AAAS

NSF

2020 HBCU-UP/ CREST PI/PD MEETING

FEBRUARY 5-6 WASHINGTON, D.C.

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AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE

AAAS

2020 HBCU-UP/CREST PI/PD Meeting

Program Book

Co-hosted by
American Association for the Advancement of Science (AAAS)
Diversity, Equity, and Inclusion Programs (DEI)
and
National Science Foundation (NSF)
Division of Human Resources Development (HRD)
Directorate of Education and Human Resources

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Contents

Overview of the Meeting

2020 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 director 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, an 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

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 underrepresented 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.

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/**, and the ***Science*** family of journals, 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 264 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.* AAAS fulfills its mission to advance science and serve society through initiatives in science policy, diplomacy, education, career support, public engagement with science, and more.

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 **https://www.aaas.org/**

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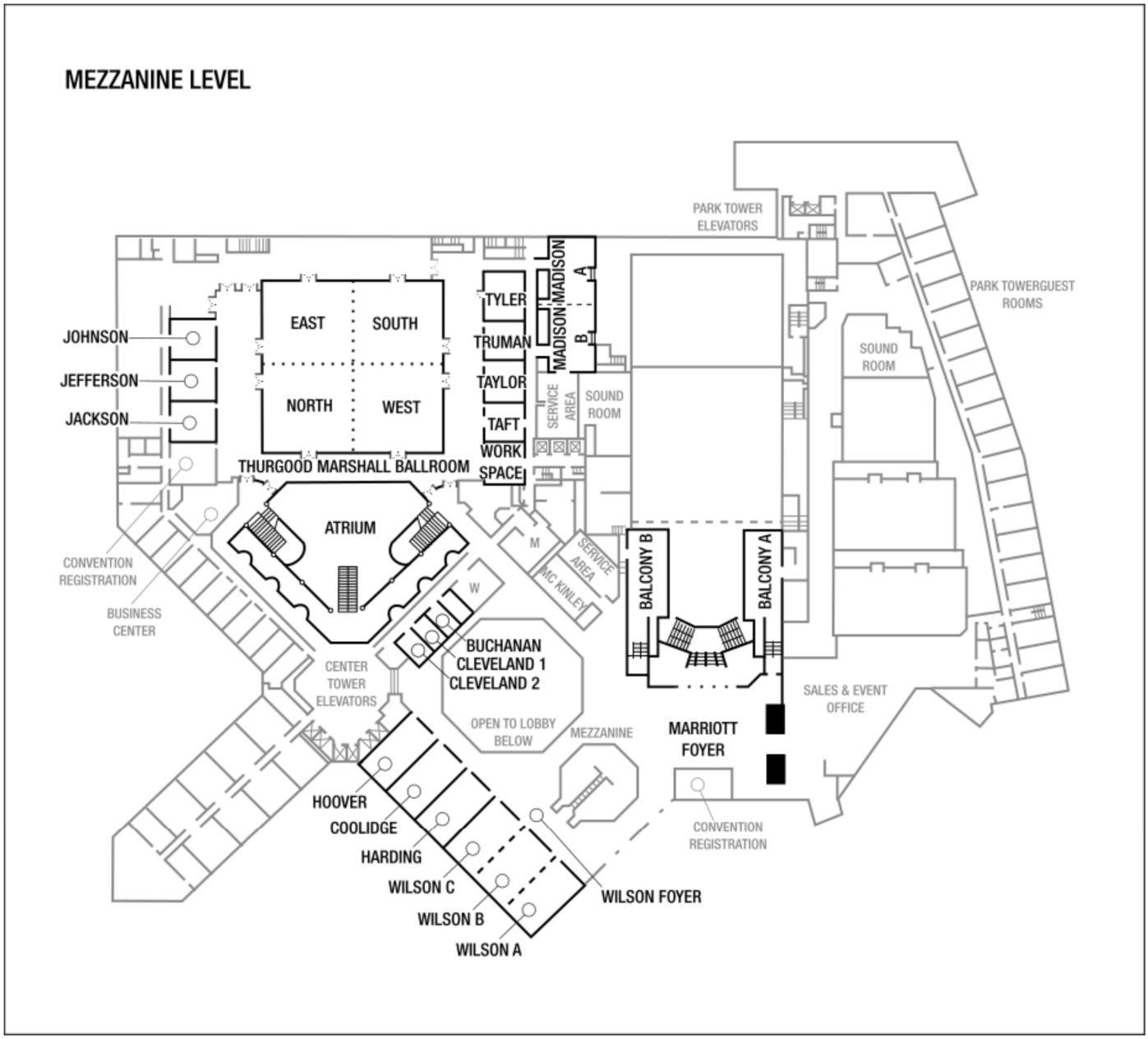


Wednesday, February 5, 2020

8:00am — **Registration Check-in**
Lobby Registration

9:00am - 9:45am — **Opening Plenary Session 1**
Lincoln 5&6

Welcome: Diana Elder, *Division Director, HRD, NSF*

Jermelina Tupas, *Deputy Division Director, HRD, NSF*

9:45am - 10:00am — **Break**

10:00am - 11:30am — **Concurrent Business Meetings**

A. HBCU-UP
Maryland A,B,C

Michelle Claville and Claudia Rankins, *Program Directors, NSF*

B. CREST
Delaware A

Victor Santiago and Emanuel Waddell, *Program Directors, NSF*

11:30pm - 1:30pm — **Plenary Session 2 and Lunch**
Thurgood Marshall Ballroom

Keynote Speaker:
David Hall, *President, University of the Virgin Islands*

1:30pm - 4:30pm — **Concurrent Breakout Session 1**

CREST PIs

1:30pm - 4:30pm — **Moderators: Victor Santiago and Emanuel Waddell***, Program Directors, NSF*
Maryland A

