferences. The Center is the premier program that initiated the concept of a Journal Club for undergraduate students on the UDC campus. When it began, Journal Club was the only STEM program included in this forum. The Center specializes in facilitating undergraduate laboratory and research experiences for all STEM students interested in STEM research and enhancement. The Center has established an Academic Advancement Partnership (AAP) between doctorate degree granting institutions and the Center to facilitate the enrollment of UDC students in the AAP institutions and to provide opportunities for UDC faculty to form research collaborations with AAP faculty. These institutions include: Georgetown University, George Washington University, University of California, San Diego, Rensselaer Polytechnic Institute, Howard University, Johns Hopkins University, Indiana University, University of Wisconsin, and Rutgers University. STEM Center students have been accepted into PhD programs at the following institutions: Cornel University, Howard University, The Scripps Research Institute, University of North Carolina at Chapel Hill, University of Delaware, University of Maryland, Georgetown University, Virginia Commonwealth University, George Washington University, University of Wisconsin, University of Cincinnati, University of Pennsylvania, Stony Brook University, The Rockefeller University, Rutgers University, and Memorial Sloan - Kettering Cancer Center.

Funder Acknowledgement: The STEM Center is supported by NSF/HBCU-UP grants 1531014 and 1622811.

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Poster Category: STEM Science and Mathematics Education

Developing Quantitative Expertise in the Undergraduate Biology Curriculum (QEUBiC)

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The National Science Foundation's HBCU-UP Targeted Infusion Project (August 2014 to July 2018) at Bethune-Cookman University (B-CU), Florida is entitled “Developing Quantitative Expertise in the Undergraduate Biology Curriculum (QEUBiC).” The overall goal of the project is to provide learning experiences for students to develop quantitative and computational skills for biological discovery and analysis. Three additional goals were established through three supplemental funding. The first goal (MATH Supplement in 2015) is to improve mathematics success by providing learning experiences in data analytics to biology undergraduates enrolled in lower level college math courses. The second goal (NSF HBCU Pilot Program Supplement in 2016) is to identify the best predictive metacognitive behavior for developing quantitative expertise in the context of cognitive tutors that facilitate robust learning. The third goal (Public Participation in STEM Research (PPSR) Supplement) is to enhance the research productivity of the faculty and students in the biology program through collaboration with citizen researchers and groups in east central Florida. The PPSR project at B-CU is entitled "Bacteria Influences on the Health of Water Bodies, Soil, Plants, Animals and Humans." Several key achievements include an operational model for developing quantitative expertise in the undergraduate biology curriculum. The model consists of intra-and extracurricular, modular learning transactions that simultaneously targeted the development of student strategic learning, quantitative abilities, and scientific literacy. The project is infusing strategies to enable students acquire robust knowledge of math and statistics characterized by knowledge that is deep, connected, and coherent. The project has collated theoretical frameworks for robust learning of biology with Big Data. The Transdisciplinary Data Scholars Career Development Program (https://goo.gl/oLWTiX) was established to develop the capacity of individuals and teams to harness the data revolution. The QEUBiC infusion project has enhanced the infrastructure for research, instruction and learning of biology at Bethune-Cookman University. Finally, peer-reviewed publications from the project included datasets suitable for infusion into biology courses.

Funder Acknowledgement: 1. National Science Foundation's Historically Black Colleges and Universities - Undergraduate Program (HBCU-UP) HRD-1435186. 2. Dear Colleague Letter: Increasing College Opportunity Through Improved Mathematics Success in the First Two Years of College (NSF 15-026). 3. Dear Colleague Letter: Strengthening Research Capacity at Historically Black Colleges and Universities (NSF 16-080). 4. Dear Colleague Letter: Public Participation in Science, Technology, Engineering, and Mathematics Research: Capacity-building, Community-building, and Direction-setting (NSF 17-047).

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Poster Category: STEM Research

Introducing the Postmortem Clostridium Effect in Decaying Corpses

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A first-of-its-kind study on an emerging topic of the human thanatomicrobiome (thanatos-, Greek for death) has pinpointed Clostridium spp. as the specific bacteria that are the primary mediators of putrefaction in internal organs. This groundbreaking research also introduces and describes a new scientific concept, the Postmortem Clostridium Effect (PCE), which elucidates some of the roles that Clostridium spp. play during human putrefaction. The study encompasses one of the largest cohort of cadavers to date and adds empirical data to the Human Postmortem Microbiome Project (HPMP). Although Clostridium is ubiquitous in internal organs of decaying corpses, there are large gaps in our knowledge of the role that the bacteria contributes. The findings of our previous thanatomicrobiome studies discovered that a majority of microorganisms in the human body after death are the obligate anaerobes, Clostridia. Furthermore, we found that Clostridium spp. predominate at long times since death (up to 10 days). The current study compared the microbial communities profiled by amplicon-based sequencing of the 16S rRNA gene V4 and V3-4 hypervariable regions. We investigated spleen and liver tissues of 45 cadavers and determined that Clostridium spp. also predominate at shorter times since death (4 hours). We attribute Clostridium’s high abundance in decomposing human bodies to three factors. First, Clostridium has a very fast growth rate. C. perfringens has the most rapid doubling time of approximately 7.4 minutes at optimal temperatures. Next, the bacteria have effective proteolytic functions. Clostridium spp. have collagenases that digest vertebrate collagen that permit access to gut epithelia and allow transmigration to other tissues such as liver and spleen. Lastly, Clostridium spp.’s anaerobic nature lends to effective decomposition. Decaying corpses’ internal organs lack oxygen which facilitates the rapid growth of anaerobic bacteria in nutrient-rich hosts. A future research question would be, “What kind of abiotic and biotic factors does

the Postmortem Clostridium Effect have on microbial communities in human cadavers from different geographical locations?"

Funder Acknowledgement: National Science Foundation HRD 1401075

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Poster Category: STEM Research

Saccharification and Fermentation Optimization of Miscanthus Feedstock for Ethanol Production

Amber Jones, Alcorn State University, MS
Co-Author(s): Destiny Crockett, George Frye, Rodrick Patterson, Ananda Nanjundaswamy, Alcorn State University

Feedstock loading and enzyme cost are the two important factors that determine the process efficiency of cellulosic ethanol production. While increased enzyme concentration results in enhanced sugar release, cost of the enzyme makes the process expensive. However increased substrate results in enhanced sugar, but will reduce the fermentation process by interfering in mass transfer rates such as oxygen and heat. Developing an optimal enzyme concentration and feedstock loading will assist in developing an ideal method that can enhance the process efficiency. Miscanthus giganteus is an emerging feedstock for production of bioethanol. The objective of this study was to develop an ideal enzyme and biomass loading concentration for saccharification and fermentation using acid-pretreated feedstock. The pretreatment method, effect of enzyme and feedstock loading and process optimization using RSM design will be discussed.

Funder Acknowledgement: This research was funded by NSF HBCU UP Research Initiation Award to AN.

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Poster Category: STEM Research

Fisk University Implementation Award: Transformative Impact of Fisk University Implementation Award on STEM Learning and Research Capacity

Lee Limbird, Fisk University
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Fisk University engaged in an interdisciplinary approach to increasing student strengths in baseline mathematics courses and supplementary instruction in critical gatekeeper courses in order to support deeper student learning and persistence in STEM majors and transition to post-graduate STEM training and careers. Simultaneously, we have increased the ability of students to behave as scientists by introducing authentic research into course-associated laboratories and increasing faculty research capacity to serve as academic year and summer research mentors for undergraduates. The interdisciplinary STEM focus of our efforts has led to an awareness of the importance of quantitative and computational confidence and competence across all sciences, but particularly in the biological sciences, transformed by the genomic revolution. Current efforts are focused on increasing faculty and student efficacy in quantitative and computational skills and their broad application as we evolve a focus on Quantitative and Computational Life Sciences at Fisk, with aligned new major and minor disciplines for students to engage in.

Funder Acknowledgement: NSF HRD 1332284.

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Poster Category: STEM Science and Mathematics Education

The Payoffs for Retention and Networking of Getting to Know Freshman Students

Jana Marcette, Harris-Stowe State University
Co-Author(s): Anbreen Bashir, Scott Horrell, John MacDougal, and Diane Smoot, Harris-Stowe State University, St. Louis, MO

Despite decades of interest and research into promoting the success of under-represented students in STEM, a persistent gap remains. Nationally, retention in science fields is lower for students in low-income brackets, first-generation students, and minority students. Harris-Stowe State University is an open-enrollment Historically Black College/University that ranks in the top of Missouri public institutions in the degree production of African-Americans, and is thus is an ideal place to study factors that can broaden participation in STEM. Harris-Stowe was awarded a Targeted Infusion Project in the Fall of 2015, with the goal of implementing faculty-driven first-year biotechnology curriculum to study the effect on biology student retention and networking. Prior to the TIP:BIO-BOOST funded intervention, only 6% of first-time freshman were known to full-time biology faculty by the end of their first term (assayed each November). Now in TIP BIO-BOOST year three, the number of first-year freshman known by full-time faculty has grown to 43%. The BIO-BOOST intervention has redefined the first-year biology experience at Harris-Stowe with significant effects on retention and opportunities for students. These successes are being realized during a time of rapid growth (2.5x increase in enrollment) for the Harris-Stowe Biology Program. Through assessment of the TIP:BIO-BOOST intervention, we intend to build both academic and social strategies that promote the success of STEM students.

Funder Acknowledgement: This project is funded by a National Science Foundation HBCU-UP TIP grant, award number 1533545.

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Poster Category: STEM Research

Dopamine Neuron Control by the Transcription Factor FKH-8

Brian Nelms, Fisk University

Dopamine levels are precisely controlled throughout the animal kingdom to regulate coordinated movement, reward, and learning, yet we still have much to learn about how dopamine neurons fine-tune dopamine output. We are identifying and characterizing novel proteins required for dopamine neuron function in the model organism C. elegans through RNA-Seq, genetics, and pharmacological approaches. One protein we have shown to be important is the winged-helix transcription factor FKH-8, a member of the conserved Forkhead/Fox family. FKH-8 is expressed in all dopamine neurons from the embryo to the adult and is required for correct dopamine-dependent movement behavior. We are investigating downstream targets of FKH-8, which may include genes involved in dopamine metabolism. FKH-8 is also expressed in many other ciliated sensory neurons, and we are identifying those neurons and assessing the requirement of FKH-8. This includes the CO2/O2-sensing BAG neurons, which appear to have changes in key gene expression upon loss of FKH-8.

Funder Acknowledgement: NSF HBCU-UP RIA #HRD14-01091; NSF HBCU-UP TIP #HRD13-32491; NSF CREST #HRD15-47757; NIH R25 #1R25MD010396-01; NIH R25 #1R25GM107754-01

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Poster Category: STEM Science and Mathematics Education

Personalized Genetics and Genealogy Exercises Enhance Introductory Biology Courses

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Spelman College piloted a novel approach to increase student engagement in STEM fields, through development of an introductory biology course intervention centered on a genetics and genealogy (G&G) approach. Biology faculty have taught the Genes and Genealogy curriculum in the introductory biology class in fall 2016 and 2017. Introductory biology was taught by personalizing the material for each individual student using the G&G approach. Students were taught the basics of genetics and evolution via an exploration of their own DNA (from genetic testing kits) or of an online “avatar” (the one of the instructors’ DNA sequence). The course involved three modules using genomic aspects of human evolution: Ethical, legal, Social issues in direct-to-consumer genotyping services, estimating Neanderthal ancestry and skin pigmentation analysis. An art component of this curriculum included an iBook titled “Who am I?” portrait builder which invited students to create a narrative about their recent and more deep ancestry. Majority of the students (~80%) opted to use their own DNA rather than ‘avataar’ DNA suggesting a high level of student buy-in for this approach. This was supported by survey data that revealed high level of student enthusiasm and engagement in the course. Most significantly, assessments of student learning before and after each module show learning gains in content knowledge. We conclude that personalizing the introductory science curriculum is an effective strategy to increase student engagement.

Funder Acknowledgement: National Science Foundation

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Poster Category: STEM Science and Mathematics Education

Implementing CUREs: Virginia Union University Research Training Program in the Biology Sciences - Year Two

Carleitta Paige-Anderson, Virginia Union University
Co-Author(s): Vernon Ruffin

Targeted Infusion Projects awarded through the Historically Black Colleges and Universities Undergraduate Program (HBCU-UP) support the development, implementation, and study of innovative evidence-based approaches to improve the preparation of HBCU undergraduate students. This project focuses on the Biological Sciences major at Virginia Union University (VUU) and seeks to address interrelated issues facing STEM departments at many small, liberal-arts institutions, such as: 1) limited access to meaningful research experiences for undergraduates and 2) obstacles to faculty research productivity. To address these challenges, the project will utilize a comprehensive approach to integrate research into the curriculum and bolster faculty research capacity. Herein, we describe the implementation of course-based undergraduate research experiences (CUREs) into the Introductory Biology course(s) to provide all enrolled students access to authentic scholarly endeavors that build on the research expertise of the co-PIs. In 2016, VUU was selected as part of the 10th cohort for the Howard Hughes Medical Institute’s Science Education Alliance-Phage Hunters Advancing Genomic and Evolutionary Sciences (SEA-PHAGES) program. Briefly, one section of the first year general biology course (specifically the laboratory) curriculum was augmented to include SEA-PHAGES. First-year students conducted experimental analyses to extract novel bacteriophages from environmental soil samples, and used bioinformatics tools to annotate the genomes. These efforts are in stark contrast to the traditional laboratory curriculum

designed to expose enrolled students scientific concepts, yet fail to facilitate student application of theoretical content. After 1 year, the teaching and learning environment, fostered through the SEA-PHAGES program, has been evaluated and demonstrate that participating students report an increased likelihood to persist in the biological sciences. Furthermore, the scientific contributions of the faculty and students have been recognized at regional and national conferences underscoring the broader impacts of the project paradigm. It is anticipated that the implementation of CUREs will enhance the quality of STEM education at VUU, leading to the formation of a new research-intensive academic curriculum, and increase VUU's production of STEM graduates who are competitive for graduate school and careers in biological sciences.

Funder Acknowledgement: National Science Foundation

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Poster Category: STEM Research

Peer Mentoring in an Undergraduate Parasitology Research Project

Alexa Rosypal von Dohlen, Johnson C. Smith University

The present study describes a peer mentoring experience in an undergraduate parasitology research setting. The goal of this work was to develop a supportive community of research between a peer mentor and research mentees.

Funder Acknowledgement: This work was supported by grant #1505407 from the National Science Foundation Historically Black Colleges and Universities Undergraduate Program and by a mini-grant from the Scholarship of Teaching and Learning and Applied Research Program at Johnson C. Smith University.

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Poster Category: STEM Research

The Virginia Union University (VUU) Science Technology Engineering and Mathematics (STEM) Research Journal Club

Vernon Ruffin, Virginia Union University
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The Virginia Union University (VUU) Science Technology Engineering and Mathematics (STEM) Research Journal Club is one of the initiatives in the Targeted Infusion Proposal entitled Virginia Union University Undergraduate Research Training Program in the Biological Sciences (#1623357). Specifically, the STEM Research Journal Club serves as an opportunity to create a community of scholars among VUU students, faculty and external research collaborators. Recently at VUU, a small private liberal arts HBCU, there has been an interest in developing the research support structure on campus and creating opportunities for faculty and students to explore current advances in disciplinary research. The VUU STEM Research Journal Club is strategically positioned to cultivate the development of foundational research skills while exploring current advances in disciplinary research. The aims of the VUU STEM Research Journal Club are to expose students to historic and current scientific research topics that are extensions of concepts introduced in academic courses, introduce methods/ techniques used in scientific research and provide students an opportunity to discuss the theory and limitations of such approaches, acquaint students with current investigators and institutions in their field(s) of interest, and train students on how to prepare and give effective PowerPoint presentations summarizing key components of peer-reviewed journal articles and reviews. In addition, the VUU STEM Research Journal Club aims to provide an opportunity for faculty researchers to present an overview of research in their field of interest and/or their proposed or current STEM research. The VUU STEM Research Journal Club will also give external researchers the opportunity to present current data to VUU faculty and students. Together, students and faculty will engage in productive dialogs focusing on methods/techniques and advances in STEM research. The VUU STEM Research Journal Club is designed to promote scientific literacy and scientific awareness in STEM research for STEM majors. It is expected that these efforts will facilitate disciplinary networks, foster opportunities to develop new areas of inquiry, and increase opportunities to establish research collaborations with scientific investigators. Interested students must identify a faculty research mentor who will help identify an appropriate journal to present and train students on how to prepare and give effective PowerPoint presentations summarizing key components of peer -reviewed journal articles. In the Fall of 2017, the VUU STEM Research Journal Club was scheduled to meet every other Wednesday for a total of 6 total Journal Clubs, excluding holidays and scheduled exams. A total of 5 presentations were given; one from each of the targeted populations (faculty, student, and guest researcher) during the Fall semester. To this date, 4 faculty mentors and 4 students have requested presentation dates.