Postdoctoral Fellowship Panel
Industrial Partnership Panel
CREST Centers PI Panel
HBCU-RISE PI Panel

HBCU-UP Research Initiation Award PIs

1:30pm - 3:30pm — **Writing a Competitive NSF Research Proposal**
Maryland C

Engin Serpersu, Marcia Newcomer, Alias Smith, Karen Cone, Kathy Dickson, Sophie George, Kwabena Gyimah-Brempong, Guebre Tessema, Allena Opper, Paige Smith, *Program Directors, NSF*

Moderator: Claudia Rankins*, Program Director, NSF*

3:30pm - 4:30pm — **STEM Central**
Maryland C

Kelly Mack, *Vice President, Undergraduate STEM Education and Executive Director, Project Kaleidoscope, AAC&U*

Tania Siemens, *STEM Central Community Manager, AAC&U*

Cheryl Talley, *Associate Professor of Neuroscience, Virginia State University*

Moderator: Simone Soso, *AAAS Fellow*

HBCU-UP Implementation, Broadening Participation Research, and Center Project PIs

1:30pm - 2:30pm — **STEM Central**
Delaware A

Kelly Mack and Tania Siemens, *AAC&U*

Cheryl Talley, *Virginia State University*

Michelle Claville, *Program Director, NSF*

Moderator: Maria Carranza*, AAAS Fellow*

2:30pm - 4:30pm — **Telling Your Story**
Delaware A

Autumn Arnett, *Author, Writer, Journalist*

Moderator: Felicia Fullilove, *AAAS Fellow*

HBCU-UP Targeted Infusion Project PIs

1:30pm - 2:30pm **Telling Your Story**
Delaware B

Autumn Arnett, *Author, Writer, Journalist*

Moderator: Felicia Fullilove, *AAAS Fellow*

2:30pm - 3:30pm **STEM Central**
Delaware B

Kelly Mack and Tania Siemens, *AAC&U*

Cheryl Talley, *Virginia State University*

Moderator: Simone Soso, *AAAS Fellow*

3:30pm - 4:30pm **Session with Program Directors**
Thurgood Marshall Ballroom

Claudia Rankins and Michelle Claville,
Program Directors, NSF

4:30pm - 5:00pm **Break**

5:00pm - 6:30pm **Poster Session 1 and Reception**
Exhibit Hall A

6:30pm - 8:00pm **Poster Session 2 and Reception**
Exhibit Hall A

Thursday, February 6, 2020

Breakfast on Your Own

9:00am - 10:15am **Concurrent Breakout Session 2**

A. Post Award Information
Delaware A

Jannele Gosey and Denise Martin,
Division of Grants and Agreements (DGA), NSF

Moderator: Brandy Huderson, *AAAS Fellow*

B. Meeting of New Awardees
Delaware B

Michelle Claville, *Program Director, NSF*

Rashawn Farrior, *DGA, NSF*

C. Meet the BIO Program Directors
Maryland C

Manju Hingorami, Cliff Weil, Jodie Jawor, Leslie Risler, Diana Pilson, Sally O'Connor, *Program Directors, NSF*

Moderator: Felicia Fullilove, *AAAS Fellow*

D. Meet the SBE, ENG, and INCLUDES Program Directors
Maryland A

Kwabena Gyimah-Brempong and Paige Smith, *Program Directors, NSF*

Moderator: Maria Carranza, *AAAS Fellow*

E. Meet the MPS, GEO, and MRI Program Directors
Maryland B

Guebre Tessema, Brandon Jones, and Randy Phelps, *Program Directors, NSF*

Moderator: Marilyn J. Suiter,
Program Director, NSF

10:15am - 10:30am **Break**

10:30am - 11:45am **Concurrent Breakout Session 3**

A. Post Award Information
Delaware A

Jannele Gosey, Rashawn Farrior, and Denise Martin, *DGA, NSF*

Moderator: Brandy Huderson, *AAAS Fellow*

B. Information on the Graduate Research Fellowship Program
Delaware B

Earnestine Easter and Michelle Claville, *Program Directors, NSF*

Moderator: Simone Soso*, AAAS Fellow*

C. Meet the BIO Program Directors
Maryland C

Manju Hingorami, Cliff Weil, Jodie Jawor, Leslie Risler, Diana Pilson, and Sally O'Connor, *Program Directors, NSF*

Moderator: Felicia Fullilove, *AAAS Fellow*

D. Meet the SBE, ENG and INCLUDES Program Directors
Maryland B

Kwabena Gyimah-Brempong and Paige Smith, *Program Directors, NSF*

Moderator: Maria Carranza, *AAAS Fellow*

E. Meet the MPS, GEO and MRI Program Directors
Maryland A

Guebre Tessema, Brandon Jones, and Randy Phelps, *Program Directors NSF*

Moderator: Marilyn J. Suiter, *Program Director, NSF*

Noon - 2:00pm **Plenary Session 3 and Lunch**
Marriott Ballroom

Keynote Speaker:
Brian Chad Starks, *Founder & CEO, BCS and Associates*

2:00pm - 3:00pm **Informal Meeting with NSF Program Officers**
Marriott Ballroom

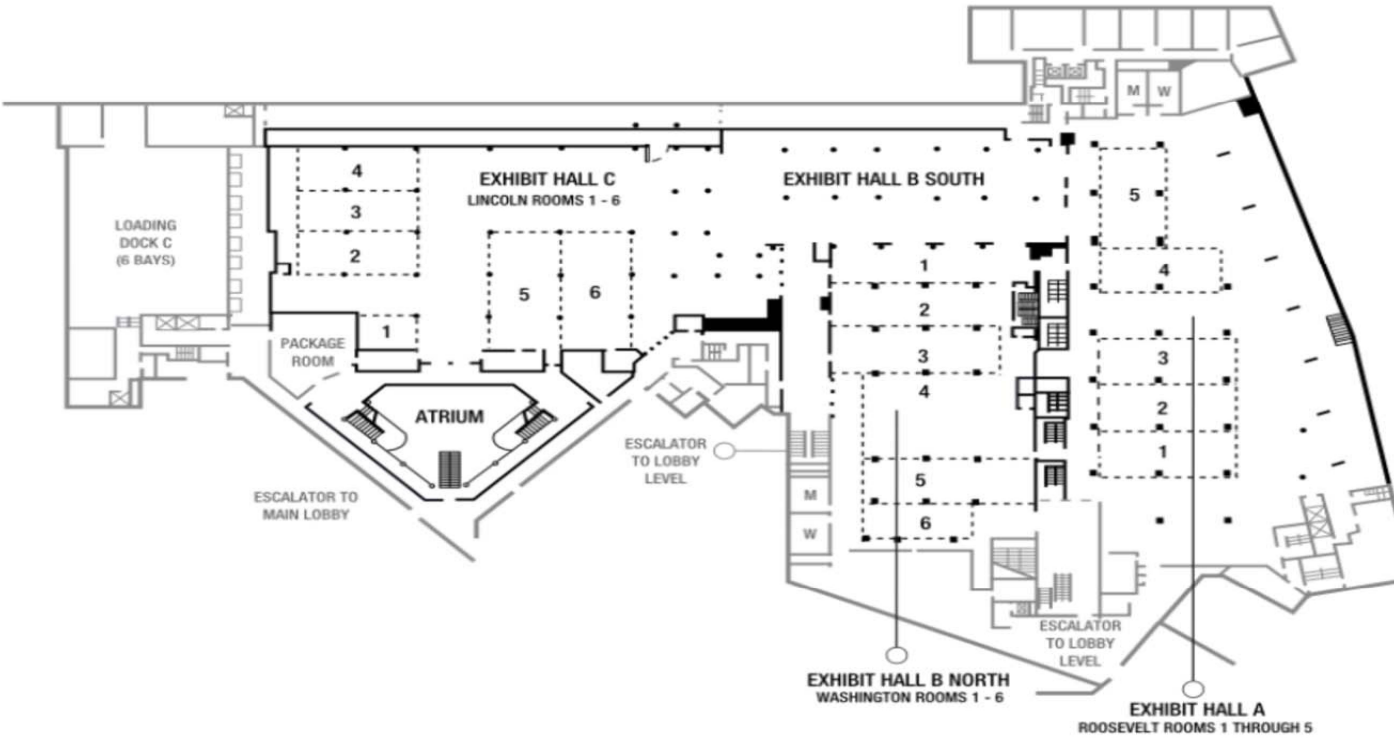
****Note: There will be some additional sessions by invitation only.*

Key:

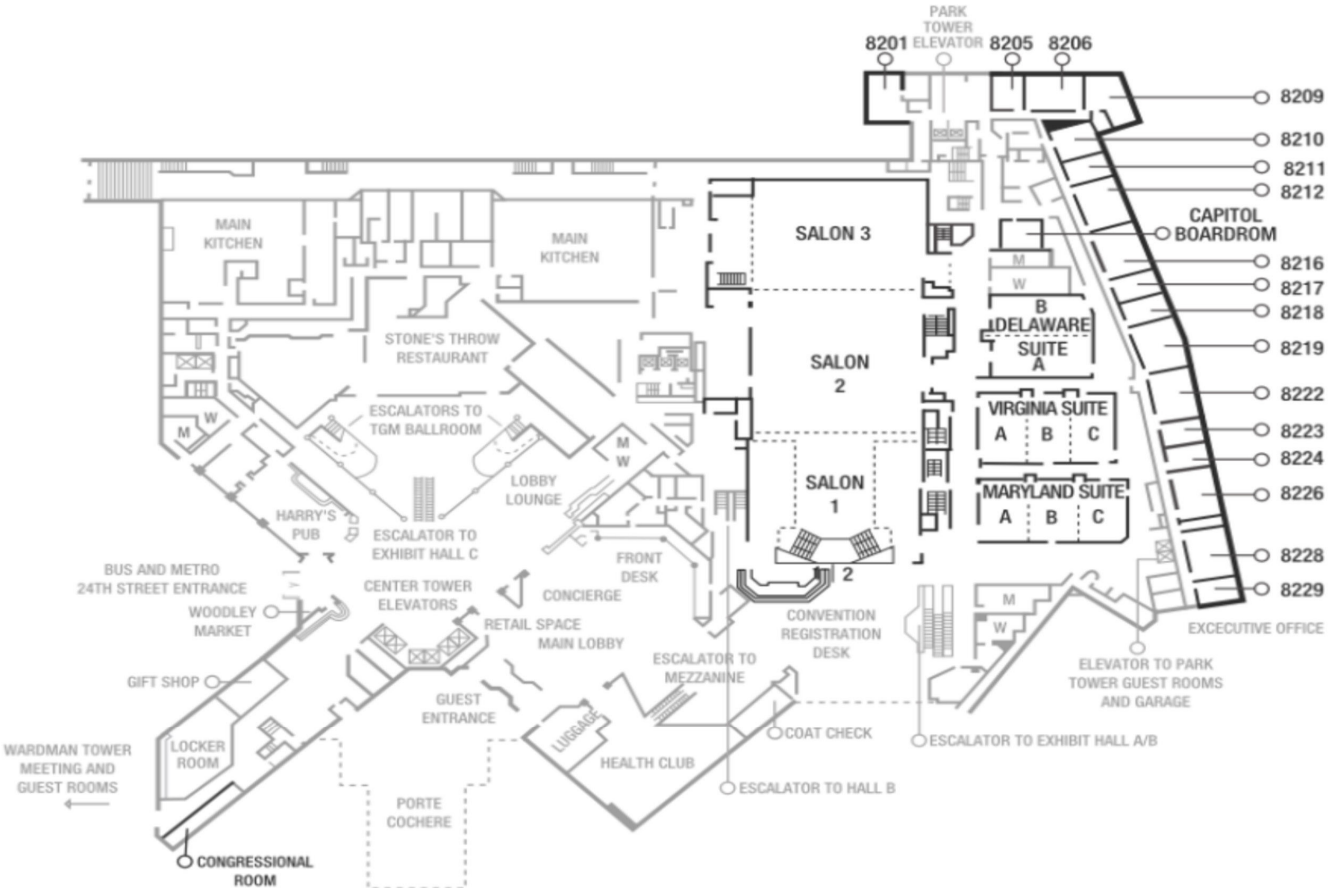
BPR	**Broadening Participation Research**
CREST	**Centers for Research Excellence in Science and Technology**
DGA	**Division of Grants and Agreements**
EHR	**Directorate for Education and Human Resources**
EiR	**Excellence in Research**
HBCU-UP	**Historically Black Colleges and Universities Undergraduate Program**
HRD	**Human Resource Development**
HSI	**Hispanic Serving Institutions**
NSF	**National Science Foundation**
RIA	**Research Initiation Award**
TIP	**Targeted Infusion Project**