Funder Acknowledgement: National Science Foundation #1623357

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Poster Category: STEM Science and Mathematics Education

Student Insight into Understanding Math Application Problems

Susan Safford, Lincoln University
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We are developing an app for math application problems in biology. The app itself and the problems are being developed primarily by students with guidance from faculty. Student input occurs at every level through the use of student assistants and a student-based focus group of biology and biochemistry majors. Surveys from the last two years show that at least 60% of the students have already used an app of their own volition for a math or science class. Three-fourths of the students expressed interest in an app that focused on math application problems from their biology classes. The app itself is in an early stage of development, but students like the fact that it is designed to showcase Lincoln University while providing them with appropriate problems and useful feedback. The student assistants who assist faculty in developing the problems have proved invaluable in providing the faculty with insight into student thinking and understanding of typical problems we introduce in classes. The misunderstandings that occur are not always apparent in class. This has allowed faculty to provide tutorials that address these misconceptions and to frame the questions in the app in such a way as to discover whether the students are overcoming their misconceptions. This poster will focus on the problems that are chosen and student feedback on the problems themselves.

Funder Acknowledgement: NSF

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Poster Category: STEM Research

Functional Analysis of Cupin Proteins in Arabidopsis Thaliana

Dr. Sanjaya, West Virginia State University
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The combined effects of climate change and an ever-increasing global population have created one of the most serious societal problems of our time. Identifying more efficient and effective ways to feed the growing world population is essential for the survival of our species. Selective breeding practices have met the challenge of sustaining the world's food supply to some extent; however, producing enough nutrient-dense foods in an increasingly hostile environment will require implementation of modern genetic techniques that can create robust and high-energy crops. Therefore, there is great need for in-depth knowledge on the molecular mechanisms that regulate seed storage compounds, including the identification and characterization of genes that regulate the storage of lipids, starch, and proteins in seeds. 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 candidate's genes to study further to understand mechanism of storage compound metabolism in plants. We are also using similar screening tools to screen other proteins involved in seed storage compounds. By use of Agrobacterium-mediated flower dip, we have generated transgenic Arabidopsis plants overexpressing/RNAi cupin proteins under the control of constitutive or seed specific promoter, respectively. Genetic and biochemical analysis of these transgenic plants are in progress.

Funder Acknowledgement: National Science Foundation, HRD-1600988.

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Poster Category: STEM Research

The Stability of Microbial Communities After Exposure to Surface Water Microbiome in a Controlled Closed System

Indu Sharma, Hampton University
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Red deepsea crabs, Chaceon quinquedens, are primarily found along the Atlantic slope at a depth range of 500-900 meters north of Cape Hatteras. The red deepsea crabs are commercially fished in Virginia and contribute to the local economy. During fishery, they are exposed to the surface ocean microbiome. We hypothesize that the core gut microbiome remains stable and is not influenced by exposure to the surface ocean microbiome. To test our hypothesis, crabs were kept in a holding system onshore at a constant temperature of 5°C in surface ocean water retrieved from a ballast tank on the fishing vessel Sea King (F/V). The crabs (n=5 per time point) were sampled at 0, 2, 4, 10, and 20 days. The water quality, temperature, salinity, ammonia, nitrate, and nitrite levels were monitored throughout the experiment. The reference in situ microbiome was established using crab guts sampled aboard Sea King (F/V) and stored in liquid nitrogen. Now, each crab gut will be subjected to microbial DNA isolation followed by PCR for 16S rDNA using a or the V3-V4 primer set. The resulting PCR products will be processed for next generation sequencing using the Illumina platform. The data will be analyzed using QIIME and oligotyping pipeline. It is anticipated that the core microbiome will be stable; however, the flexible microbiome will change initially and then become stable. The results generated will help us to establish core and flexible microbiome and to formulate questions to understand how and what host factors play a role in the gut microbial community dynamics in response to starvation.

Funder Acknowledgement: National Science Foundation, Award #1601057.

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Poster Category: STEM Research

Investigating the Effects of Socioscientific Argumentation Development on Student Academic Success

Hector Torres, Bethune-Cookman University, Daytona Beach, Florida
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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. The major goal of this Broadening Participation Research (BPR) in STEM Education project entitled 'Investigating the Effects of Socioscientific Argumentation Development on Student Academic Success' 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. The research questions for the project are (1) What socioscientific argumentation strategies do the students currently use? (2) What gaps exist in effective socioscientific argumentation? (3) Does socioscientific argumentation instruction influence student outcomes? The accomplishments of the project include the identification of 95 students that were grouped into low (22); moderate (55) and high (18) argumentativeness scores. Additional data collection and analytics are in progress. In collaboration with STEM Central, a two part outreach webinar series was delivered in August 2017. The webinar topics were (1) Generate an Argument: An Instructional Model (https://stem-central.net/webinars/34) and (2) Socioscientific Issues as a Curriculum Emphasis: Theory, Research and Practice (https://stem-central.net/webinars/35). The expertise aspect of the project is guided by (1) the evaluative skill [attending to relevant aspects of the situation and decide what needs to be done] is the basic cognitive ability that characterizes all these areas of expertise; and (2) expertise can be developed in the four categories of expert instruction [evaluation + communication], expert judgement [evaluation + qualitative or quantitative expression], expert performance [evaluation + execution]; and expert prediction [evaluation + projection]. Therefore, a key product from the project is an argumentation expertise development system that will prepare students and faculty in the four categories of expertise with socioscientific issues as sources of data. Measures of student academic success are being assessed from the dimensions of academic achievement, career success, attainment of learning outcomes, persistence, acquisition of skills and competencies, and satisfaction. The research will produce information needed to develop intervention models for improving scientific argumentation expertise development of STEM students.

Funder Acknowledgement: 1. National Science Foundation's Historically Black Colleges and Universities - Undergraduate Program (HBCU-UP) HRD-1435186. 2. Tania Siemens and team at STEM Central (https://stem-central.net/)

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Poster Category: STEM Science and Mathematics Education

Implementation of Course-based Undergraduate Research Experiences in General Biology

Melanie Van Stry, Lane College
Co-Author(s): Diane Sklensky

Lane College is a historically black college committed to educating underserved, minority students. Our overall goal for this project is to improve student learning of foundational concepts and retention in Biology and Chemistry through student-centered activities within our first-year courses. A key activity to achieve this goal is the implementation of course-based undergraduate research experiences (CUREs) in our General Biology Laboratory courses. A key element for the success of the program is our peer-mentors, who serve as supplemental instructors for our General Biology courses. These students receive training in both leadership, through a collaboration with the office of first year experience, as well as research techniques through mentored projects related to those that will be completed by students enrolled in the General Biology Laboratory courses. These projects include isolation and characterization of antibiotic resistant bacteria from the soil, gene annotations and comparative genomics in collaboration with the Genomics Education Partnership (GEP), or cloning and characterization of GAPC from Tennessee native plants. We are implementing these CURE projects within one of our laboratory sections for each General Biology course during the 2017/2018 academic year. In addition, we are assessing student learning outcomes related to understanding the scientific method using the Experimental Design Ability Test and the CURE learning survey developed by the GEP.

Funder Acknowledgement: National Science Foundation HRD#1623340.

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Poster Category: STEM Research

Mechanisms of Heat-Induced Loss of Plant Resistance - A Progress Report

Lieceng Zhu, Fayetteville State University

In the past a few months, we have focused on recruiting students and training students in performing research, building the team, and strengthening our laboratory to assure the success of the project. To date, students have completed part of phenotyping study pertaining to objective 1 of the project with minimum supervision. The findings from the research and challenges regarding involving undergraduates in research will be discussed.

Funder Acknowledgement: NSF-HBCU-UP Project.

Chemistry and Chemical Sciences

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Poster Category: STEM Research

Infusing Inquiry-Based Green Chemistry into Undergraduate Laboratory

Mohamed Abdalla, Tuskegee University
Co-Author(s): Mohamed A. Abdalla, Willard Collier, Melissa S. Reeves, Albert E. Russell, and Marilyn Tourne, Tuskegee University, Tuskegee, AL

The overall goal of the TIP at Tuskegee University is to improve the Department of Chemistry laboratory curriculum and the environment through three initiatives: a) professional development activities for teaching with a guided inquiry-based model, b) inclusion of green chemistry throughout the chemistry laboratory curriculum and c) increase of student hands-on access to instrumentation. This will be accomplished through developing guided inquiry experiments that produce silver metal, silver ions, and silver nanoparticles from the General Chemistry laboratory waste stream and apply the ions and nanoparticles as catalysts and antimicrobials. Two significant accomplishments for the department will be the diversification of our experiment portfolio and the reduction of our laboratory waste. In the first phase of the project, silver waste is to be collected and purified to be used for silver nanoparticle synthesis. The purification of silver using a 'green' method has since only been accomplished utilizing an AgCl standard. The purified silver salts will be reused as catalysts for Mannich reactions in organic chemistry labs. The recycled silver is also being used to synthesize silver nanoparticles and investigate their biological activities. Thus, this project will be a closed-loop process which involves various levels of our Chemistry laboratories. The broader impacts of this project include linking chemistry concepts and green chemical methods to hands-on research experiences which will stimulate the students' awareness and the pursuit of scientific careers. The TIP will strengthen research, research training, and allow new active-learning methodologies to be implemented throughout the chemistry curriculum at Tuskegee University. Undergraduate and graduate students will be exposed to the overarching theme of green chemistry, recycling, sustainability, and its impact on our world. Students involved in this work will be part of a multi-step closed-loop process in which they can ultimately follow semester by semester ending in a newly found appreciation for sustainable practices. Current progress on this project will be presented in three areas: a) faculty development b) research assistant experiment outcomes, and c) evaluation and implementation of the newly developed experiment.

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Poster Category: STEM Research

CREST Fisk University Center for Biological Signature and Sensing (BioSS)

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The Fisk University Center for Biological Signature and Sensing (BioSS) conducts collaborative interdisciplinary research in the area of biological, chemical, and nuclear sensors for biological applications. The overarching theme is the development of novel biosensors to address a variety of biological testing needs. Center efforts are organized into three research subprojects: In Subproject 1 we are testing the hypothesis that the approach of combined transcriptional network analysis, microfluidics tools for reaching a better understanding of dopaminergic neuron function. By integrating biochemistry, polymer synthesis, and microfluidics, Subproject 2 is developing a sensor to reveal the fundamental role of manganese in essential cellular processes and optimize this sensor for monitoring heavy metals in the environment. Subproject 3 will utilize traditional nuclear sensing devices and by integrating materials science, computational science, and mathematical optimization to develop and utilize novel radiation sensors for biological applications. Mentoring together with innovative learning modules, we assure a successful pathway of under-represented minority talent moving from Community College through the Ph.D, and thus serve as a model for national replication.

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Poster Category: STEM Research

MauG Catalyzes the Oxidation and Cross-Link of Tryptophan

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The diheme enzyme MauG catalyzes oxidative post-translational modifications of a protein substrate, precursor protein of methylamine dehydrogenase (preMADH), which consists of a native tryptophan residue (βTrp108) and a 7-hydroxylated tryptophan (βTrp57). The reaction results in the covalent crosslinking of βTrp57 to βTrp108, insertion of a second oxygen atom into the side-chain of βTrp57, and oxidation of the quinol species to the quinone. Despite extensive works on the mechanism of the MADH maturation reaction it is still unclear how the βTrp57 gain the first hydroxyl group forming the preMADH. In this research, we have found that tryptophan could gain the first hydroxyl group via reacting with hydrogen peroxide. MauG catalyzes the oxidation reaction and the subsequent cross-linking reaction. The kinetic of the reaction was studied using UV-Visible absorption spectroscopy and supported by LC-MS spectroscopy. Analysis of the kinetic data indicates MauG catalyzes the insertion of first oxygen to tryptophan with a rate constant of 2.8 × 10-3. The LC-MS study of the reaction indicates that tryptophan is first converted to a mono hydroxyl tryptophan which is then quickly converted to a di-hydroxy tryptophan. The reaction then proceeds to form cross-linked tryptophan which is evidence by a dimer peak in LC -MS and small increase of absorbance at 350 nm. Comparing the enzyme catalyzed reaction with the non-catalyzed oxidation reaction, it is found that the oxygen insertion can take place without MauG but with a much slower rate. The cross-linking reaction is MauG specific. This study may help to fully understand the biosynthesis of MADH through post-translational modification.

Funder Acknowledgement: This work is supported by NSF Research Initiation Award under HBCU-UP program (Award number: 505446).

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Poster Category: STEM Research

Synthesis and Functionalization of Thiochromanones and Thioflavanones

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Conjugate addition reactions of Thiochromone with Organo-metallic reagents provide a rapid entry into Thiochromanone and Thioflavanone, an important class of bioactive organosulfur compounds. Excellent yields of 1,4-adducts – thiochromanone and thioflavanone can be isolated (up to 92%). The large library of thiochromanone and thioflavanones can be quickly synthesized by using commercially available or easily prepared organometallic reagents. These thioflavanones and thiochromanones are useful precursors for many pharmaceuticals, such as 1,5-benzothiazepine, a versatile pharmacophore in drug discovery. Thioflavanones and thiochromanones could be converted into useful sulfoxides and sulfones in high yields.

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

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Poster Category: STEM Research

The Interdisciplinary Nanotoxicity Center

Jerzy Leszczynski, Jackson State University

Environmental effects of chemical compounds are among leading challenges of the 21st Century. Notably, applications and production of nano-scale materials has 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 of efficient, fast and inexpensive computational approaches able to predict toxicity of new species before their industrial applications. The collaborative activities of the 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 strengthen by interaction with the Jackson 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 PhD 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 (CCTCC). This is supplemented by the 18th Southern School on Computational Chemistry and Materials Sciences (SSCCMS) Conference.

Funder Acknowledgement: National Science Foundation.

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Poster Category: STEM Research

The Search for Novel Bioactive Actiomycetes from Fresh Water Habitats

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Actinomycetes are Gram-positive bacteria that are known to produce bioactive secondary metabolites that are useful in medicine. For over 50 years most of the drugs that were obtained were from terrestrial sources. However, with a decline in the number of new drugs from these sources the ocean was the next source of potentially new pharmaceuticals. The ocean has a rich untapped biodiversity and has been shown to produce new bioactive compounds. In this study, the diversity of cultivable marine sediment-derived microorganisms was examined and their potential as cytotoxic agents against microbial indicators and mammalian tumor cells was investigated. The microorganisms were inoculated on three different isolation media to enhance the diversity of cultivable microbes. Of all the microorganisms isolated, 11 exhibited antimicrobial activities. These 11 microorganisms were grown in large scale fermentations and the identification of the bioactive chemical entities from these extracts are currently under investigation.

Funder Acknowledgement: This work was partially supported by the NSF Research Initiation Award grant 1600638.

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Poster Category: STEM Science and Mathematics Education

Graduation Academy - Transitioning STEM Students to Graduation and Graduate School

Aliecia McClain, Norfolk State University
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This project at Norfolk State University will focus on the development of STEM majors at the sophomore, junior, and senior levels. This new project features a Graduation Academy which focuses on moving students toward graduation and then on to graduate school. These features will include a Sophomore Summer Bridge Program, Departmental Junior Prep and Grad Societies for enhanced advising and mentoring of students at the sophomore, junior, and senior levels, Scholarships, as well as undergraduate research support. The goal is to increase the matriculation rate of students from sophomore to junior year by the third fall, to increase in the number of students maintaining eligibility for Federal Financial Aid, to increase the success-rate of students beyond the freshmen year and to increase in the diversity of the workforce in STEM fields.

Funder Acknowledgement: National Science Foundation Implementation Project

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Poster Category: STEM Research

Assessing the Strength of Halogen Bonds and R-X...pi Interactions for Complexes Derived from the CCDC and PDB

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Co-Author(s): Khanh-An Tran

Here we investigate and compare the strengths of halogen bonds and R-X...pi interactions derived from organic crystals found in the CCDC and protein-ligand complexes found in the PDB. Interaction energies are computed at the DFT-D/B3LYP/ def2-TZVP level of theory with and without implicit solvation corrections. The strengths of these interactions are related to the complex geometry and to the size/charge of the halogen sigma-hole.

Funder Acknowledgement: This project was funded by the NSF HBCU-UP program.