Hotel Floor Plans

EXHIBITION LEVEL



LOBBY LEVEL



Autumn Arnett, *Author, Writer, Journalist*

Autumn A. Arnett is a professional storyteller and editor, whose work centers around issues of equity and access in education. She is the author of Let's Stop Calling It an Achievement Gap, and a former editor for U.S. News & World Report, Education Dive, HBCU Digest and Diverse: Issues In Higher Education. Her work has also appeared in The Atlantic and Complex Magazine. She has moderated and served on numerous panels around issues of access, opportunities and outcomes for African-American students and is a passionate advocate for historically Black colleges and universities.

Autumn serves as an advisory board member for the Education Writers Association, and on an advisory committee for the American Council on Education's race and ethnicity project. She is currently leading a research team examining childhood criminalization in Austin, Texas and is a member of a national planning group around democracy and civility in America. She is a copy editor for the Journal of African American Males in Education and a contributor to the National Association of Black Journalists' NABJ Journal. Autumn is a graduate of Clark Atlanta University.

Michelle Claville, *Program Director, NSF*

Michelle Claville is a Program Director at the National Science Foundation in Alexandria, Virginia. There, she is assigned to the Historically Black Colleges and Universities Undergraduate Program (HBCU-UP) and the Louis Stokes Alliances for Minority Participation (LSAMP) program, both of which are housed in the Division of Human Resource Development, Directorate of Education and Human Resources. Claville is the Assistant Dean for the School of Science, and a Professor of Chemistry at Hampton University (Hampton, Virginia). Over the last 17 years, Claville has made several advances in scholarship as evidenced by her grantsmanship, research and publications. As a staunch advocate for broadening participation of underrepresented people in science, technology, engineering and mathematics (STEM), she has mentored scores of individuals including, students (high school, undergraduate and graduate students), and post-doctoral associates in physical organic chemistry research on biomolecules and nanomaterials. Furthermore, she has established STEM research and education programs that provided financial and professional development support for students and early career faculty. Claville received the PhD in Chemistry, a BS in Chemistry, and a BA in English, from the University of Florida, Gainesville, Florida. Claville proudly recognizes her faith and her family as being essential to her accomplishments.

Diane Elder, *Program Director, NSF*

Diana Elder is the director of the Division of Human Resource Development at the National Science Foundation. She began her academic career at Northern Arizona University (NAU), where she earned a BS in Geology, a BS in Physical Sciences, and an MS in Quaternary Studies. While completing her graduate studies, Elder worked for the United States Geological Survey (USGS) branches of Astrogeology and Western Regional Geology, Los Alamos National Laboratory, and the Desert Research Institute. She earned her PhD in Geological Sciences at the University of California – Riverside. After completing her PhD, Elder returned to Northern Arizona University, where she holds the rank of Associate Professor of Geomorphology. Her most recent appointment is as Associate Dean for Academic Affairs for NAU's College of the Environment, Forestry, and Natural Sciences. Elder has also served as a Program Director for the Directorate for Biological Sciences in the Division of Biological Infrastructure. She has received grants from several federal agencies, including NSF, USGS, and the National Park Service.

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

Yolanda Scott George served as the Deputy Director and Program Director for STEM Education at the American Association for the Advancement of Science (AAAS) for more than 30 years. Prior to joining AAAS, she was Director of Development, Association of Science-Technology Centers (ASTC), Washington, DC; Director, Professional Development Program, University of California, Berkeley; and a research biologist at Lawrence Livermore Laboratory involved in cancer research and cell cycle studies using flow cytometry and cell sorters.

George has conducted evaluations, workshops and reviews for the National Institutes of Health and National Science Foundation (NSF), as well as for private foundation and public agencies, including the European Commission. She worked 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's leadership in STEM.

She has served as principal investigator (PI) or co-PI on several NSF grants, including Vision and Change in Undergraduate Biology Education; National Science Education Digital Library Biological Sciences Pathways; Historically Black Colleges and Universities-Undergraduate Programs; Robert Noyce Teacher Scholarship Program; Transforming Undergraduate Education in STEM (TUES) and Virtual Faculty Workshops; and Women's International Research Collaborations at Minority Serving

Institutions. George was the lead AAAS staff person for the L'Oreal USA Fellowships for Women in Science Program (postdoctoral fellowships) and the David and Lucille Packard Foundation HBCU Graduate Scholars Program (graduate school fellowships).

George served as a board or committee member for the following organizations: 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.

David Hall, *President, University of the Virgin Islands*

David Hall began his tenure as the fifth president of the University of the Virgin Islands (UVI) on August 1, 2009. At that same time, he was also awarded a Distinguished Professorship of Spirituality and Professionalism at UVI.

In his Fall 2009 Convocation address, Hall placed the UVI on the *"Pathways to Greatness."* He stated, *"My charge, as I see it, is to give this community the license to dream again, to believe in each other again, and to reach for the stars of greatness."*

Born in Savannah, Georgia, Hall holds a bachelor's degree from Kansas State University, where he was named an "All American" for his athletic and scholarly accomplishments. After graduating from Kansas State, he played professional basketball in Italy. He received his doctor of jurisprudence (JD) from the University of Oklahoma, where he also earned a master's degree in Human Relations. He holds both an LL.M. degree and a doctorate of juridical science (SJD) from Harvard Law School.

In 1993, when he was appointed dean of the Northeastern University School of Law, he made history by being the first African-American to hold the position. He also served as Provost and Senior Vice President of Northeastern University, and was also the first African American to hold that position.

Having taught law for more than 25 years in the law schools of the University of Mississippi, the University of Oklahoma and Northeastern University, Hall has enjoyed a distinguished career as an educational administrator and preeminent scholar in the field of law. In May 2010, in recognition of his significant contributions to the legal field, Hall was awarded the honorary degree of Doctor of Laws from the New England School of Law in Boston, Massachusetts. He has been honored by the Massachusetts Black Lawyers Association as a Trailblazer. Hall was appointed by President George W. Bush to serve on the Legal Services Corporation Board of Directors.

His publications include works on civil rights, the U.S. Constitution and race, legal education, and social justice. He has authored a book on the intersection of law and spirituality, entitled "The Spiritual Revitalization of the Legal Profession: A Search for Sacred Rivers," and lectures nationally on topics of social justice, leadership, diversity and spiritual values in professional life. He is married to Dr. Marilyn Braithwaite-Hall, and is the father of three children: Rahsaan, Sakile, and Kiamsha.

Sylvia James, *Deputy Assistant Director, NSF*

Sylvia M. James is the Deputy Assistant Director of the National Science Foundation's (NSF) Directorate for Education and Human Resources (EHR), where she oversees aspects of directorate program development, staffing, performance management, and internal and external communications. Prior to her role as Deputy Assistant Director, James served as the Director of the Division of Human Resource Development (HRD). As Division Director, she managed a $148 million budget and a talented team of scientific and administrative staff. During her 17-year tenure at NSF, James has served in numerous capacities, including as the Acting EHR Deputy Assistant Director, Acting Director of the Division of Human Resource Development, Acting Director and Acting Deputy Division Director of the Division of Research on Learning in Formal and Informal Settings, Lifelong Learning Cluster Coordinator, and Lead Program Director/Program Director for several EHR programs including ISE, ITEST, ATE, ASCEND, and AYS.

James currently serves as the Co-Chair of the Federal Coordination in STEM (FC-STEM) Interagency Working Group on Inclusion in STEM (IWGIS) and was a member of the Burroughs Wellcome Fund, Student Science Enrichment Program (SSEP) Advisory Committee from 2012-2016. She has served as an education consultant for science education radio, youth publications, and museums and an adjunct science faculty member. James holds a Bachelor of Science degree in Biology from Loyola University, a Master of Science degree from Johns Hopkins University, and a Doctorate in Science Education from Morgan State University, all located in Baltimore, Maryland.

Kelly Mack, *Vice President, Undergraduate STEM Education and Executive Director, Project Kaleidoscope, AAC&U*

Kelly Mack is the Vice President for Undergraduate STEM Education and Executive Director of Project Kaleidoscope at the Association of American Colleges and Universities (AAC&U). In this capacity, Mack provides leadership for the organization's mission level commitments to quality and inclusion through the delivery of world class professional development aimed at empowering our nation's finest STEM faculty to competitively train and educate more STEM students. Prior to joining AAC&U, Mack was the Senior Program Director for the National Science Foundation ADVANCE Program while on loan from the University of Maryland Eastern Shore where, as a Professor of Biology, she taught courses in Physiology and Endocrinology for 17 years.

Mack's holistic approach to STEM reform is grounded in a strategic vision that foregrounds inclusion as an immutable factor for achieving excellence in undergraduate STEM education. Her leadership in STEM reform has led to: significant increases in the capacity of STEM faculty to implement culturally responsive pedagogies, major shifts in the ways in which leadership development for STEM faculty is delivered, and the expansion of both physical and virtual convening platforms for knowledge generation, exchange, and dissemination.

Recognized as a national thought leader in higher education, Mack's work has been highlighted in *Diverse* Magazine and *U.S. News and World Report*. Currently, she is an advisor to several institutional transformation initiatives at NSF-funded ADVANCE institutions, as well as other national STEM reform collaboratives. She is also co-founder and chair of the board of the Society of STEM Women of Color, Inc., and has served as member of numerous board and national committees.

Mack earned the BS degree in Biology from the University of Maryland Eastern Shore and, later, the PhD from Howard University in Physiology. She has had extensive training and experience in the area of cancer research with her research efforts focusing primarily on the use of novel antitumor agents in breast tumor cells, as well as the use of bioflavonoids in the regulation of estrogen receptor positive (ER+) and estrogen receptor negative (ER-) breast tumor cell proliferation. Most recently, her research efforts have examined STEM leadership development and the impact of mindfulness on STEM faculty self-efficacy.