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Poster Category: STEM Research

Bionanoscience: Quantum Chemical Study on Binding of Selected Amino Acids with Graphene

Dinadayalane Tandabany, Clark Atlanta University

Studies on interactions between graphene and amino acids are important to obtain knowledge that will be useful in producing graphene-based biochemical sensors, and biomedical implants. Graphene provides high sensitivity and selectivity when

different molecules are adsorbed. In this study, two finite size graphene sheets of small graphene (GS) consists of 62 carbon atoms and large graphene sheet (GL) consists of 186 carbon atoms were considered to understand the binding of five naturally occurring amino acids (tyrosine (Tyr), phenylalanine (Phe), tryptophan (Trp), histidine (His), and proline (Pro)) with them. Conformational analysis was done for each of the above-mentioned amino acids using HF/3-21G level as implemented in Spartan '16. Two lowest energy conformers and one highest energy conformer for each amino acid were chosen to examine the binding with graphene sheets. We considered different orientations for each conformer of amino acid to study the interactions with small and large graphene at M06-2X/6-31G(d) level. All geometry optimizations were performed within the symmetry constraints. Binding energies with and without basis set superposition error (BSSE) were calculated in the gas phase. We also examined the influence of solvent (water) on the binding affinity of each of the amino acids with graphene. HOMO-LUMO energy gaps were calculated at the TPSSh/6-31G (d)//M06-2X/6-31G(d) level for all the complexes and pristine graphene. Our aim is to address the following questions: (i) Which conformer of amino acid provides the most stable complex? (ii) What types of interactions (pi...pi, C-H/N-H…pi, or combinations of these interactions) are responsible for stabilization of the complexes? (iii) How does the size of graphene sheet affect the binding strength? (iv) How does the binding affinity vary from gas phase to aqueous medium? (v) Does the band gap of graphene alter by the binding of amino acids with it?

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Poster Category: STEM Research

Superoxide-derived Selective Reduction of CO2 to CO at Low Overpotentials in Ionic Liquid

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Electroreduction of CO2 using high selective and efficient ways is the key point of CO2 utilization. Here we reported the electrocatalytic approach that can be used for the rational design of CO2 reduction system with potentially using any electrodes in aerobic environments. In this system, CO2 reduction displayed at very low over-potential, >90% faradic efficiency and near 100% of carbon selectivity to CO. This approach was initiated from the superoxide radicals (O2.-) electrochemical generation, and further CO2 was efficiently activated through the CO2 adducts N-heterocyclic carbenes (NHCs) in 1-Butyl-3-methylimidazolium bis (trifluoromethylsulfonyl)imide (Bmim NTf2) ionic liquid. Electrochemical and computational results suggested a ECE mechanism, in which O2.- efficiently transform Bmim cations to N-heterocyclic carbine (NHC) structure, and which further activate CO2 with NHC-CO2. This work offers a green approach for CO2 reduction supply under simplicity and mild conditions, which have potential application in a broad range of molecular-material platforms and catalytic systems, and also O2 involved biological processes.

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Poster Category: STEM Research

Chirped Pulse Terahertz (CP-THz) Spectroscopy of Biologically Relevant Molecules

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Recent advances in digital technology, driven by researchers in the electronic industry, have made the development of a new technique named segmented Chirped Pulse THz (CP-THz) spectroscopy possible. With broadband ranges in the 0.3 to 1 THz region, the application of CP-THz spectroscopy provides researchers with the ability to investigate reaction dynamics at room temperature as well as the structurally sensitive analysis of biologically relevant molecule such as N-acetyl-proline and Biotin. The recorded spectrum exhibits unique rotationally resolved features in the THz frequency region under thermally heated conditions and the laser ablation technique. This technology is paired with the utilization of an absorption cell sample chamber (White cell) enabled to probe the gas-phase molecules capturing unparalleled sensitivity, speed, and spectral coverage with coherent chirped-pulse excitation. The spectral analysis was performed with a spectral fitting software, JB95, in conjunction with ab initio calculated structures. The results show some evidence indicating the possible occurrence of a chemical pyrolysis process. This technique shows great promise for possible future studies of larger biological molecules. The relevance of our findings to the function of several biological systems will be discussed.

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Poster Category: STEM Research

Authentic Materials Research with Undergraduates

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CSUSB currently has no graduate program in Chemistry or Physics, the host departments to the Center for Advanced, Functional Materials. As such, undergraduates are involved in every facet of local research, and many additional opportunities for research are offered at other sites. We will overview three of the research strands in which the student and their faculty mentors have been involved in the past two years; In particular (1) thin films of croconic acid, specifically modeling and preparing films on silica and gold substrates with applied electric fields, (2) preparation, analysis and modeling of a novel multiferroric single crystal, codenamed 'blue', and (3) study of the degradation and solvent penetration through polymer films to be used as the substrate of the ferroelectric materials. Measures of educational progress and growth of student researchers will also be presented.

Funder Acknowledgement: National Science Foundation, CREST 1345163

Computer Sciences and Information Management

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Poster Category: STEM Research

Computational Research on Music & Audio (CRoMA): Year Three Review

David Heise, Lincoln University

Computational Research on Music & Audio (CRoMA) was launched at Lincoln University in 2015 with the support of the National Science Foundation through an HBCU-UP award. The purpose of this project is to establish a research program to study aspects and applications of computational audio signal processing. This effort has an interdisciplinary focus, drawing from disciplines such as computer science, engineering, mathematics, psychology, biology, and music. Further, the project aims to specifically include undergraduate students in the research activities. In year three, the project has: a) directly supported five undergraduate students and one graduate student as research assistants, b) supported summer salary and a course release to allow the PI to engage in research activities, c) fostered interdisciplinary collaborations between researchers in the region and beyond, and d) enabled presentation of work by students and the PI at national and international conferences. One such presentation, 'Musical Instrument Classification Utilizing a Neural Network', earned a first-place award at the 2017 Emerging Researchers National Conference in STEM in the undergraduate computer science category. Research continues to incorporate attention into computational auditory scene analysis (CASA) using 'focal templates', as presented at the 2017 IEEE Sensors Applications Symposium and the 2017 Meeting of the Society for Music Perception and Cognition. Recent research has focused on identification of pollinators in the environment from field audio. Training and recruitment of new students to the CRoMA Team of Interdisciplinary Collaborators (CRoMA-TIC) will be facilitated by the development of a topics class (to be offered Spring 2018) on Machine Learning and Signal Processing, which will target students from computer science and other disciplines (including biology), giving special attention to problems in computational bioacoustics. A foundation for CRoMA has been established through this project, and the PI is looking for opportunities to sustain this effort through forged collaborations and other sources of support.

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Poster Category: STEM Research

HBCU EAGER: A Data Flow Approach to Meet the Challenges of Big Data Analytics

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Space and computation power demands needed for the ever increasing size of the data and complexity of data analytics algorithms are stretching the memory and computational limits of conventional von Neumann-based computers. It is time to explore other architectures, such as data flow systems, to overcome these limitations. Our research explores the feasibility of Fresh Breeze, a data flow architecture, for big data analytics. In our research, we looked into the issues of porting Deep Neural Network programs to funJava, a functional subset of Java. We use a minimal two-layer network to explore these issues and opportunities for enhancing, extending, and improving funJava language support and the capability of the

funJava compiler to better support the development of deep neural networks in funJava. We reported preliminary results of this work in a paper at Parco2017. Using synthetic data for our development work, we found that with a Fresh Breeze implementation the performance of the computational bottleneck, the matrix multiplication, within a layer scales linearly as the number of cores increases. This is made possible by the ability in Fresh Breeze to decompose a computation into parallel data-driven tasks and good load balancing of tasks (to ensure that tasks that are ready for execution are quickly and evenly distributed to all available cores). We have a similar observation with performance studies for linear algebra computations and for multi-program computations where more than one funJava program is run at the same time on the Fresh Breeze system. Fresh Breeze has no knowledge about what a task does nor does it need to know. The tasks can be from the same computation (like a matrix multiplication), different computations (say, one from machine learning and another from computational biology, running at the same time), or the different stages, iterations, or layers of a complex computation. The research also provides opportunities to expose and train PVAMU (an HBCU) students on deep learning and data flow computers. One of the student projects is looking into the issues of implement 2-D convolutions in funJava. Another project is exploring the performance of funJava versions of four machine learning algorithms: K-Nearest Neighbors, naive Bayes & Bayesian Belief Networks, Logistic Regression, and Linear Regression. A summer student project was undertaken to develop the funJava versions of support libraries, like StrictMath and JAMA.

Funder Acknowledgement: NSF; DoD

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Poster Category: STEM Research

iCREDITS: Creating a SMART Grid

Enrico Pontelli, New Mexico State University
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Our research supports the creation of the Sustainable, Modular, Adaptive, Reliable/Robust/Resilient and Transactive (SMART) grid framework. This framework is based on the concept of Distribution Feeder Microgrids (DFMs) interacting with each other via an enhanced transmission and communication infrastructure. In combination with the transmission and communications enhancements, the DFMs will result in a grid that is:
* Sustainable: The DFM structure enables more innovation in and competition for energy services, promoting economic efficiency and reducing environmental impact. Moreover, the single-point control of storage and load will interact with high levels of transmission-level sustainable resources (e.g., large-scale wind, solar, nuclear) in energy management and promote stability. High levels of local renewable energy are also inherently promoted.
* Modular: Enabled by enhanced communications and control algorithms, DFMs can operate individually and in cohorts to support each other and the grid, in contrast to the existing 'all or nothing' paradigm.
* Adaptive: Individually, DFMs can respond to changes at multiple time scales, from varying levels of intermittent generation (on the timescale of seconds) to the adoption of new technologies (on the timescale of years), as a consequence of standardized yet flexible information exchange and controls.
* Reliable, Robust and Resilient: DFMs support the spectrum from reliability to robustness and resilience on multiple fronts. By enabling flexibility in operations, the grid provides quality service even in the face of ever-increasing amounts of non-dispatchable generation. Because of the built-in security and protection measures combined with local storage and control, DFMs reduce the likelihood of cascading failures by rapidly acting to provide the transmission grid with load shedding, voltage support and frequency support. Finally, DFMs provide ultimate resilience by serving critical loads with local resources indefinitely, even in the event of wide-area grid failure, and by providing blackstart support to assist with the recovery of the transmission grid.
* Transactive: DFMs can be the basis of an internet-enabled energy service market, where customer devices and grid systems can, in close to real time, barter over the proper way to solve their mutual problems, and settle on the proper price for services.

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Poster Category: STEM Science and Mathematics Education

Teaching Computational Thinking (CT) in an Introductory CS Course with RAPTOR based Visual Programming and eBook (zyBook) based Interactive Learning

Mahmudur Rahman, Morgan State University
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A core challenge in introductory programming courses during the freshmen year is getting students to understand how a static textual representation (source code) maps to a highly dynamic process (program execution). The program execution is typically illustrated using graphical PowerPoint lecture slides or by drawing diagrams on a whiteboard, which is tedious and error prone and requires a great deal of effort. Research findings demonstrate that teaching computational thinking (CT) and problem-solving skills before or alongside traditional programming yielded significant improvements in student performance. There are also a large body of evidence supporting

the idea that most students nowadays are visual learners who learn programming concept better through web-based visual and interactive environment instead of learning from traditional black board lecturing styles. Being motivated, this work focuses of our instructional approach of teaching an introductory programming course "COSC 111: Introduction to Computer Science I" in Python by integrating CT skill alongside programming by identifying key concepts and incorporating visual and interactive learning in classroom through using a flowchart-based programming environment and using a web-based interactive eBook. We also created an assessment built around CT concepts to gauge the ability of incoming students and measure the progress at the end of a semester. In this study, eleven sections of COSC 111 were included over three semesters as control and experimental groups. The potential of visualization and code simulation with instant feedbacks (students can read, edit, and run programs in dynamic flow-charts and within the pages of the eBook inside the browser) seems to be effective (analysis showed a statistically significant difference) in aiding the understanding of CT processes and problem-solving skills of novice programmers. To add to our understanding of what students were experiencing, we also administered a survey to students at the end of the course. Regarding learning styles and tools, survey result showed that the eBook was helpful in understanding programming concepts (71.5%) and instant feedback that the online book provided was helpful (82.9%). Overall, it seems that the proposed pedagogical approaches have made a positive difference by increasing student motivation and engagement, and reducing failure rates.

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Poster Category: STEM Science and Mathematics Education

Increasing the Training that Grambling State University Students receive in Data Analytics

Yenumula Reddy, Grambling State University
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National employment projections indicate a growing need for workers with skills in Big Data Analysis. To ensure that Grambling State University is preparing students who will enter the workforce will skill in the analysis and interpretation of structured and unstructured big data, several strategies have been identified for implementation. These strategies target both STEM and non-STEM majors. Also included in the implementation plan are high school students. This poster presentation focuses on the design and implementation of a summer research program that focuses on the development of Big Data Analysis skills. During the summer of 2016, the program offered on the campus of Grambling State University included a high school student and undergraduate students at GSU. The program offered during the summer of 2017 was open to high school students only. Lessons learned from both of these programs will be highlighted. Also discussed will be the infusion of mini projects, which require the use of the R Language, into an introductory computer science course that is available to all majors at Grambling State University. This course was recently developed and offered for the first time. The incorporation of Data Analytics into an upper-level Research Topics Computer Science Course will also be examined.

Funder Acknowledgement: National Science Foundation, HBCU -UP funding

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Poster Category: STEM Research

A Cloud-based Cryptographic Simulator for Enhancing the Undergraduate Learning Experience in Cybersecurity Education

Weifeng Xu, Bowie State University

Cryptography builds the fundamental security concepts of cryptographic algorithms, cryptographic protocols, and cryptanalysis, it has become the basis for other security-related courses in cybersecurtiy education. However, there are still a few major barriers for students at HBCU institutions to comprehend the core concepts of the cryptography, including decontextualized learning, complex math, and the lack of publicly available instructional materials. The overarching project goal is to enhance African-American undergraduates' learning experiences in cryptography at Bowie State University (BSU) by addressing these major learning barriers. The project aims at implementing a cloud-based cryptographic simulator with a contextualized learning approach to help students comprehend the fundamental concepts of cryptography, including protocols and cryptanalysis.

Funder Acknowledgement: NSF-HBCU

Ecology, Environmental and Earth Sciences

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Poster Category: STEM Research

Center for Energy and Sustainability (CEaS) at California State University Los Angeles

Andre Ellis, California State University Los Angeles
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The NSF-CREST Center for Energy and Sustainability (CEaS), originally established in 2009 at California State University Los Angeles, is currently in its Phase-II. The center continues to prepare students, especially of Hispanic heritage, for advanced degrees in the areas of materials research, energy and sustainability. Cal State LA has been recognized by NSF to be the top MS granting institution that educates potential Latino doctorates, and now as the top institution in the country for social/upward mobility. A pivotal role in the success of Cal State LA - in preparing students for advanced degrees in STEM – has been the collective effort of the faculty in centers such as the CREST-CEaS (and others) being supported by NIH, NSF, etc. CEaS fellows, mentored by the corresponding affiliated faculty, are making significant strides in their respective research thrust areas: (1) photovoltaics and emerging photovoltaic materials,(2) fuel cells and microfluidic-based direct methanol fuel cells, (3) new superconducting materials and applications, and (4) system modeling. To date, the CEaS faculty/students have over 150 publications/presentations and nearly 50% of our graduated fellows and affiliated students either moved on to M.S. and/or obtained PhD degrees in STEM. The center, in collaboration with the LSAMP Bridge to Doctorate program, will provide further professional development activities to better prepare students for doctoral programs, including assisting students with GRE preparation and the application process. At the institutional level, CEaS continues to be a pioneering research center on campus. The institution is in support of hiring of 6 new faculty across two colleges in the area of materials research, and we anticipate more faculty hires in the coming years. In addition, a new MS Program in Materials Studies was recently approved at the university level and is currently in revision by the California State University System's Chancellor's office. These accomplishments demonstrate the efforts and determination of the CEaS faculty and the institutional support for energy/materials research.

Funder Acknowledgement: National Science Foundation-CREST: HRD-1547723

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Poster Category: STEM Research

Project OANeuro: Quantifying the Effects of Ocean Acidification on Neurobiology in Marine Fishes via Inquiry-Based Experiential Learning

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The goal of Project OANeuro is to develop neurosensory research capacity at Hampton University to examine how projected changes in environmental conditions over the next century may affect the organism-environment interface in aquatic fauna. The project investigates the effects of ocean acidification on the form and function of the sensory systems of marine fishes from diverse phylogenies, habitats, and ecologies. Behavioral and morphological changes resulting from CO2 exposure are documented in marine fishes. However, the extent to which fish neurosensory function is altered as a consequence remains largely unknown. The unifying synthesis linking environmental conditions to changes in form and sensory function is thus an important research frontier. Project OANeuro provides new infrastructure to develop novel student-oriented inquiry-based research experiences that address high-impact questions while enriching STEM education and career trajectories in a predominantly African American undergraduate population. The project applies electrophysiological and morphological techniques to assay the effects of acute (2 week) and chronic (2 month) aqueous carbon dioxide exposure to concentrations that are representative of projected changes over the next century on: a) the morphological development of visual and auditory sensory structures, b) their electrophysiological performance, and c) the capability of a GABA receptor antagonist to alter potential sensory deficits. Collectively, the proposed interdisciplinary approach will enable novel mechanistic insights, with potential for the undergraduate scholar-researchers significantly impact this rapidly emerging field.