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

Shirley Malcom is Senior Advisor and Director of SEA Change at AAAS. She has served as a program officer in the NSF Science Education Directorate; an assistant professor of biology at the 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 policymaking body of NSF, from 1994 to 1998, and of the President's Committee of Advisors on Science and Technology from 1994 to 2001.

Karen Marrongelle, *Assistant Director, NSF EHR*

Karen Marrongelle is the Assistant Director of the National Science Foundation (NSF) for Education and Human Resources (EHR). She leads the EHR directorate in supporting research that enhances learning and teaching to achieve excellence in U.S. science, technology, engineering and mathematics (STEM) education.

Prior to joining NSF, Marrongelle was dean of the College of Liberal Arts and Sciences at Portland State University and Professor of Mathematics and Statistics, where she oversaw 24 departments and programs across the humanities, social sciences and natural sciences.

In addition to her work as dean, Marrongelle, has served as a faculty member in the Department of Mathematics and Statistics at Portland State University since 2001. Prior to her appointment as dean, she held positions as the Vice Chancellor for Academic Strategies and Assistant Vice Chancellor for Academic Standards and Collaboration with the Oregon University System.

From 2007-2009, Marrongelle served on a rotation as a program officer at NSF and led numerous grants, collaborating with researchers nationally and internationally to improve undergraduate mathematics education and K-12 mathematics professional development.

Biographies

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

Claudia Rankins, *Program Director, HRD, NSF*

Claudia Rankins is a Program Director in the Directorate for Education and Human Resources at the National Science Foundation, where she manages the Historically Black Colleges and Universities Undergraduate Program and the Centers for Research Excellence in Science and Technology. Prior to this post, Rankins served at Hampton University for 22 years in a number of capacities, including chair of the department of physics, assistant dean for research, and dean of the School of Science. Rankins holds a PhD in Physics from Hampton University. She is the co-founder of the Society of STEM Women of Color, Inc.

Victor Santiago, *Program Director, HRD, NSF*

Victor Santiago is a Program Director in the National Science Foundation's Division of Human Resource Development (HRD). This division implements programs and activities that enhance the quantity, quality and diversity of human capital engaged in U.S. science, technology, engineering, and mathematics (STEM). A principal focus of HRD is to ensure access to and full participation in STEM through increased, improved and diversified opportunities; enhanced quality in the educational experience; and hands-on research experiences. In particular, HRD plays a central role in increasing opportunities in STEM education for individuals from historically underserved populations—minorities, women and persons with disabilities—and supports the development of the educators, researchers, and institutions dedicated to serving these populations. During his sixteen-year tenure at NSF, Santiago has served as Program Manager for several national STEM research and education programs. He also served as Acting Division Director, HRD and as Deputy Division Director, HRD.

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

Tania Siemens, *STEM Central Community Manager, AAC&U*

In her role as the STEM Central Community Manager, Tania works to develop and expand STEM Central to support and grow AAC&U STEM initiatives such as the NSF Historically Black Colleges and Universities Undergraduate program. Tania researches, develops, and implements novel STEM Central leadership initiatives designed to build capacity for leading on-line communities. She has over 15 years of experience in science, education, and engaging communities. She obtained an MS from Cornell University where she studied the Ecology and Management of Invasive Plant Species on the Galapagos Islands, Ecuador. While at Cornell, Tania held a NSF GK-12 Fellowship in which she partnered with high school science teachers to develop and implement inquiry-based science labs and field experiences. Tania worked at The Nature Conservancy for five years from 2006-2011 as an Invasive Species Project Coordinator where she developed and coordinated citizens, scientists, and invasive species managers in Early-Detection and Rapid Response networks. Currently, Tania also works part time for Oregon Sea Grant at Oregon State University where she coordinates a regional initiative to collaboratively address aquatic invasive species educational and management efforts.

Brian Chad Starks, *Founder & CEO, BCS and Associates*

Brian Chad Starks is a speaker, writer, and critical criminologist. A nationally recognized expert on diversity, inclusion, and the disruption of implicit bias, Starks is famous for his authenticity and sense of humor. Born and raised in "The Metro" – Columbia, South Carolina, he attended Richland County public schools and graduated from Columbia High School. Starks attended Wofford College in Spartanburg, South Carolina, where he played football and majored in Sociology. For more than twenty years, he has championed diversity and inclusion for individuals, organizations and communities. The former owner of B. Chad Bonding, Starks holds a Master's degree in Criminal Justice from the University of South Carolina and a doctorate in Criminology from the University of Delaware. He has been on the faculty at Lynchburg College, Delaware State University, and Benedict College in Columbia, South Carolina and is currently an Adjunct Professor at Clemson University. Starks also serves as an Associate Director with the Delaware NASA Space Grant Consortium where he works to increase minority student representation. In 2014, Starks was awarded the Louis L. Redding Diversity Award from the University of Delaware. This award honors individuals who have implemented diversity programs that resulted in a significant change to the culture and climate of the university. In 2016, Starks received the NAACP

Civil Rights award from the Lynchburg, Virginia Branch. He was also inducted into the 2016 Wofford College Athletics Hall of Fame. He is a proud member of Omega Psi Phi Fraternity, Incorporated. As CEO of BCS & Associates Consulting Firm, Starks travels around the country, speaking and teaching the truth about implicit bias, cultural competency, and structural inequality.

Cheryl Talley, *Associate Professor of Neuroscience, Virginia State University*

Cheryl Talley examines factors that lead to lasting behavioral change, specifically those related to high academic achievement. In studies funded by the National Science Foundation, Talley and her colleagues have sought to reveal the role that affective factors like academic identity and self-regulation play in student success. With her training in affective neuroscience, Talley utilizes various strategies, including mindfulness training and education in human values (EHV) to help students develop strong academic identities and associated behaviors. The academic intervention that was developed at Virginia State University, Project Knowledge is currently being adapted for students in grades K-12. In addition, Talley's work is helping to inform replication efforts of successful STEM interventions conducted at various HBCUs across the country.