Funder Acknowledgement: NSF-HBCU-UP

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Poster Category: STEM Research

Precipitation Change, Switchgrass Biomass, and Greenhouse Gas Emission

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Switchgrass (Panicum virgatum L.) is widely selected as a model feedstock for sustainable replacement of fossil fuels and climate change mitigation. However, how climate changes, such as altered precipitation, will influence switchgrass growth and soil carbon storage potential have not been well investigated. We conducted two precipitation manipulation experiments with five treatments: -50%, -33%, +0%, +33%, and +50% of ambient precipitation, with an "Alamo" switchgrass in Nashville, TN. Results showed that the wet (+33%, and +50%) treatments had little effects on aboveground biomass and leaf gas exchange compared to the ambient precipitation treatment, regardless of fertilization or not. The -33% treatment did not change aboveground biomass and leaf photosynthesis, but significantly decreased transpiration and enhanced water use efficiency.

Only the -50% treatment significantly decreased plant biomass and leaf area index, without changing leaf photosynthesis. Soil CO2 emission generally decreased under the drought treatments and increased under the wet treatments, while there was no significant difference between the two drought treatments or between the two wet treatments. Our results demonstrate that switchgrass biomass responded in a single negative asymmetry model to precipitation changes, but soil CO2 emission responded strongly to precipitation changes in an "S" curve model. The contrasting models for switchgrass biomass and soil respiration in response to precipitation indicate that extreme wet or dry conditions may shift ecosystem from carbon accumulation toward debt, and in turn provide government and policy makers with useful information for sustainable management of switchgrass.

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Poster Category: STEM Research

Linking Gulf Stream Physical Forces and the Temporal Variability of the Mesopelagic Prey Community Off Cape Hatteras Using a Bio-physical Mooring

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Co-Author(s): Doug Nowacek, Duke University, Durham, NC; John Horne, University of Washington, Seattle, WA

The influence of Gulf Stream flow variability on the confluent region off the Cape Hatteras slope was investigated using a bio-physical mooring deployed from March, 2016 to May, 2017. The mooring was equipped with hydrographic sensors (CTDs), current meters (ADCPs), and an acoustic echosounder (Simrad 70 kHz WBAT) and was co-located with a passive acoustic recorder to detect marine mammal presence/absence. This multi-sensor mooring optimized whole-water coverage of both physical and biological factors over 900 m water depth, to determine the influence of the Gulf Stream on the mesopelagic community and top predators. The influence of Gulf Stream warm water intrusions, extending to at least 550m depth over a period of several days to weeks on the density and vertical distribution of the mesopelagic community was explored. The combination of moored environmental and biological sensors demonstrates a novel approach to studying the links between physics and apex predators in a diverse, deep-water slope ecosystem.

Funder Acknowledgement: NSF HBCU-UP RIA

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Poster Category: STEM Research

Pre- and Post-harvest Switchgrass Root Microbiomes and the Effect of Planting Densities

Keerthi Mandyam, Alcorn State University
Co-Author(s): Ari Jumpponen, Kansas State University; Girish Panicker and Ananda Nanjundaswamy, Alcorn State University

In an agricultural landscape, management practices – crop rotation, tillage, cultivation of cover crop, planting densities – can change soil and plant microbiomes. Continuous cover crops with minimal or no tillage are central to Conservation Agriculture (CA), the core principle of sustainable crop production. Switchgrass (Panicum virgatum) is a perennial C4 grass native to North America and used in soil conservation. To better understand the impact of plant varieties and planting densities on CA, four switchgrass varieties (Alamo, Bomaster, Colony and Kanlow) were grown as cover crop under high and low planting densities since 2012 in a split plot randomized complete block design at Alcorn State's Center for Conservation Research in Mississippi. The overall objective was to compare the switchgrass fungal and bacterial rhizobiomes before and after harvest. Roots were sampled in November 2015 right before harvest of aboveground biomass and again in March 2016 immediately after the grass had all regenerated. Bacterial (16S) and fungal (ITS) amplicon libraries were generated for Illumina sequencing. The rhizobiomes were not influenced by switchgrass varieties but varied before and after harvest. Additionally, bacterial rhizobiomes were also influenced by planting densities before harvest but not after. In contrast, fungal rhizobiomes were influenced neither by variety nor planting density either pre- or post-harvest. Among the major bacterial phyla, Actinobacteria, Chloroflexi and Aramatimonadetes were more abundant before harvest, whereas Firmicutes, Planctomycetes, Bacteroidetes were more abundant after harvest. Proteobacteria, Nitrospirae and Acidobacteria remained unchanged pre and postharvest. Among fungal phyla, Glomeromycota and Basidiomycota were more abundant before harvest, whereas Ascomycota and Chytridiomycota were more abundant after harvest. Basal taxa formerly assigned to Zygomycota remained unchanged before and after harvest. A large number of indicator species and common (core) communities of both bacteria and fungi were identified and their potential functional relevance will be discussed in the context of CA.

Funder Acknowledgement: This project was funded mainly by NSF HBCU UP Research Initiation Award to KM.

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Poster Category: STEM Research

Observational Research with the JSU Mobile Meteorology Unit: From the Mountains to the Sea and a Total Solar Eclipse

Loren White, Jackson State University
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A wide variety of data have been collected using the "JSU Mobile Meteorology Unit". This compact set of equipment includes capabilities for vehicular transects, pedestrian measurements, and radiosonde measurements. Phenomena targeted have included: atmospheric response to the total solar eclipse; North American monsoon system; midlatitude fronts; drylines; marine layer incursions; and microclimatic characterization of archaeological sites and sinkholes. The vehicular platform measures temperature and humidity, both within a U-tube and a Gill shield, as well as solar radiation, pressure, and GPS position. The pedestrian system uses an aspirated shield, pyranometer, barometer, infrared temperature sensor, and GPS. Data are analyzed as time series, spatial series, and geographic map views. Calculated quantities include potential temperature, dewpoint, mixing ratio, and heat index. The Windsond radiosonde system enables vertical sampling of temperature, humidity, wind, and pressure up to about 6 km MSL. Soundings have been done for the 2017 eclipse and at varying positions relative to fronts and drylines. The vehicular system has been operated in more than 20 states, temperatures ranging from -12 to 43 C, and elevations from -70 to 3040 m. A rich dataset has been gained to examine spatial variability scales and response characteristics of the instrumentation. In particular, there is interest in comparison of shields in rain, non-precipitation, fog, and snow cases. Findings so far have included: Outside of heavy rainfall, the Gill shield is more responsive to temperature fluctuations than the U-tube, but humidity response is similar. Mesoscale anomalies have been documented related to monsoon thunderstorms. Embedded marine air layers associated with diurnal and synoptic factors along the California coast. Microscale humidity anomalies linked to surface features such as sinkhole escarpments in Missouri. Feasibility of non-disruptive climatic sampling of the microscale environment of prehistoric cliff dwellings has been demonstrated. Heat index variations across incised valleys and major reservoirs have of 10-20 degrees are common on scales smaller than typical observation spacing. Well-defined three-dimensional dryline structure has been documented in the southern Trans-Pecos region of Texas, far south of previously published reports. Boundary layer responses to a total solar eclipse documented by multiple radiosonde ascents across the umbra.

Funder Acknowledgement: This study was supported by National Science Foundation EAGER Award #1644888.

Mathematics and Statistics

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Poster Category: STEM Research

Creating New Possibilities in STEM

Calvin Briggs, Lawson State Community College
Co-Author(s): Sharon Crews

The Lawson State Community College Center of Excellence in STEM Innovation and Workforce Development (LSCC-CESIWD) provides college-wide leadership, training, and support for all activities in alignment with STEM career pathways: laboratory and educational research, policy, and workforce development. The center's mission "promoting student access, success, and career placement in STEM and related disciplines by supporting academic and internship opportunities; deepening student and faculty engagement in college-wide STEM activities; strengthening innovation and collaborations to advance STEM preparation for post-secondary students and faculty; and, developing and supporting exemplary practices in STEM education at the two-year college level." More specifically the goals of the of the center include: Goal 1: identifying, disseminating and propagating STEM instructional, enrichment, and learning best practices; Goal 2: analyze institutional, state, regional, national, and internationally representative data sets informing existing literature regarding STEM career pathways and trends; Goal 3: Leverage funding and resources to support the center's programs, activities, STEM instructional strategies, and learning methodologies. Lawson State's Center for Excellence in STEM Research and Workforce Development consist of a coalition of STEM stakeholders committed to broadening the participation of underrepresented minorities in STEM career paths. The CESTEM, supported through the leveraging of state, federal, corporate, and community resources, implements, disseminates, and propagates innovative instructional strategies, best practices, research, and STEM policy. In addition, the CESTEM provides vision and organization for STEM and high-academic achievement related programs. The CESTEM consist of STEM faculty, community, corporate, and legislative stakeholders, supporting a consensus of best practices, policy forecast, and strategic planning models to broaden participation of underrepresented minorities in STEM career pathways throughout Alabama and the Southeast.

Funder Acknowledgement: The National Science Foundation

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Poster Category: STEM Research

Some Fast Solvers for Poroelastic Models

Mingchao Cai, Morgan State University

Poroelastic models have been widely used in Biomechanics. For example, modeling brain edema and cancellous bones. We aim at solving the Biot model under the MAC Finite Difference discretization and the stabilized finite element discretizations. To solve the resulting saddle point linear systems, some iterative methods are proposed and compared. In these methods, the inner solvers are preconditioners for the generalized saddle point problem. In the preconditioners, the Schur complement approximation is derived by using Fourier analysis approach. Extensive experiments are given to justify the performance of the proposed preconditioners and to compare all the algorithms.

Funder Acknowledgement: NSF HBCU-UP Research Initiation Award through HRD1700328; NIH BUILD grants through ASCEND Pilot project

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Poster Category: STEM Science and Mathematics Education

Results from Applying a Flipped Model in Pre-calculus to Engage Students for Higher Retention and Building Stronger Foundations for One Semester

Anne Fernando, Norfolk State University
Co-Author(s): Rhonda Fitzgerald, Norfolk State University, Norfolk, VA

The overall goal of teaching pre-calculus using a flipped model is to increase the pass rate in pre-calculus and to provide a strong foundation in the course to increase retention in STEM majors. Weaving major specific mathematics applications is accomplished. Pre-Class Implementation–In the days prior to class, students are provided with two ways to access links featuring mini-lectures introducing new topics. Each concept may be explained via several pre-recorded videos not to exceed 20 minutes in total. In-Class Implementation–The first focus is to assure that everyone has the basic prerequisite concepts for this class meeting (readiness assurance). The second will be to apply the knowledge acquired in the pre class assignment. The most vulnerable part of the learning process takes place in class. Post-Class Implementation–Online labs will be assigned per section via Cengage WebAssign. Out-of-class sessions with student instructors will focus on student driven problem solving and model successful learning strategies. Following an exam, students will answer a post-exam survey to help them reflect and focus on effective exam preparation strategies. In this Poster or talk we discuss some results after implementing this flipped approach for one semester in 2 pre-calculus sections.

Funder Acknowledgement: HBCU-UP TIP Project Award #1623345

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Poster Category: STEM Research

The Importance of Psychosocial Factors to Retention in STEM Disciplines

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Retention of students through to graduation in STEM disciplines is a complex phenomenon influenced by many factors, including psychosocial factors such as motivation and social networking. Our research at both Historically Black Colleges and Universities (HBCUs) and Hispanic Serving Institutions (HSIs) provides insight into ways that Minority Serving Institutions (MSIs) can and do address such psychosocial factors. We will provide quantitative and qualitative data highlighting aspects of psychosocial factors that impact students and graduates. We will also share the observations of those involved in STEM at MSIs, including students, graduates, faculty, administration, and staff.

Funder Acknowledgement: This project is supported by a grant from the National Science Foundation (#1623237).

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Poster Category: STEM Research

Superconvergence of Weak Galerkin Finite Element Approximation for Second Order Elliptic Problems by L2-Projections

Anna Harris, University of Arkansas at Pine Bluff
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The weak Galerkin finite element method (WG-FEM) is a novel numerical method that was first proposed and analyzed by Wang and Ye for general second order elliptic problems on triangular meshes based on a discrete weak gradient. In general, the weak Galerkin finite element formulations for partial differential equations can be derived naturally by replacing usual derivatives by weakly defined derivatives in the corresponding variational forms. The superconvergence in the finite element method is a phenomenon in which the finite element approximation converges to the exact solution at a rate higher than the optimal order error estimate. Wang proposed

and analyzed superconvergence of the standard Galerkin finite element method by L2-projections. The main idea behind the L2 -projections is to project the finite element solution to another finite element space with a coarse mesh and a higher order of polynomials. The objective of this paper is to establish a general superconvergence result for the weak Galerkin finite element approximations for second order elliptic problem by L2-projection methods. The results of numerical experiments show great promise for the robustness, reliability, exibility and accuracy of superconvergence in WG-FEM by L2-projection methods.

Funder Acknowledgement: NSF HBCU-UP RIA

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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, Mahesh Hosur, Mohammed Qaz, Vijaya Rangari, Alfred Tcherbi-Narte and Shaik Zainuddin, Tuskegee University, Tuskegee, AL; Martha Escobar and Melissa McDonald, Oakland University, Rochester, MI

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 to develop, implement, study and evaluate a unique HBCU-UP Implementation program for STEM underrepresented minority (URM) undergraduate students at Tuskegee University (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 Makers Space a STEM-based product from a MSE perspective; (3) Research internships at National laboratories, MSE-focused industry, 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); (6) A Young Material Scientists Research Conference at TU; and, (7) The creation of virtual learning communities as a means for students to engage in scientific dialogue. Over the 5 year grant period, 80 undergraduates will be recruited and prepared for careers in MSE through this novel 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).

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Poster Category: STEM Science and Mathematics Education

HBCU-UP Implementation Project: Preparing Interdisciplinary Minority Scientists & Engineering of the Future

Shaik Jeelani, Tuskegee University
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Material scientists have a profound impact on technological, aerospace, agricultural, military, healthcare, transportation and sports industries; however, few colleges and universities in the United States offer undergraduate-level degree programs in this field. To address these deficiencies and the diversity challenges in the current Materials Science and Engineering workforce, a group of STEM faculty at Tuskegee University is collaborating to develop an innovative undergraduate minor and co-curricular model. Under this grant, juniors and seniors from various STEM disciplines will study in the new material science and engineering minor. In parallel with their primary major, students pursuing a minor in material science and engineering will complete an intensive multidisciplinary coursework in the field, co-curricular activities designed to prepare them for MSE-related graduate studies, and experiences akin to those of STEM professionals. Recruitment of students to pursue this minor will begin in Spring 2018. It is anticipated that during the five-year funding period, the undergraduate minor program will prepare as many as 100 undergraduate STEM majors who will be ready for challenging careers in industry as well as graduate studies in Materials Science and Engineering.

Funder Acknowledgement: National Science Foundation, HBCU - UP Implementation Grant#: HRD-179433

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Poster Category: STEM Science and Mathematics Education

Support Needs in Teaching General Biology with Integration of Mathematics

Qingxia Li, Fisk University

Co-Author(s): Tomas Gross, Western Kentucky University, KY

STEM (science, technology, engineering and mathematics) retention is a major problem in most colleges and universities, especially HBCUs. A broad model of support systems that includes psychological factors is adopted to address retention in biology and mathematics. The purpose of our study was to develop an instrument to identify the support needs of college students registered in College Algebra and General Biology. We adapted the theoretical model of the performance pyramid to create a 70-item measure called the Student Support Needs Scale, which resulted in a robust 35-item, seven-factor solution. We examined the psychometric properties of our scale, established the reliability and validity of the resulting instrument. This instrument could potentially help our institutional programs to make informed decisions about resource allocation based on students' needs.

Funder Acknowledgement: NSF-HBCU-UP Broadening Participation Research Project with grant number: 1719262

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Poster Category: STEM Research

Global Uniform Stabilization of a Nonlinear Fluid Structure Interaction to a Non-Trivial Equilibrium

Yongjin Lu, Virginia State University

Uniform stability to a non-trivial equilibrium of a nonlinear fluid structure interaction model is studied. To achieve this goal, boundary feedback control on the interface and/or interior feedback control on the fluid and solid domain are proposed. The stabilization result obtained is global and no assumptions on the smallness of the initial data or the size of equilibrium point are needed. The proof is based on special multipliers constructed from the Stokes solver and the projection operator on some appropriate functional space.

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Poster Category: STEM Science and Mathematics Education

CASL: The Center for Advancement of STEM Leadership

Camille McKayle, University of the Virgin Islands
Co-Author(s): Kelly Mack, AAC&U; Goldie Byrd, NC A&T; Orlando Taylor, Fielding Graduate University

The Center for the Advancement of STEM Leadership (CASL) uses the cultural authority of Historically Black Colleges and Universities and their legacy of liberatory leadership to empower the next generation of STEM academic leaders--from all professorial and administrative levels--to envision, inspire, and transform institutional climates for maximally broadening the participation of African Americans in STEM. CASL expands the perspective through which traditional leadership theories, policies and practices related to broadening participation in STEM can be examined and explained. CASL integrates the conditions that shape the unique histories of our emerging HBCU leaders--whether favoring or unfavoring--into the intellectual knowledge base that informs undergraduate STEM reform. This poster will introduce you to the work of CASL.

Funder Acknowledgement: Funded by the National Science Foundation, HBCU-UP program

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Poster Category: STEM Research

A Bayesian Predictive Simulation for Aquifer Contamination

Arunasalam Rahunanthan, Central State University
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In contaminant transport in subsurface we often need to forecast flow patterns. In the flow forecasting, subsurface characterization is an important step. To characterize subsurface properties we establish a statistical description of the subsurface properties that are conditioned to existing dynamic (and static) data. We use a Markov chain Monte Carlo algorithm in a Bayesian statistical description to reconstruct the spatial distribution of two important subsurface properties: permeability and porosity. By using reconstructed permeability and porosity distributions, we predict subsurface flows. In this poster, we present a Bayesian framework for predictive simulation of contaminants in an aquifer.

Funder Acknowledgement: NSF's HBCU-UP (Award Abstract No: 1016283)

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Poster Category: STEM Research

Data Science and Analytics Advancing STEM Education at North Carolina A&T State University

Guoqing Tang, North Carolina A&T State University
Co-Author(s): Goldie S. Byrd, Margaret I. Kanipes and Dorothy Yuan, North Carolina A&T State University, Greensboro, NC

In this poster presentation, we will present project design and implementation progress on our NSF HBCU-UP ACE Implementation Project entitled, Data Science and Analytics Advancing STEM Education at North Carolina A&T State University. The overarching goal of this integrated, multidisciplinary undergraduate program is to use data science and analytics (DSA) to create an incubator for engaging URM students in computationally intensive tools training, data-enabled critical-thinking skills development, and global research and education experiences. Further, this project will transform institutional teaching and learning through evidence-based STEM gateway course reform and data-informed assessment and intervention. The program emphasizes curriculum and research infrastructure development, undergraduate research and global experience, faculty and student engagement, academic advising/mentoring, local HBCU and community health outreach, and education and research partnerships; it is guided by an education research project investigating these approaches efficacy in NCA&T's environment. Through engaging students in cutting-edge research, coupled with close course and curricular ties and professional development among the STEM departments at NCA&T, the ACE project will increase exposure and extend benefits to many students and faculty from NCA&T and other HBCUs. It will broaden the DSA curriculum and education opportunities for undergraduate students at NCA&T and other HBCUs, fostering and nurturing students' interest in this emerging discipline. It will help student participants at NCAT and other HBCUs to be more competitive in the global workforce and for graduate study in DSA. It will broaden faculty members' expertise and skills in DSA, leading to improved and enhanced curricula at NCAT and other HBCUs as well as exciting and timely data science and analytics concepts introduced during and after the project period.

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Poster Category: STEM Research

Robustness of Estimators in Poisson - Inverse Gaussian Regression Models

Kimberly Weems, North Carolina Central University
Co-Author(s): Paul J. Smith, University of Maryland, College Park, MD

The generalized linear mixed model (GLMM) extends classical regression analysis to non-normal, correlated response data. Because inference for GLMMs can be computationally difficult, simplifying distributional assumptions are often made. We focus on the robustness of estimators when a main component of the model, the random-effects distribution, is misspecified. Results for the maximum likelihood estimators (MLEs) of the Poisson-inverse Gaussian model are presented.

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Nanoscience

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Poster Category: STEM Science and Mathematics Education

Student-Led Professional Development under NSF CREST CREAM Project at NSU

Messaoud Bahoura, Norfolk State University, Norfolk, VA
Co-Author(s): Ashley Haines, Aliecia McClain, Sangram K. Pradhan and Xiao Bo, Norfolk State University, Norfolk, VA

We report on professional development and outreach activities led by CREST CREAM scholars at Norfolk State University. These activities included workshops focused on challenges of college and beyond, experimental design and technical writing, strategizing manuscript submission and acceptance, completing the journey: from enrollment, to graduation and full-time employment, necessities for networking, and working in industry. A journal club initiative offered opportunities for high school, undergraduate and graduate students to share and discuss external publications relevant to the Center?s research topics. This imitative generated much interest especially from high school and undergraduate students.

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Poster Category: STEM Research

Progress on Design of Nanostructures for Energy Efficient Devices

Rami Bommareddi, Alabama A&M University
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Satilmis Budak, Kristopher Liggins, Samuel Uba, Bir Bohara, Marcus Pugh, Vernessa Edwards, Michael Curley and Padmaja Guggilla

Effect of silver particles on the white light emission characteristics of sodium borate glasses embedded with rare-earth ions is being investigated. Glasses were made by the melt quenching technique. Silver nanoparticles were induced by heat treatment of the glass above the glass transition temperature. Diode laser excitation was used to stimulate emission from the samples. Our analysis indicates that silver particles are playing a role in enhancing the emission spectrum of the rare-earth dopants. Microscopic images of the samples were also taken to determine the distribution of silver within the glass samples before heat treatment. Preliminary results showed a 40% increment in sample fluorescence after the initial heat treatment. Sample color coordinates were close to those of white light. Thermoelectric thin films devices were prepared from Ni/Bi2Te3/Ni and Ni/Sb2Te3/Ni thin films using DC/RF Magnetron Sputtering Deposition System. They were annealed at different temperatures to see the thermal treatment effects on the efficiency of the fabricated thermoelectric devices. After thermal treatment of Ni/Bi2Te3/Ni and Ni/Sb2Te3/Ni thin film devices, their thermoelectric and optical properties were characterized using Seebeck Coefficient Measurement, van der Pauw 4-Probe Resistivity Measurement System, Laser Thermal Conductivity and Scanning Electron Microscopy Systems. Nanocomposite films of PMN-PT and PZT paints have been fabricated by the conventional paint-brushing technique on copper substrate. The pyroelectric, piezoelectric, and dielectric properties of these films were measured to explore their suitability in thermal energy conversion devices and uncooled infrared detectors. The properties investigated include: dielectric constants (ε' and ε’’); pyroelectric coefficient (p); piezoelectric coefficient (d33) and energy conversion performance. Preliminary results indicated that paint composite films are functional and figure-of-merits increase with an increase in amount of PMN-PT nanoparticles in paint. The Khon-Sham equation of Density Functional theory, based on two fundamental theorems of quantum mechanics of many-body systems, has been used to obtain electron density calculations of confined electron systems, which have implications for the properties of matter, including energy harvesting via piezoelectric/pyroelectric effects. We illustrate preliminary results for simple confinements. Effect of silver particles on the white light emission characteristics of sodium borate glasses embedded with rare-earth ions is being investigated. Glasses were made by the melt quenching technique. Silver nanoparticles were induced by heat treatment of the glass above the glass transition temperature. Diode laser excitation was used to stimulate emission from the samples. Our analysis indicates that silver particles are playing a role in enhancing the emission spectrum of the rare-earth dopants. Microscopic images of the samples were also taken to determine the distribution of silver within the glass samples before heat treatment. Preliminary results showed a 40% increment in sample fluorescence after the initial heat treatment. Sample color coordinates were close to those of white light. Thermoelectric thin films devices were prepared from Ni/Bi2Te3/Ni and Ni/Sb2Te3/Ni thin films using DC/RF Magnetron Sputtering Deposition System. They were annealed at different temperatures to see the thermal treatment effects on the efficiency of the fabricated thermoelectric devices. After thermal treatment of Ni/Bi2Te3/Ni and Ni/Sb2Te3/Ni thin film devices, their thermoelectric and optical properties were characterized using Seebeck Coefficient Measurement, van der Pauw 4-Probe Resistivity Measurement System, Laser Thermal Conductivity and Scanning Electron Microscopy Systems. Nanocomposite films of PMN-PT and PZT paints have been fabricated by the conventional paint-brushing technique on copper substrate. The pyroelectric, piezoelectric, and dielectric properties of these films were measured to explore their suitability in thermal energy conversion devices and uncooled infrared detectors. The properties investigated include: dielectric constants (ε' and ε’’); pyroelectric coefficient (p); piezoelectric coefficient (d33) and energy conversion performance. Preliminary results indicated that paint composite films are functional and figure-of-merits increase with an increase in amount of PMN-PT nanoparticles in paint. The Khon-Sham equation of Density Functional theory, based on two fundamental theorems of quantum mechanics of many-body systems, has been used to obtain electron density calculations of confined electron systems, which have implications for the properties of matter, including energy harvesting via piezoelectric/pyroelectric effects. We illustrate preliminary results for simple confinements.

Funder Acknowledgement: NSF HBCU-RISE grant HRD 1546965

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Poster Category: STEM Research

CREST-Center for Innovation, Research, and Education in Environmental Nanotechnology (CIRE2N)

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The CREST-Center for Innovation, Research, and Education in Environmental Nanotechnology (CIRE2N), with participants from the University of Puerto Rico, Rio Piedras, Mayagüez, and Cayey Campuses, and Universidad del Turabo (a HSI-PUI in Gurabo, PR), will be dedicated to the development of nanomaterials and devices for applications in water and soil remediation, sensors,

and energy conversion. CIRE2N is based upon the overarching philosophy of using research and education as a vehicle to achieve self-sustainability and to develop the future Hispanic STEM workforce. CIRE2N will engage in the following interdisciplinary research groups (IRGs): IRG 1: Nanomaterials for Water and Soil Remediation, which will be working on innovation, research and education in water recycling and purification, and resource recovery. In particular, reactive membranes for water purification, heavy metal remediation, and microbial reactors will be developed. IRG 2: Sensors for Human Health and Environmental Monitoring, which will develop nanomaterials that enable new, robust and stable devices for physical and biochemical sensing. The goal is to develop devices that remain operational in harsh conditions and with minimal power consumption. IRG 3: Nano materials for Energy Conversion and water recovery, which will be working on energy storage and conversion, with special interest in the development of advanced materials for ammonia alkaline fuel cells and urea microbial fuel cells. The testbed for the nanotechnology being developed will be at Las Cucharillas Marsh, a coastal wetland reserve in Cataño, Puerto Rico, managed by the Corredor del Yaguazo, Inc., a community-based NGO that has a cooperative agreement with UPR-Rio Piedras, and Puma Energy. CIRE2N will support the development and training of students, K-12 teachers, and faculty members in their respective research areas. CIRE2N will provide our undergraduate and graduate students with the necessary tools to develop successful STEM careers. It is the primary objective of CIRE2N to strengthen Hispanic STEM education and nanotechnology technical areas outlined in this proposal together with the institutionalization and sustainability of the Center through the development of a high potential of nanotechnology commercialization by increasing the technology readiness level (TRL). This is especially relevant for areas where heavy metal and sewage contamination is a serious threat to ecosystems and human health.

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Poster Category: STEM Research

Synthesis of Porous Carbon from Packaging Waste for 3D Printed Energy Devices

Vijaya Rangari, Tuskegee University
Co-Author(s): Mohanad Idrees, Syed Ahmed, Naga Korivi, and Shaik Jeelani, Tuskegee University, Tuskegee, AL

The growth of portable consumer electronics has led to a tremendous demand for high-performance energy storage devices. Supercapacitors have gained attention for its fast charging time, long cycle-lives, wide range operating temperature, and meeting environmental standards. The objective of this study is to synthesize activated porous carbon from packaging waste material and develop a simple supercapacitor device using 3D printing technique. Packaging waste was carbonized at 500°C at autogenic pressure. This carbon was further reacted with Na(OH) at ratios of 2 and 4 and at 700 °C to produce activated carbon. The resulting carbon was characterized using BET, Raman, XRD, and SEM. The printable carbon paste/ink was prepared by mixing the activated carbon with PVA/ H3PO4 electrolyte at a ratio of 1:2. Using predesigned CAD model, the electrodes were printed with VOL-25 printer head commonly used for printing of pastes. After the first electrode is printed, thin electrolyte film was placed on its top and then the second electrode is printed. Printed devices were allowed to dry before their removal from the substrate. 3D printed devices were characterized for their charge-discharge performance. Activated carbon has shown BET surface area of 903 m2/g and pore volume of 0.5195 cc/g, which is close to commercial activated carbon. XRD and Raman have shown increased graphitization. Printed devices have shown specific capacitance of 29 F/g and power density of 750 W/Kg at a current density of 2.5 mA/ cm2.Two devices connected in series were successfully able to light up an LED for 25 Seconds. Packaging waste is a promising source of high quality activated carbon. 3D printed devices have shown excellent performance, suggesting additive manufacturing is a promising technique for fabrication of versatile energy devices for portable consumer electronics.

Funder Acknowledgement: NSF-CREST, NSFRISE, NSF-DMR-MRI

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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 on 'Initiative in NanoBioengineering Undergraduate Research and Education for Minority Students (INBUREM)' that is aimed to strengthen 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 annual evaluation and prepare formative and summative reports of 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

Physics

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Poster Category: STEM Science and Mathematics Education

From the Sea to the Stars: Educational Advancement at UVI via Observations and Astronomy Research Experience.

Antonino Cucchiara, University of the Virgin Islands
Co-Author(s): David Morris and Nastassia Jones, UVI, USVI

The University of the Virgin Islands (UVI) is going through a overall renovation of the Physics curriculum: a new 4-years Bachelor of Science in Physics with concentration in Astronomy has been offered. The principal goal is to provide a new STEM-focus workforce for the territory, starting from UVI students and exapanding to local educators (K-12). The acquisition of a portable inflatable planetarium and telescopes have provided the opportunity to shift the typical teaching paradigm, from the classical teaching scheme to active learning and research-based lessons. We present the first examples of these new teaching methodologies in the General education and physics major Astronomy courses.

Funder Acknowledgement: NSF HBCU-UP grant number #1719265

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Poster Category: STEM Research

Resistance Switching and Memristive Hysteresis in Visible-Light -Activated Adsorbed ZnO Thin Films

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The discovery of resistance switching memristors marks a paradigm shift in the search for alternative non-volatile memory components in the semiconductor industry. Normally a dielectric in these bistable memory cells changes its resistance with an applied electric field or current, albeit retaining the resistive state based on the history of the applied field. Despite showing immense potential, sustainable growth of this new memory technology is bogged down by several factors including cost, intricacies of design, lack of efficient tunability, and issues with scalability and eco-friendliness. Here, we demonstrate a simple arrangement wherein an ethanol-adsorbed ZnO thin film exhibits orders of magnitude change in resistance when activated by visible light. We show that there exists two stable ohmic states, one in the dark and the other in the illuminated regime, as well as a significant delay in the transition between these saturated states. We also demonstrate that visible light acts as a non-invasive tuning parameter for the bistable resistive states. Furthermore, a pinched hysteresis I-V response observed in these devices indicate what seems to be a new type of memristive behaviour.

Funder Acknowledgement: National Science Foundation HBCU-UP Award # 1719425; Department of Education MSEIP Award # P120A170068

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Poster Category: STEM Science and Mathematics Education

A Golden Binary as an Inspirational Tale for the High School Classroom

Mario C. Diaz, University of Texas Rio Grande Valley
Co-Author(s): Alna Hendrick, Veterans Memorial High School, Brownsville, TX and Erick Vallarino, San Benito High School, San Benito, TX

On September 14, 2015, a new chapter in the history of astronomy has begun. Gravitational Waves were detected for the first time, after the longest search to verify a theoretical prediction in the history of modern physics. Less than two years after this detection, the astronomical community had the chance to observe the first collision of two neutron stars with a multiplicity of instruments ranging from X-ray and Gamma-ray satellites, to optical telescopes including gravitational wave detectors. This history is a highly inspirational tale. A long standing search which solves many scientific mysteries at the same time: the source of heavy metals on Earth like gold and platinum, the origin of the most energetic explosions in the universe, and opens at the same time a new venue to measure the expansion of the universe. Time Domain Astronomy is the name adopted in astronomy to refer to the study of transient astrophysical events like this one. But Time Domain Astronomy includes the observation of many different astronomical events whose associated energetics varied during the night sky: i.e. the study and tracking of asteroids, observations of eclipsing

binaries, novae, supernovae as well as the observation of kilonovae (which is the name given to the associated electromagnetic emission during the collision of neutron stars). In this poster we discuss how the study of Time Domain Astronomy can be utilized as the main topic of a High School Astronomy course. The course focuses on the utilization of an astronomical observatory to teach hands-on astronomy to HS students performing regular observations of transient events. Students learn to operate a telescope and to perform astrometric and photometric observations at the same time they learn astronomical topics typically adopted in the HS curriculum.

Funder Acknowledgement: The authors acknowledge support from NSF-PHYS 1156600 and NSF-HRD 1242090.