Jermelina Tupas, *Acting Division Director, HRD, NSF*

Jermelina Tupas is the Deputy Director of the Division of Human Resource Development (HRD), Directorate for Education and Human Resources at the National Science Foundation (NSF). HRD is responsible for programs that focus on building capacity at minority serving institutions and ensuring the participation of underrepresented groups in STEM. Before going back to NSF in 2012, she held the position of Director for the Division of Community and Education (DoCE), Institute of Youth, Family and Community at the National Institute of Food and Agriculture (NIFA) – USDA from October 2009 to August 2012. DoCE is responsible for a range of education and education research, training, workforce development, capacity building at minority serving institutions programs and provided support for individual fellowships at the graduate and postdoctoral levels in food and agriculture sciences. She was instrumental in establishing the NIFA Fellows and the Women and Minorities in STEM programs. She also worked at the National Institute of General Medical Sciences, National Institutes of Health from August 2006 to September 2009 where she managed a portfolio of student training, fellowship and faculty research as a Program Director in the Division of Minority Opportunities in Research (MORE) now known as the Division of Training, Workforce Development and Diversity. MORE managed programs that included undergraduate student training and development, support graduate students and postdoctoral fellows who are traditionally underrepresented in the biomedical sciences, and support research capacity building for faculty at MSIs. She first joined NSF in January 2004 as a Program Officer in the Division of Molecular and Cellular Biosciences, Biological Science Directorate and managed a research portfolio in the area of Cellular Signal Transduction. Prior to joining the federal government, Tupas was a faculty member at the Pacific Biomedical Research Center, University of Hawaii at Manoa (UHM), where she carried out her research in relaxin hormone signaling and transcription regulation, with funding coming from NIH and private foundations. In addition to her research project she also managed two undergraduate student research training (Minority Access to Research Careers) and student development (Minority Biomedical Research Support) programs focused on increasing diversity in biomedical sciences. Tupas holds a bachelor's degree in Zoology and a Master's degree in Microbiology from the University of the Philippines. She completed a PhD in Molecular Biology from the Institute of Medical Sciences, University of Tokyo, Japan, where she studied the transcription regulation of the human G-proteins that are important components of many signal transduction pathways.

Emanuel Waddell, *Program Director, NSF*

Emanuel Waddell joined the University of Alabama in Huntsville (UAH) Department of Chemistry in the Fall of 2004, where he is a member of the Biotechnology and Materials Science Faculty. He is a graduate of Morehouse College (I.B.S., Chemistry, Physics) and Louisiana State University (PhD, Analytical Chemistry). His research at LSU was in the area of near infrared time-resolved fluorescence. Following the receipt of his doctorate, Waddell completed a National Research Council Post-Doctoral Fellowship at the National Institute of Standards and Technology in Gaithersburg, MD where he became interested in the laser ablation of polymer substrates and its application in microfluidic (lab-on-a-chip) devices. Emanuel was tenured and promoted to Associate Professor at UAH in 2010. From 2010 to 2019, Waddell served as the campus coordinator for the Louis Stokes Alliance for Minority Participation. In 2015, Waddell was appointed as Associate Dean for the College of Science at UAH. From 2017 to 2019, Emanuel served as the national president for the National Society for the Professional Advancement of Black Chemists and Chemical Engineers (NOBCChE). Emanuel joined the National Science Foundation in July 2019 where he is a Program Officer with the HBCU-UP, CREST and HSI programs.

Biographies

Iris R. Wagstaff, *ERN Conference Lead and NSF PI, STEM Program Director, AAAS*

Iris R. Wagstaff, PhD, is a scientist, educator, mentor, researcher and STEM advocate. She currently serves as a STEM Program Director in the Diversity, Equity, and Inclusion Department of AAAS where she manages initiatives at the under-graduate, graduate, and postdoctoral levels focused on broadening participation in STEM and workforce development. She is also a Principal Investigator of several National Science Foundation (NSF) grants the include: *Preparing Diverse STEM Researchers to Address Global Challenges, Developing an Evidenced-Based Best Practices Community for Supporting Low-Income, High-Achieving Students in STEM Education and the Workforce, and The Impact of Making and Innovation at HBCUs.* She served as a 2015-2017 AAAS Science and Technology Policy Fellow at the DOJ National Institute of Justice Office where she developed and led an agency-wide diversity and inclusion initiative.

She is a native of Goldsboro, NC with a BS and MS in Chemistry from UNC-Greensboro and NC A&T State Universities respectively; and a PhD in Science Education from North Carolina State University. She worked as a research chemist at the Dow Chemical Company for 15 years where she led analytical project teams and company-wide diversity initiatives. She has over 20 years of STEM outreach and advocacy developing informal science programs, mentoring, resourcing parents, facilitating professional development for K-12 science teachers, and building strategic partnerships between industry, academia, and community organizations. Additionally, she has expertise in program evaluation, STEM curricula development, and pedagogy. She is the Founder and Executive Director of Wagstaff STEM Solutions; an educational, professional development, and diversity consulting company.