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Poster Category: STEM Science and Mathematics Education

Institutional Change through Faculty Advancement in Instruction and Mentoring: Year 3 Findings

Mehri Fadavi, Jackson State University
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From January 2014 through 2017 (Year 3), the ICFAIM program at Jackson State University's Department of Physics, Atmospheric Sciences, and Geoscience sought to: a) create sustainable institutional change by establishing a supportive infrastructure for improved faculty pedagogy, mentoring, and research opportunities for undergraduate STEM students; (b) improve student learning and critical thinking skills, and (c) increase the enrollment, retention and graduation rate of participating students. The purpose of the current study was to provide outcome data from ICFAIM's professional development efforts for Program Year 3 by summarizing evidence of the effect of program participation on faculty and students. Methods: To assess the program's effectiveness in meeting its principle goals, a quantitative evaluation design was implemented, along with some qualitative components that triangulated several data sources. This design permitted collection of formative evaluation information to highlight areas for potential improvement, as well as summative evidence of the short-term ICFAIM program outcomes. Year 3 data were collected on participating faculty and students, using the Motivated Strategies for Learning Questionnaire (MSLQ; online and hard-copy), student science content tests (online and hard copy), the Critical Thinking Assessment Test (CAT; hard copy), Faculty post workshop surveys (collected by program staff, but mailed and entered by evaluators), Faculty end-of-year reflection survey (online), and professional development observation (field notes by evaluators and the use of observation protocols). The faculty sample originally consisted of 35 participants (23 faculty, 12 graduate students) from the department and other departments within the JSU College of Science, Engineering and Technology. The aggregate student sample included 551 students enrolled in the faculty participants STEM courses (315 Semester 1; 302 Semester 2). The student population included 62% female, 38% male, 91% African American, and 59% who listed biology as their undergraduate majors.

Funder Acknowledgement: NSF-HBCU UP-Grant number 1332444

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Poster Category: STEM Science and Mathematics Education

Targeted Infusion Project: Infusing Quantitative Biology Methods into Cognate and Upper Division Courses: Enhancement of the Life Sciences Curriculum

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

This Targeted Infusion Project at Fisk University seeks to incorporate quantitative biology methods and embed authentic research into lecture and laboratory components of cognate and upper division life science courses. In this post-genomic era it is clear that a strong quantitative skill set is a prerequisite for biology majors. Informed by Vision and Change, and other national initiatives and reports, we have committed to curricular innovation that leverages the recommended best practices obtained from research on teaching and learning. 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. Together, the objectives will provide a strong foundation in core scientific skills, particularly quantitative skills such as computation, modeling, problem solving, and data analysis. This interdisciplinary approach will synergize with several ongoing initiatives at Fisk University and have a transformative effect on student training for careers in STEM disciplines. Seven undergraduate students have participated in this project during the first grant year, developing new labs for the introductory physics courses, as well as working on projects for the biophysical chemistry course. The introductory Physics for Life Sciences course has been approved by the University and is being offered for the 2017-2018 academic year. The first semester of the course and its associated laboratories will be

offered in the Fall semester, the second semester and associated labs will be taught in the Spring. The Biophysical Chemistry course is under development and is on schedule to be offered in the Spring semester of the 2017-2018 academic year. Modules for upper level biology courses are being developed and will be phased in beginning Fall 2017.

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

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Poster Category: STEM Research

NSF-CREST: Advanced Center for Laser Science and Spectroscopy

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The CREST Advanced Center for Laser Science and Spectroscopy (ACLaSS) at Hampton University continues to enhance human resource development of minority students, and strengthen the research and education infrastructure. The goals of ACLaSS are to: 1) advance the research and education center with cutting edge laser sciences and spectroscopy; 2) develop and implement graduate and undergraduate educational modules; 3) provide extensive research and educational opportunities to graduate and undergraduate students, 4) strengthen the pipeline of students pursuing advanced degrees in science and technology through outreach activities and summer workshops, and 5) provide educational opportunities in laser science and spectroscopy to high school teachers and students in grades K-12. The ACLaSS involves the participation of a diverse group of faculty and students from the Physics, Chemistry, and Atmospheric and Planetary Sciences Departments at Hampton University, as well as scientists at other national and international institutions, industries, and government agency laboratories. The research endeavors in the ACLaSS at HU include laser spectroscopy and materials modeling, fluorescence spectroscopy and application, and laser remote sensing. The research activities of laser spectroscopy and materials modeling include the spectroscopic characterization of plasmon-coupled semiconductor quantum dots and Raman molecules for photonic applications of light amplifications, chemical molecular sensing, and nonlinear optical modulations. The research activities of fluorescence spectroscopy and application include the development of low-quantum defect gain media for eye-safe lasers. The development of new laser gain media continues to be an active area of research with a large range of potential applications for the civilian and military sectors. The research activities of laser remote sensing include the measurements and analyses of aerosols, planetary boundary layer, wind speed, water vapor, temperature, cirrus clouds, polar stratospheric clouds, and carbon dioxide. The current center activities during the no-cost extension period also include effective synergetic activities between the subprojects and degree completion of remaining minority graduate students.

Funder Acknowledgement: Acknowledgement: The CREST program at HU is supported by the NSF HRD:1137747.

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Poster Category: STEM Research

Generating Large Scale Flocks of Sperm in Viscoelastic Fluid

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Sperm collective swimming in viscoelastic fluid provides a biologically relevant model system to study the behavior of active matter. To study the statistical mechanics of the flocking of sperm, it will be important to study the variation of sperm orientation within a large flock. While early experiments show that increasing cell density increases the average flock size, packing the field of view (570 ×426 µm) with sperm was not sufficient to generate large flocks. On the other hand, by transiently aligning sperm orientation with a flow, we were able to observe flock sizes close to the height of the field of view (across 435 µm or 240 cells) forming after the flow was turned off. This suggests that the sperm flock sizes depend on the history of the flock orientation. Furthermore, alignment due to cell-cell interactions through viscoelastic medium is not enough to overcome the vigorous swimming of sperm and align two flocks with different orientations, yet enough to prevent rotational diffusivity from efficiently breaking down the large flocks. We will also discuss the orientation variation within a large flock.

Funder Acknowledgement: NSF 1665004

Science and Mathematics Education

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Poster Category: STEM Science and Mathematics Education

HBCU-UP Implementation Project: Science Community of Active Learners to Enhance Achievement and Retention (SCALAR)

Maurice Edington, Florida A&M University
Co-Author(s): Lewis Johnson, Desmond Stephens, and Paulette Reneau, Florida A&M University, Tallahassee, FL

This presentation will provide an overview of Florida A&M University's (FAMU) recently funded HBCU-UP Implementation project 'Science Community of Active Learners to enhance Achievement and Retention (SCALAR).' The overall goal of SCALAR is to significantly improve student success rates in FAMU's STEM programs and gateway courses. This will be achieved by taking a deliberate, integrated, and focused approach towards: 1) improving student math deficiencies early in the academic career; 2) ensuring that students develop sound foundational knowledge in core disciplines; 2) helping students develop positive attitudes about their ability to learn; 3) placing students in effective learning environments; 4) providing students with sufficient academic support resources throughout their academic career in STEM; and 5) developing and enhancing critical thinking skills. The successful implementation of the SCALAR project will result in improved academic support services, teaching and learning in STEM areas. The outcome of these efforts will be an improvement in the student core abilities and mindset necessary to tackle the rigor of STEM disciplines, which will lead to higher student retention of content, increased recruitment and retention of students in STEM majors, shorter time toward degree, and increased numbers of students obtaining graduate degrees.

Funder Acknowledgement: Funded by the National Science Foundation (NSF) Historically Black Colleges and Universities-Undergraduate Program (HBCU) Grant award HRD-1719546

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Poster Category: STEM Science and Mathematics Education

Mathematics Teaching Institute

Nicola Edwards, Delaware State University
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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 the MTI is to train teachers to better support student learning in an active learning environment. Instructors benefit from the 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 the MTI is to 1) expose instructors to alternative teaching practices that encourage students to become critical thinkers, 2) to help instructors create PBL tasks that improve the quality and level of the cognitive demand for student engagement, and 3) to encourage interdisciplinary collaboration among STEM instructors to produce STEM rich problems. Instructors implemented the PBL activities in all sections of College Algebra, and have designed some activities for Trigonometry. Preliminary data suggest participation in PBL supports student engagement in course content. This year, instructors for College Algebra and Trigonometry participated in Professional Learning Community (PLC) during the academic year as an extension of the 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

Regenerative Medicine, A Vehicle to Infuse Laboratory-Bench Modules Into the Exercise Physiology Curriculum

Chad Markert, Winston-Salem State University
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Regenerative medicine is a novel discipline that both excites undergraduates and may be used as a vehicle to expose students to scientific concepts and opportunities. The goal of this communication is to describe the implementation of an NSF -funded Targeted Infusion Project (TIP) in which underrepresented minority undergraduates are exposed to laboratory-bench skills and summer research opportunities that they may not have encountered otherwise. A three-week infusion of lab-bench and data presentation skills, in the context of a regenerative medicine/ bioengineering project, aimed to engage students and expose them to opportunities as summer researchers and teaching assistants. The infusion aimed to assess the extent to which students improved 1) attitudes toward lab bench-based techniques, using attitudes toward science as a proxy, 2) perceptions of scientific inquiry, 3) intentions to engage in undergraduate research, and 4) intentions to persist in STEM-related fields. Results indicate that the three-week infusion had no effect on science attitudes, but transcribed responses to structured interviews administered after the summer research experience indicated that students who completed summer research projects had positive experiences. Differences in intentions to engage in research were detected between groups of students in different STEM majors, in addition to differences in intentions to pursue a career in science. We describe the implementation of the

infusion and briefly discuss quantitative outcomes. We conclude that infusion of lab-bench modules in the context of a regenerative medicine/bioengineering project may play a small but important role in increasing (minority) participation and persistence in the STEM pipeline.

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Poster Category: STEM Science and Mathematics Education

The UVI Growth Model: A Comprehensive Approach to Success for STEM Majors

Camille McKayle, University of the Virgin Islands
Co-Author(s): RR. Stolz, T. Turner, S. Romano, A. Stanford, A. Bauman, N. Monrose, N. Jones, L. Cummings, A. Sanchez, R. Berkeley, and A. Tucker Blackmon

The UVI Growth Model for STEM Retention has resulted in increased rates of retention, persistence, and graduation as well as increased numbers of STEM majors. The model has been developed through funding from the National Science Foundation's Historically Black College and Universities Undergraduate Programs (NSF HBCU-UP) since 1999, and has been fueled by increased capacity from NSF VI-EPSCoR and other NSF and NIH grant projects. Over the course of the NSF HBCU-UP funding, UVI has realized a 48% increase in STEM majors. The College of Science and Mathematics improved retention rates, with the most recent cohort realizing a 91% retention rate, versus UVI's 75% overall rate (data from UVI's Office of Institutional Research and Planning). The persistence rate has also increased for STEM majors, and is currently at approximately 65%, versus UVI's overall 58%. Graduation rates for STEM majors have increased by six percent, and currently hover near 30%, versus UVI's overall six year graduation rates of 22 to 26% (in keeping with UVI's chosen institutional peers, where graduation rates range from 19% to 39%). The success of the UVI Growth Model is in part due to adaptation and implementation of research based approaches, many of which had been proven to positively impact student success in other settings. These approaches have included developing a summer program for entering freshmen, as well as formal course-related, and informal non-course related activities focused on both student academic and social experiences. Our comprehensive plan has incorporated feedback, with all activities evaluated, revised, and re-visited. In some instances, activities were created at UVI, but always had as a basis research on student achievement. Our current emphasis in the model has been on student professional development, and enhancement of the undergraduate STEM environment to impact student personal growth and success in STEM. We are now integrating a growth mindset into our Freshman Development Seminar, our Sophomore Boost program, and our faculty development activities. Carol Dweck, Stanford University, has demonstrated that persons with a 'growth' mindset who believe that intelligence is malleable are more successful than those with a 'fixed' mindset who believe that intelligence is static. We are using the approach Dweck's team has developed for teaching about growth mindset to middle school students to develop materials appropriate for university students. By teaching students how one can 'grow' intelligence through work and using evaluation instruments to measure where one is on the mindset spectrum, we expect to continue to increase student success in STEM. Our goal with our current ACE implementation project is to continue to further validate the UVI Growth model so that it can be adopted by other institutions.

Funder Acknowledgement: NSF HBCU-UP ACE Implementation Project Grant No. 1623126

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Poster Category: STEM Research

Virtual e-Mentorship Training to Broaden Participation in STEM

Jillian Wendt, University of the District of Columbia
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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, pursue a job in STEM. In this project, female, minority graduate students will 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 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 process 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 presentation will explain the rationale of the project and project development; namely, the development of the e-mentorship training modules.

Funder Acknowledgement: NSF Award Number 1717082

Social, Behavioral and 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): Sherri Frizell, Prairie View A&M University; Aretha Marbley, Texas Tech University

The goal of this Project is to utilize a mixed methods approach using both qualitative and quantitative measures to identify the factors that contribute to faculty production of successful minority STEM graduates at HBCUs. The research focus is implemented in an effort to better understand how HBCU STEM faculty can structure successful collegiate experiences to impact the quantity and quality of STEM degree graduates.

Funder Acknowledgement: National Science Foundation

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Poster Category: STEM Research

Expectancy-Value Theory in an Academic Intervention to Target STEM Persistence

Victoria Davis, Virginia State University
Co-Author(s): Toni Harris, Brian Sayre, Leslie Whiteman, John Fife, and Cheryl Talley, Virginia State University, Petersburg, VA

There is substantial evidence that the use of psychosocial academic interventions will result in improved student achievement (Dweck, Walton, & Cohen, 2014). In an effort to obtain a better understanding of this phenomenon, the current multi-study examines student psychosocial variables as predictors of student academic success, which was informed by the Expectancy-Value Model (Eccles & Wigfield, 2002). Specifically, the effectiveness of a psychosocial academic intervention is examined and the importance of students' self-expectancy and task value for classroom achievement in STEM courses is explored. Researchers hypothesized that a psychosocial intervention tailored to increase factors of the Expectancy-Value Theory for STEM students would increase academic rates. The intervention included a 2-credit prerequisite Biology professional development course and McGraw-Hill Education's LearnSmart adaptive learning platform. Study participants were STEM majors taught in BIOL120 Principles of Biology I, a general biology course. All sections utilized the same syllabus, LearnSmart, online homework assessments, and online exam questions. However, Biology majors were required to take BIOL 130 Professional Practices, in which elements of the psychosocial intervention were delivered. The study compared students' final grades, pass/fail rates of assignments, LearnSmart activity rates. Results found that the pass rates of biology majors increased 17% over the 3-year period compared to other STEM majors enrolled in the course. The results indicate that psychosocial academic intervention techniques that target mastery goal orientation and student academic efficacy, combined with the LearnSmart adaptive learning tool, can significantly increase student performance in an introductory general biology course. Due to indications, researchers further explore mastery and academic efficacy in persistent STEM students through assessing The Expectancy-Value Theory. Participants then included two hundred forty-six African American male and female STEM college students. Student participants were given an assessment battery that assessed task value, self-handicapping, and expectancy for success. Analyses found that students' expectancy for success was a significant predictor for final course grade in the sample. Additionally, it was found that high academic achievers are more likely to value classroom tasks and are less likely to use self-handicapping strategies in comparison to their counterparts. Results indicate that self-expectancy and task value are key factors for academic student success for African American STEM students. Additionally, it is confirmed that the development of mastery orientation and academic efficacy can help students perform at higher rates in STEM. Current research informs intervention efforts to effectively increase retention rates and African American representation in STEM.

Funder Acknowledgement: National Science Foundation: Targeted Infusion Project: Using Evidence Based Programming to Inform a Living-Learning Community; Award No: 1623262

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Poster Category: STEM Research

Closing the Loop: An Evaluation Process for Improvement of Intervention Design with Application

Marie Hammond, Tennessee State University
Co-Author(s): Elaine Martin, Tom Broyles, Martez Burks, David Shelton and Susan Githua, Tennessee State University, Nashville, TN

Designing an intervention based upon research literature is the first step towards improvement process. Rarely does an intervention work the way we intend at this point. Thus, revision to increase the effectiveness of the intervention is critical. Based in the theory of continuous quality improvement and using a combination of consultative, evaluative, and educational review processes, this poster will report on the procedures used and outcome of such a review process. Attention to differences between the current context and the context of the research base and literature will be articulated to further clarify the critical nature of evaluation in the improvement of processes and interventions included in grant-funded research. An example using the intervention sequence being developed across two recent HBCU-UP BPR grants awarded this group of researchers will be included.

Funder Acknowledgement: National Science Foundation, HBCU -UP Broadening Participation Research

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Poster Category: STEM Science and Mathematics Education

Non-cognitive factors as Mediators of the Effects of Cognitive Skills on Academic Performance in African American Secondary Students

Oliver Hill, Virginia State University
Co-Author(s): Brittany Watkins; Alicia Cooper, Virginia State University

The purpose of this research study is to investigate non-cognitive factors (academic efficacy, avoiding novelty, self-handicapping, and self-presentation) as mediators of the relationship among cognitive skills (processing speed, working memory, and auditory processing) and academic performance in African American secondary students. Results from the causal model suggest that these non-cognitive variables do mediate the effects of cognitive skills on academic performance in this population. The relevance of these findings to the development of effective intervention programs is discussed.

Funder Acknowledgement: NSF Grant HRD-1533563

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Poster Category: STEM Research

Culture Identity, Africultural Coping Strategies, and Depression as Predictors of Suicidal Ideations and Attempts Among African American Female College

Kara Morrison, Virginia State University
Co-Author(s): Reginald Hopkins

Suicide prevention is now a major health concern in America for many minority groups in the United States. Although African American women have one of the lowest suicide rates in the country, there is limited research exploring the underlying causes of this phenomenon. There is growing consensus that the cultural practices and beliefs of African American women may influence their low rates of suicide. This study explores role of cultural identity, Africultural coping strategies, and depression as predictors of suicidal ideations and attempts among African American female college students. It was hypothesized that suicidal ideations and attempts are negatively related to cultural identity and Africultural coping styles, but positively related to depression. One hundred and thirty-seven African American students were administered a battery of measures assessing cultural identity, coping strategies, suicidal ideations and attempts. Pearson correlations and binary logistic regressions were used to evaluate the data and test the major hypothesis. Results revealed that Africultural coping strategies and depression emerged as significant predictors of suicidal ideation and attempts. Spiritual-centered coping was the strongest predictor of past year and lifetime suicidal ideations, as well as lifetime suicidal attempts amongst cultural identity, cognitive emotional coping and depression. Future research should investigate risk and resiliency of African Americans and the effectiveness of culturally tailored interventions focused on spiritual and collective centered coping in reducing suicidal ideations and attempts. A greater understanding of cognitive-emotional coping is needed as it may be impacted by acculturative stress and increased negative behavioral outcomes in African Americans, particularly if they are depressed.

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Funder Acknowledgement: Virginia State University

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Poster Category: STEM Science and Mathematics Education

The Impact of Infusing Cybersecurity into Sociology and Criminal Justice: The First Year Report

Carlene Turner, Norfolk State University
Co-Author(s): Claude Turner, Elijah Manson, Robert Perkins, Yuying Shen, Cheryl Hinds, Jonathan Graham, and Kianga Thomas, Norfolk State University, Norfolk, VA; Anthony Joseph, Pace University, New York, NY

This poster presentation encapsulates the implementation efforts for the Socio-Cybersecurity Project at Norfolk State University. Specifically, an analysis of the impact of teaching socio-cybersecurity modules on the learning outcomes of approximately 400 undergraduates will be examined. The analysis is grounded in Vygotsky's Experiential Learning paradigms. The project team created six socio-cybersecurity modules in the first year of the project, which were subsequently infused across three courses. The targeted courses were Elementary Statistics, Social Problems, and Introduction to the Social Sciences. Utilizing a quasi-experimental methodology, pre and post-tests were conducted on the student sample, with the infused modules being the treatment. Paired t-tests analyses were conducted to compare the mean differences across the pre and post-test conditions. The results demonstrates that there was some difference in means for some of the indicators. However, the results also show that there are opportunities to improve the experiential thrust of the module infusion. These findings are instrumental in guiding the direction of the second and third years of the project.

Funder Acknowledgement: National Science Foundation, HBCU -UP Targeted Infusion Project Grant No. 1623201.

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Poster Category: STEM Research

Using Eye Tracking to Study Migrant Remittances and Welfare

Angelino Viceisza, Spelman College
Co-Author(s): Eduardo Nakasone, Michigan State University, East Lansing; Maximo Torero, World Bank, Washington, DC

It is well documented that migrant remittances are a significant driver of global development and serve as a pillar of economic stability (e.g. The World Bank 2015, Yang 2011). In fact, it is estimated that remittance flows to developing countries will reach US$ 479 billion in 2017, a number that far exceeds official development assistance. Nonetheless, sending remittances remains costly. The World Bank estimates that, as of 2014, the global average cost of sending US$ 200 held steady at 8 percent of the transaction value. The creation of publicly available comparison databases containing detailed information on the costs, speed, and reliability of sending remittances has been identified as one of the most efficient means to achieve the above aims; as they did for the airline industry. This study partners with RemitRight (www.remitright.com), the first World Bank-certified metasearch web and mobile platform for online money transfers from the US to top remittance-receiving countries, to test behavioral foundations and relevant attributes of online comparison-shopping for financial-remittance senders (such as Western Union, MoneyGram, banks, etc.) One of the study's main intellectual merits lies in the fact that it uses non-choice (neuro) data in the form of eye tracking to unpack 'the black box' of experimentally elicited migrant remittance choices. In so doing, the study sheds light on (1) how neuroeconomic data can be used in field contexts to identify relevant attributes of choice and (2) the resulting welfare effects that could accrue to migrants and recipients from comparison-shopping and increased transparency. From a broader standpoint, the study will also provide evidence for whether and if so how neureconomic data can be used to craft development policy and in turn impact outcomes. This poster presentation will focus on results from the first set of field experiments conducted with a sample of close to 400 Central American immigrants residing in the metro DC area. It will also shed light on the next wave of the study, which will occur during Spring to Summer 2018 'live' on www.remitright.com.

Funder Acknowledgement: This study is supported by an EAGER grant from the National Science Foundation, Award number: 164992

Technology and Engineering

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Poster Category: STEM Research

Genesis of a Multi-function Drag Enhancement and Measurement System (mDEMS) to Facilitate Atmosphere Modeling and Space Debris Mitigation

Sharanabasaweshwara Asundi, Tuskegee University
Co-Author(s): Jimesh D. Bhagatji, PES University, Bengaluru, Karnataka India; Piyushkumar B. Taylor and Sardar Vallabhbhai Patel, Institute of Technology, Vasad, Gujarat India

Since the advent of containerized pico/nano/micro-satellites (PNMSats), there is renewed focus to address/limit space debris. However, mass launch of PNMSats across the world is also an opportunity to refine satellite drag-temperature models and facilitate better understanding of atmosphere, space weather, and predict the life of spacecraft in orbit. A novel multi-function drag enhancement and measurement system (mDEMS) is proposed to - (i) rapidly deorbit PNMSats at the end of their mission-life and (ii) validate/refine drag-temperature models. An elaborate computer aided mechanical design is presented,

which demonstrates the integration of - (i) a telescopic boom for isolating the onboard magnetometer from electro-magnetic interference, (ii) a drag gossamer mounted with drag sensors on a flexible printed circuit board, (iii) a container for storing batteries, and (iv) a dipole UHF/VHF antenna. The mDEMS is a two-stage deployment system for PNMSats in altitudes of upto 600km. The packaging volume is < 30% of the volume of a pico-class CubeSat and < 200 grams in mass. Preliminary results of the design are progressive and the proposing team is motivated to realize it into a commercial-off-the-shelf system.

Funder Acknowledgement: National Science Foundation

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Poster Category: STEM Research

Modeling and Quantifying Cyber Attacks on Signalized Traffic Networks

Gurcan Comert, Benedict College

Transportation networks are considered as one of the critical physical infrastructures for resilient cities (cyber-physical systems (CPSs)). In efforts to minimize adverse effects, agencies work with the National Highway Traffic Safety Administration of the US Department of Transportation. This paper uses a belief network-based attack modeling at signalized traffic networks under connected vehicles and intelligent signals framework. For different types of cyber attacks defined in the literature, risk areas and impact of attacks are evaluated via traffic simulations with various scenarios. Technically based on the selected metrics, risk probabilities are calculated for signal controllers. Impact of these risks on an example signalized traffic network are quantified in terms of average intersection queue lengths and delays (time spent in queue and server). In addition, effect of having redundant traffic sensing systems on intersection performance measures is also demonstrated.

Funder Acknowledgement: NSF Grant Nos. 1719501 and 1400991; U.S. Department of Homeland Security Summer Research Team Program and was conducted at Critical Infrastructure Resilience Institute, University of Illinois, Urbana-Champaign. USDOT Regional University Transportation Center for Connected Multimodal Mobility

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Poster Category: STEM Research

A Hybrid Control Systems Approach for Sequential Theory in Cancer Treatment

Chang Duan, Prairie View A&M University
Co-Author(s): Wasiu Opeyemi Oduola, Xiangfang Li, LiJun Qian, Prairie View A&M University, Prairie View, TX; Edward R. Dougherty, Texas A&M University, College Station, TX

Objective: Tumorigenesis is due to uncontrolled cell division arising from mutations and alterations in the proliferative controls of the cell population. The fight against tumor growth and development has often relied on combination therapy which has been acclaimed as one of the main standards of care in cancer therapeutics and prevention of drug-related resistances. The toxicity of the combinatorial drugs raises a significant concern whenever patients take two or more drugs concurrently at the maximum tolerated dose. A promising solution in tumor treatment involves the administration of the drugs in an alternating or sequential fashion rather than a simultaneous manner. In this work, we investigate how feasible such an approach is from a mathematical perspective and propose a switched hybrid control systems framework. Methods: We explore the response of tumor cells dynamics to sequential drugs administration with the aid of a time-dependent switching strategy. A transit compartmentalized model is employed to describe the tumor cells progression to death. Results: The design of the time-based drug switching logic ensures the proliferating tumor cells are repressed. Conclusions: Simulation results are provided using the tumor growth dynamics with sequential drugs intake to demonstrate the effectiveness of the proposed method in reducing the tumor size. Significance: This work is the first attempt to provide a switched hybrid control systems framework on sequential drug administration to biomedical researchers and clinicians.

Funder Acknowledgement: This material is supported by the National Science Foundation under Grant Number 1238918, 1464387, 1736196, 1601126. Any opinions, findings, conclusions, or recommendations presented are those of the authors and do not necessarily reflect the views of the National Science Foundation.

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Poster Category: STEM Research

Interpretation of Band-to-Band Photoluminescence Images from Polycrystalline Si Wafers

Dunsin Fadojutimi, Lincoln University, PA
Co-Author(s): Uchechi Anyanwu, Andrey Semichaevsky, Lincoln University, PA

Band-to-band photoluminescence from polycrystalline Si can be used to estimate local carrier densities in semiconductor samples. Under this approach, light consisting of photons of energies that exceed the bandgap of the material is shone on a sample. The excited electrons recombine with the holes at the rates that are proportional to the product of electron and hole concentrations, n*p. However, other recombination mechanisms such as excitation-dependent Shockley-Reed-Hall non-radiative (NR) recombination result in the reduced local radiative recombination rates. It is interesting to know how the

carrier lifetimes that come from transient photoconductivity measurements compare with the estimated recombination rates. In this work, we deduce the local NR recombination rates from the PL images and find correlations between them and our intensity-dependent measurements of minority carrier lifetimes for the same samples. We use IR images taken for a set of poly-Si wafers with the spatial resolution of roughly 20 microns. The raw PL intensities were subject to several post-processing steps, including averaging, noise removal using a 2-D Wiener filter, and a conversion between the PL rate and the estimated local electron density. Then the spatial distributions of NR recombination rates were predicted. These rates averaged over the whole sample and the measured minority lifetimes for the same Si wafers show negative correlation.
References: Sio, H, Phang, S, Trupke, T et al 2014, 'An accurate method for calibrating photoluminescence-based lifetime images on multi-crystalline silicon wafers', Solar Energy Materials and Solar Cells, vol. 131, pp. 77-84.
Uchechi Anyanwu, Christian Harris, Andrey Semichaevsky, 'Carrier transport in polycrystalline silicon at high optical injection: transient photoconductance vs. numerical modeling,' 44th IEEE-PVSC, Washington, DC, June 26, 2017.

Funder Acknowledgement: This work was supported through the NSF HRD HBCU-UP /RIA grant 1505377. Images were acquired by Mr. Logan Rowe at the Talbot Lab, UIUC and kindly provided to us.

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Poster Category: STEM Research

The Impact of Project-based Learning on Improving Student Learning Outcomes of Sustainability Concepts in Transportation Engineering Courses

Elham Fini, North Carolina A&T State University
Co-Author(s): Mahour Parast and Taher Abu-Lebdeh, North Carolina A&T State University, Greensboro, NC; Faisal Awadallah, Birzeit University, Birzeit, Palestine

This study describes an intervention to enhance students' learning by involving students in brainstorming activities about sustainability concepts and their implications in transportation engineering. The study discusses the process of incorporating the intervention into a transportation course, as well as the impact of this intervention on student' learning outcomes. To evaluate and compare students' learning as a result of the intervention, the Laboratory for Innovative Technology and Engineering Education survey instrument was used. The survey instrument includes five constructs: higher-order cognitive skills, self-efficacy, ease of learning subject matter, teamwork, and communication skills. Pre- and post-intervention surveys of student learning outcomes were conducted to determine the effectiveness of the intervention on enhancing students' learning outcomes. The results show that the implementation of the intervention significantly improved higher-order cognitive skills, self-efficacy, teamwork, and communication skills. Involving students in brainstorming activities related to sustainability concepts and their implications in transportation proved to be an effective teaching and learning strategy.

Funder Acknowledgement: This research is based upon work supported by the National Science Foundation (NSF) under grant number 1238852 (Targeted Infusion Project Grant: Incorporation of Sustainability Concepts into Undergraduate Civil Engineering Curriculum Using Project-Based Learning).

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Poster Category: STEM Research

Development of NAE Grand Challenges Initiatives in Research from NSF ARRA Funding at Tennessee State University: The TIGER Institute

S Keith Hargrove, Tennessee State University
Co-Author(s): Maria Thompson, Coppin State University

The National Science Foundation provided infrastructure funding as a result of the American Recovery and Reinvestment Act (ARRA) in 2010. Tennessee State University was the recipient of funding to create a research facility based on conducting research related to the National Academy of Engineering 14 Grand Challenges. The TIGER (TSU Interdisciplinary Graduate Engineering Research) Institute was formed and is now conducting research in advanced energy systems, materials, virtual reality, and data sciences. An update on past challenges and current achievements of this facility will be presented and shared.

Funder Acknowledgement: National Science Foundation; Boeing Company; NAVSEA - Crane Naval Warfare Center

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Poster Category: STEM Research

CREST: Center of Excellence in Nanobiomaterials Derived from Biorenewable and Waste Resources

Mahesh Hosur, Tuskegee University
Co-Author(s): Anil Netravali, Maria Auad, Vijaya Rangari, Shaik Zainuddin

The Center of Excellence in Nanobiomaterials Derived from Biorenewable and Waste Resources was established at Tuskegee University (TU) with the funding from NSF for a period of five years starting October 2011. Collaborators from within the USA include Auburn University (AU), Cornell University (CU), the University of Alabama at Birmingham (UAB), and several industry and national laboratories. International collaboration is

built upon the existing relationships with researchers from Brazil and India. The research focus areas of the proposed center include: (a) synthesis of plant based nanofibers through electrospinning and Forcespinning™ methods; (b) production of bacterial cellulose fibers from soy waste products; (c) synthesis of nanoparticles from biodegradable sources such as egg shells and their use as nano-fillers in advanced composites; (d) synthesis of biopolymers; (e) development and characterization of advanced green nanocomposites using these materials with natural fibers; and (f) product design, prototyping and commercial feasibility studies. These efforts are being carried out through three sub projects; 1) Synthesis and characterization of nanobiomaterials, 2) Synthesis and characterization of biopolymers and nanobiocomposites, and 3) Processing, performance evaluation and technology transition of green nanobiocomposites to products. The materials developed will provide an alternative to the current generation of high performance 'advanced' composites materials which use thermoset polymers and man-made fibers like glass, carbon and Kevlar®. Further, these polymers are derived from petroleum, an expensive and scarce commodity, and composites are not biodegradable.

Funder Acknowledgement: NSF Award: HRD 1137681

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Poster Category: STEM Research

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

Ovais Khan, Tuskegee University

This work presents the numerical study of high-speed flow over an open cavity. The high-resolution numerical method based on WENO scheme is implemented to investigate the complex flow details in and over the cavity in terms of separation followed by vortex formation ahead of the leading edge of the cavity, shear layer over the cavity, the circulation in the cavity and the upstream propagation of disturbance waves. The WENO method used in this study is the modified third-order version which minimizes the inherent dissipation of the fifth-order classical WENO. The artificial boundary conditions are used at the inflow, outflow and far-field to avoid spurious waves in the flow domain as a result of truncating the domain into finite size and acoustic waves crossing the boundaries. The preliminary results obtained from the improved version of the WENO method provide flow details promisingly with no spurious waves. The characteristic behavior of the upstream acoustic disturbance is also compared with the experimental schlieren.

Funder Acknowledgement: The PI is thankful to National Science Foundation (NSF) to support the educational and research activities under RIA grant (HRD-1505303)

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Poster Category: STEM Research

Transforming the Culture of STEAM Teaching and Learning at Central State University

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. They 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 cultures. Instructors need to be facilitators in the classroom and students need to take greater ownership of their learning. A need exists to cultivate the learning culture both from inside and outside the classroom. At Central State University, a pilot study is taking place where sound principles in active learning in the classroom are integrated with the creation of a social environment emphasizing the benefits of learning with a group of students sharing the same educational and career goals. Several courses will be changed to a flipped classroom to stimulate student active learning. A Scholastics Club has been created to promote a social environment of learning and professional development. Through aggressive marketing, a change in the general culture of students toward self-directed learning will take place.

Funder Acknowledgement: NSF HBCU-UP

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Poster Category: STEM Research

Role of Cognitive Failures on Distracted Driving

Suman Niranjan, Savannah State University
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Distracted driving is a result of attention being diverted from the primary activity of driving. There are several reasons for distraction including adjusting a radio, accessing the multimedia

center of the car, using navigation system, talking to passengers, watching a video, grooming, and reading. Mobile utilization was resolved to be the second most basic type of diverted conduct high school drivers were occupied with before a vehicle mishap. Additionally, 44.5% of secondary school students confess to messaging while at the same time driving. It is critical to figure out which techniques are best at dissuading teenagers from texting while driving (TWD). The goal of the project is to identify behavioral factors that may impact teenagers and young driver's (between the ages of 13 and 25 years old) perceptions of following laws. Moreover, the prime goal of this study is to show that there exists an indirect relationship between the big-five personality traits and distracted driving, mediated through cognitive failures. Distracted driving is measured using two specific sub-constructs: texting while driving and distraction due to use of technology in the car (navigation and center console to name a few). A sample of 500 teenagers and young drivers has been used to conduct this study. A structural equation modelling is conducted to show that cognitive failures has a significant mediating role to play in the relationship between personality and distracted driving. Discussions of implications, limitations, and suggestions for future research are present.

Funder Acknowledgement: NSF-TIP-HBCU-UP

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Poster Category: STEM Research

Investigation of Accuracy Reduction Due to Model Over-simplification of Engineering Systems

Arturo Pacheco-Vega, California State University, Los Angeles
Co-Author(s): Florian Dugast, Pierrick Renault and Usama Tohid, California State University, Los Angeles, Los Angeles, CA

The mathematical modeling of any engineering system, whether for design, performance prediction, optimization or control, requires assessment of level of accuracy versus simplicity of the formulation. Although it is universally accepted that the more complex the formulation the more accurate the results from it, these require larger CPU times and computer resources, and are frequently limited by the capacity of computing power, precluding their use in favor of simpler models. Many times, however, engineers do not realize the potential risk that over-simplification of a problem generates in terms of accuracy of the results, as the model solution does not resemble the system behavior. The present study addresses the issue of over-simplification of the resulting mathematical model and the corresponding accuracy of its solution. The fluid flow inside a channel - containing an obstruction - is used as a demonstrative example. After constructing three sets of models of the physical system, each with a different level of detail, numerical solutions are compared to experimental data. The results show that the accuracy of the numerical approximation depends directly on the level of complexity of the mathematical model, and that over-simplification may result in up to a nine-fold degradation of the results. In addition, minor changes in the inlet boundary condition and geometry result in large changes in the flow pattern, with up to a five-fold difference in the recirculation bubble relative error. This information is fundamental for engineering professionals to consider during the modeling process for applications.

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Poster Category: STEM Research

Promoting Learning in Computer-Aided Design using the Peer-Generated Screencast Tutorials

Xiaobo Peng, Prairie View A&M University
Co-Author(s): Chang Duan, Diwei Zhang and Malcolm Jackson, Prairie View A&M University; Bugrahan Yalvac, Texas A&M University, Deniz Eseryel, North Carolina State University

This poster reports the findings of a Targeted Infusion Project funded by the National Science Foundation. The goal of the project is to improve the students' learning experiences in Computer-Aided Design (CAD) that will help them develop life-long learning skills and promote positive attitudes toward engineering. For this purpose, mechanical engineering professors and learning scientists collaborated to design and implement a student-centered instruction in the CAD courses. A quasi-experimental pre-and-post test research design was implemented. Experimental group students were asked to design screencast tutorials with their verbal explanations recorded. Students shared their screencast tutorials with their peers and provided feedback to each other's video tutorials. Control group students were asked to review the instructor made screencast tutorials. In order to explore the effect of the peer-generated screencasts on students' learning outcomes, four different evaluation instruments were used including a life-long learning survey, an engineering attitude survey, an exit project survey, and a CAD modeling exam. This poster reports the findings from the data collected using the instruments.

Funder Acknowledgement: This project is supported by the National Science Foundation under HRD Grant No. 1435073. Any opinions, findings, conclusions, or recommendations presented are those of the authors and do not necessarily reflect the views of the National Science Foundation.

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Poster Category: STEM Research

Bridging Quantitative Science with Biological Research: Jumpstarting Computational Systems Biology Research at PVAMU

Lijun Qian, Prairie View A&M University
Co-Author(s): S. Kim, Prairie View A&M University; X. Li, Prairie View A&M University; P. Obiomon, Prairie View A&M University

The goal of this project is to provide innovative solutions to more effective and efficient drug development by studying and analyzing the dynamic evolution of drug/cell interactions using biomedical big data. It will enhance the PhD program in the ECE department, broaden participation in computational biology at PVAMU, and greatly improve African American involvement in cutting edge research that is extremely valuable to the nation.

Funder Acknowledgement: NSF

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Poster Category: STEM Research

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

Subramanian Ramakrishnan, Florida Agricultural and Mechanical University
Co-Author(s): John Telotte, Lara-Perez Felkner

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. 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. For the first time we will be chairing a session at the May meeting during May 2018.

Funder Acknowledgement: NSF HBCU-UP

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Poster Category: STEM Research

Temporal Flow Characteristics of High-Frequency Supersonic Actuators Integrated in REM-Nozzle Assembly

John Solomon, Tuskegee University
Co-Author(s): Chitra Nayak, David Alexander, Leavon Lewis, Howard Javis

Temporal flow characteristics of a high-frequency supersonic actuator integrated to a nozzle-injector assembly designed for high-speed flow mixing is presented in this paper. This resonance enhanced microactuator nozzle system (REM-Nozzle) injects a fluid through four micro-nozzles of 400 µm diameter each positioned symmetrically around a 1.0 mm nozzle through which a high-frequency supersonic actuation jet pulses out in the frequency range of 13 - 21 kHz. Compressed CO2 is used as mixing fluid and compressed nitrogen is used for generating the actuation jet. The pulsed flow generates strong compressible vortex in the shear layer of steadily injected fluid that entrain and grows downstream enhancing microscale mixing of the injected fluid and nitrogen at very high-speed, and at a designated frequency. This paper summarizes the design details and characteristics of REM-nozzles,–a potential active injection scheme for efficient and controlled flow mixing in high-speed applications, and reports the ongoing studies on pulsed actuator using high-speed microschlieren imaging technique.

Funder Acknowledgement: NSF- RIA

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Poster Category: STEM Research

How to Effectively Integrate Innovative Artificial Intelligence Tools into Undergraduate Engineering Curriculum by Problem-Based Learning Approach

Yachi Wanyan, Texas Southern University
Co-Author(s): Youmei Liu, University of Houston, Houston, TX

This study aims to initiate research-supportive curricula in the Department of Engineering for undergraduate students. The overarching goal is to infuse innovative electrical/computer engineering specialized Artificial Intelligence (AI) tools into traditional engineering problem-solving routines by problem-based learning (PBL) approach to bridge current curricula gap in the Department of Engineering at Texas Southern University (TSU). Several major steps were taken towards three specific objectives during the first two and half years of funded effort: 1) to develop an interactive and comprehensive knowledge-based expert system (KBES) that can document, compare, and analyze cutting-edge AI applications in CE field and use it as the platform and educational media for curricula development and implementation; 2) to integrate AI approach into engineering curriculum; and 3) to support undergraduate students' early involvement in research. The PI has put concentrated efforts on AI infused curriculum development including: 1) Three pilot studies that infused broader AI concepts, paradigms and tools to different level students including freshmen level introduction course (CIVE141 Civil Engineering Materials), junior and senior level design and analysis courses (CIVE 334 Transportation Engineering and CIVE 335 Geometric Design of Highway); 2) Two consecutive sessions of larger scale implementation study with modified and improved AI infusion course contents on the same sophomore level core course (CIVE 224 Geotechnical Engineering). The research team has developed several different instruments and methodology for measuring progress toward desired student learning outcomes and program goals. A t-Test was used to compare student performance of the two consecutive sessions of implementation studies (CIVE224). One of the focus was to find out whether there was any difference in student learning outcome due to different implantation approaches used in classroom. The contents of AI infusion are identical to both sessions. The results indicate that students with early preparation and introduction of the AI concepts outperformed those students without such preparation with higher mean value and the difference is statistically significant with alpha = 0.05. The generated P value = 0.021, which is much lower than the alpha value. Based on these results, it is imperative for future full-scale AI infusion curricula to provide students sufficient early preparation and introduction of basic AI concepts in order to achieve better learning outcomes. The proposed KBES can be utilized as an easy-to-access pre-exposure platform in this regard. Based on the 2nd year preliminary case study results, the PBL approach is an appropriate instructional method to infuse AI into traditional engineering curriculum. The infused curriculum of several civil engineering core courses have shown noticeably positive feedbacks by both direct and indirect assessment.

Funder Acknowledgement: NSF HBCU-UP Targeted Infusion Award HRD1533569

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Poster Category: STEM Research

Synchronized High-Speed Video and Infrared Thermometry Study of Bubble Dynamics During Nucleate Boiling of Nanoemulsion

Jiajun Xu, University of the District of Columbia
Co-Author(s): James McLaurin, Cyree Beckett and Robert Stephenson, University of the District of Columbia, Washington, D.C.

Effective thermal management in various engineering systems is a critical issue, in which utilizing nucleate boiling to enhance heat transfer has attracted particular attention because its capability to remove high heat flux. However, nucleate boiling is a complex process that still requires more understanding. On one side, researchers have been relying on speculative hypotheses for decades to understand nucleate boiling heat transfer, which is a generally highly empirical and over simplified practice. On the other side, there is still disagreement on fundamental questions like: how nucleation occurs at the liquid–vapor interface for fluids with very low contact angles, and what are the physical mechanisms triggering critical heat flux etc. So there is an urgent need to collect data that enables detailed measurements of the phase, temperature, and velocity distribution during nucleation. In this study, a combination of synchronized high-speed video (HSV) and infrared (IR) thermography was used to characterize the nucleation, growth and detachment of bubbles generated during nucleate boiling. In addition, nanoemulsion was used in current study, in which nanosized phase changeable droplets were formed inside the nanoemulsion and served as the boiling nuclei. With this unique combination, it allows controlled nucleation, time-resolved temperature distribution data for the boiling surface and direct visualization of the bubble cycle to track bubble nucleation and growth. Data gathered included measurements of bubble size and shape vs. time, bubble departure frequency, wait and growth times, as well as 2D temperature history of the heater surface and velocity distribution within the liquid surrounding the bubbles. Our findings demonstrate a significant increase in heat transfer coefficient and critical heat flux of nanoemulsion compared to conventional heat transfer fluid. It is also observed here that the bubbles occurred inside the nanoemulsion appear to be more uniform and larger in size. Using the HSV and IR data, we were able to characterize the growth rate and interfacial temperature distribution of the bubbles inside nanoemulsion: the growth rate of the bubbles inside conventional fluid agrees well with classic Rayleigh-Plesset

equation with a coefficient of ½, which however, drops to be 1/4 for nanoemulsion. Future research involves more data on the effect of different phase changeable droplets, interfacial material and structures may help explain the unique nucleation process of nanoemulsion.

Funder Acknowledgement: Current work is financially supported by National Science Foundation HBCU-UP RIA grant under grant No. HRD-1601156. Research performed in part at the NIST Center for Nanoscale Science and Technology in Gaithersburg, Maryland. We want to thank Lei Chen and Gerard Henein, who assisted the manufacturing and characterization of the ITO heater, although he may not agree with all the interpretations/conclusions of this poster.

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Poster Category: STEM Research

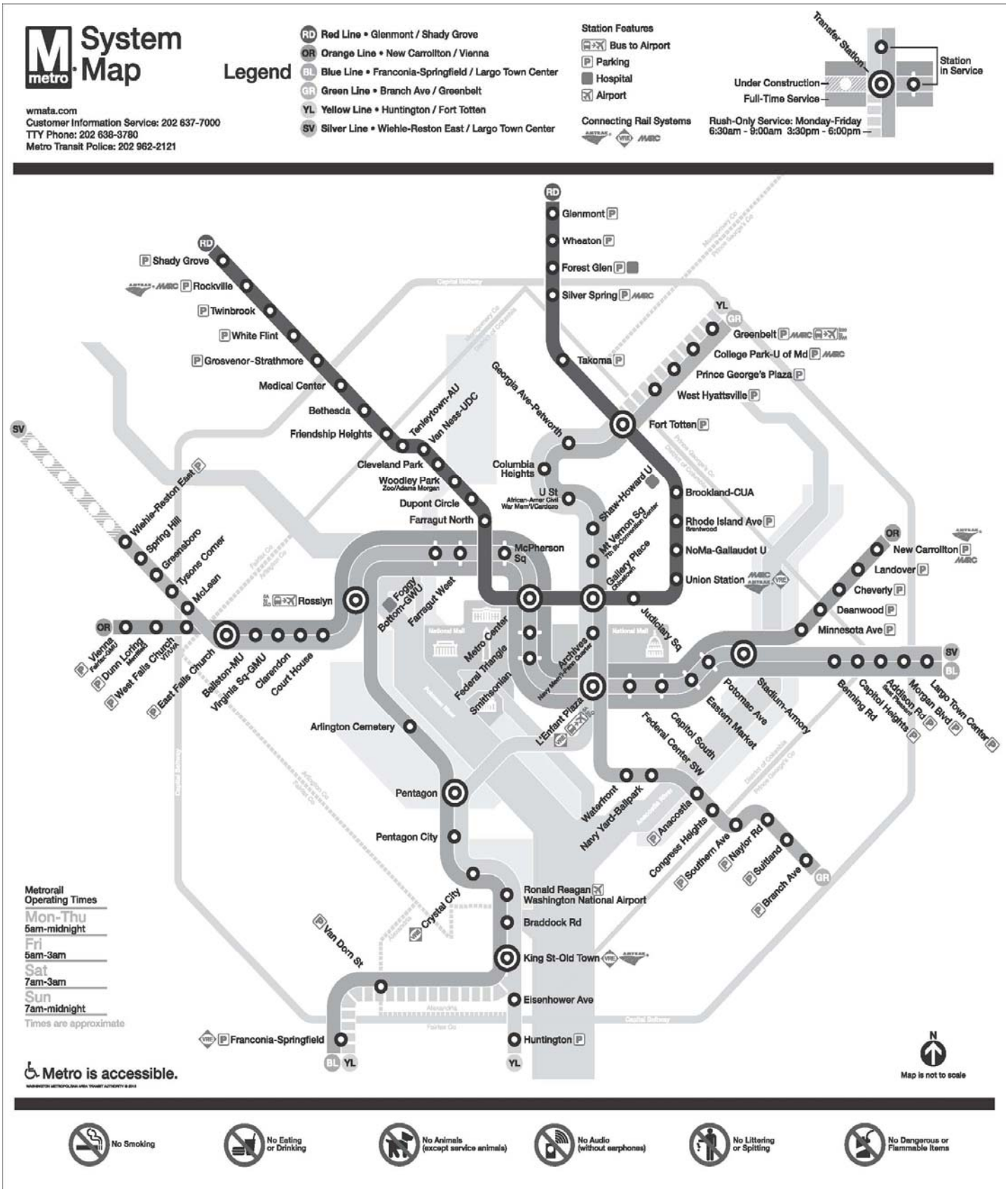
HBCU RIA: Enhancement of Research and Education in Computational Nanomechanics and Nanoscale Testing at Tuskegee University

Shaik Zainuddin, Tuskegee University

Through the HBCU-UP Research Initiation Award Grant, the Department of Materials Science and Engineering (MSE) at Tuskegee University (TU) developed its research capabilities in Computational Nanomechanics and Nanoscale Testing. These areas of research are essential to the development of a deeper understanding of the interaction of nano fillers with the matrix materials and their role in enhancing the mechanical properties of composite structures. The specific activities performed through this grant include: 1) Setting up the initial structure with various amount of cross-linking between SWCNT and Epon molecule and with a varying diameters of SWCNT, 2) Determination of interfacial binding energy and frictional stresses between carboxylic (COOH) functionalized SWCNT and Epon composites, 3) Measurement of frictional stresses as a function of the density of chemical bonds between COOH-SWCNT and Epon composites, 4) Quantification of how these stresses scale with the surface area of COOH-SWCNT, 5) Determination of interfacial strength using fiber pull-out and nanoindentation tests to compare the trends in shear strength with respect to SWCNT size and density of interfacial bonds observed in MD simulations, and 6) Involve undergraduate students in this research. Development of atomistic computational models and experiments at the nanoscale provided significant knowledge about the behavior of advanced composite materials that can be used in a variety of applications. The knowledge developed through this research project benefitted the ongoing research projects in MSE, while enhancing the research and mentoring capabilities of the PI. This also allowed TU to introduce new research area and academic course to prepare students. In addition, this enhanced capability also broadened the areas of research for students involved in the research and educational activities of the MSE department. We, therefore, were able to recruit a larger number of African American students at the undergraduate levels, some of whom have successively moved on to pursue graduate studies at Tuskegee University and elsewhere. These graduates will help bring much-needed diversity to the nation's advanced technological workforce.

Funder Acknowledgement: NSF HBCU-UP RIA-HRD1409918

Subway System Map



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