Wagstaff is also a social scientist with a research focus on employing statistical modeling to examine factors that predict science self-efficacy, science identity, and STEM career intent in high school and college students who are underrepresented in STEM. She serves on the Boards of several organizations that include the National Organization of Black Chemists and Chemical Engineers (NOBCChE), the Chemical Society of Washington (CSW), and Science, Engineering, and Math Links (SEM). She is an adjunct chemistry professor at the University of North Carolina at Greensboro where she leads diversity and inclusion efforts to broaden participation in the chemical sciences. She has received several honors that include the 2019 DC Metro HBCU Alumni Alliance Award for Education, the 2019 AERA Science Teaching and Learning Research Award, the 2019 BEYA Science Spectrum Trailblazer Award, the 2018 NOBCChE Presidential Award for Mentoring, the 2017 Women of Color in STEM K-12 Promotion of Education Award, and a 2016 nomination for the NSF Presidential Award for Excellence in Science, Math, Engineering Mentoring (PAESMEM).

Poster Abstracts

Poster Abstracts

STEM Research

Biological Sciences

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Poster Category: STEM Research

Search for the Epigenomic Mechanisms of Paternal Inheritance of Aggression in Social Honeybees

Hongmei Li-Byarlay, Central State University

N6-methyladenosine (m6A) is the main type of modification in RNAs of eukaryotes and represents about 80% of all RNA methylation. In social insects like bees, the role that m6A RNA methylation plays underlying the social behavior is still unknown. Aggression is a complex social behavior with a complicated biological basis. A dramatic difference between Africanized Honeybees (AHB) and Europe Honeybees (EHB) is the level for defense. Africanized paternity hybrids (AHB father and EHB mother) display significantly faster sting response time compared to Africanized maternity hybrids (EHB father and AHB mother). How this striking phenotypic trait is inherited through generations is a mystery from the perspective of epigenetics. Does RNA methylation modulate this transgenerational inheritance or are genomically imprinted genes involved? The overall hypothesis is that the m6A RNA methylation may determine the epigenetic inheritance of aggression behavior in social honeybees. This is the first time testing whether behavioral phenotypes of animals arise by evolutionary adaptation involving epigenetic mechanisms. The main goal of this project is to determine the epigenetic modifications (m6A) and epigenomic architecture connecting aggressive behavior of honeybees to their sociogenome. Epigenetics may be linked to distinct behavioral states and useful in studying behavioral plasticity. For this new project begun in May 2019, we have: 1) purchased two types of major research equipment, 2) recruited one undergraduate student to be involved in the research, 3) recruited a potential doctoral student, and 4) standardized a colorimetrically quantification analysis in the brain mRNA of different types of honeybee castes to quantify the distribution of m6A. The ongoing research has involved at least 20 minority undergraduate STEM students at Central State University (CSU) in learning about new technology of molecular biology. CSU consists of 95% African Americans of whom 55% are women and girls. Students involved are seeking degrees in STEM fields including biology, chemistry, exercise science, sustainable agriculture, and environmental engineering. One undergraduate student will present his research outcomes during this ERN conference.

Funder Acknowledgement: 1. NSF grant Award 1900793. NSF-HBCU-UP RIA; 2. USDA Evans-Allen Fund

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Poster Category: STEM Research

Assessment of Undergraduate Student Learning Outcomes in Principles of Biology

Khalid Lodhi, Fayetteville State University, Fayetteville
Jiazheng (John) Yuan, Department of Biological and Forensic Sciences, Fayetteville State University, Fayetteville

Fayetteville State University (FSU) as an Historically Black College and University (HBCU) is a constituent institution of the University of North Carolina (UNC) system and the second oldest public university in the state. With more than 63% African American and 68% female undergraduate students, approximately 380 students have registered as biological and forensic science majors. The objective of our research is to develop, apply, and assess evidence-based innovative models and approaches and thereby promote undergraduate, especially minority undergraduate student, success in biology and science in general. In order to improve biology teaching for undergraduate students at FSU, we have implemented in-class lectures, instructor mentoring, and peer-tutorial-based teaching strategies. The strategies include synchronized quizzes, chapter-based worksheets through peer-reviewing sections, and standardized exams to improve the learning outcomes for all undergraduate students in Principles of Biology (BIOL150), which underlies the support of the NSF funded Targeted Infusion Project: Providing Opportunities to Minority Students in STEM (PrOMiSS, 1719511). In-depth assessment of the learning outcomes from the course over two years (2017-2018) for 54 students indicates that implementation of these teaching strategies can significantly improve overall students' grades ($P<0.05$) compared to those recorded prior to implementation of these strategies. It appears that our teaching pedagogy in BIOL150 offers a platform to stimulate students' interest in the course and to inspire them to be self-oriented learners and hence, greatly benefit from their learning experiences at FSU.

Funder Acknowledgement: NSF Targeted Infusion Project: Providing Opportunities to Minority Students in STEM (PrOMiSS, 1719511)

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Poster Category: STEM Research

Enhancing Quantitative/Computational (QC) Confidence/ Competence in Life Sciences

Lee Limbird, Fisk University
ClarLynda Williams-Devane, Sajid Hussain, Brian Nelms, Willysha Jenkins, P McCarroll, Fisk University; Ayesha Boyce, UNC-Greensboro; and Patricia Campbell, Campbell-Kibler Inc.

Reciprocal faculty transdisciplinary learning has transformed the undergraduate student QC experience at Fisk due to both 1)

design, faculty preview, and initial implementation of a Technology Literacy course, ultimately required for all students in their first year, and 2) aligned interdisciplinary faculty mentored undergraduate research opportunities. Emerging faculty collaborations are resulting in extension of computational problem solving from the natural to the social and behavioral sciences, addressing societal challenges of immediate relevance to students.

Funder Acknowledgement: NSF Implementation Project Award to Fisk University

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Poster Category: STEM Research

Cause and Consequences of MAGEB2 Gene Expression

Saumya Ramanathan, Fisk University
Ashley Colemon, Angelle Jones; Department of Life and Physical Sciences, Fisk University

Melanoma Antigen Genes (MAGEs) are a family of tumor-associated genes. MAGE-A, -B and -C genes belong to the Type I MAGE subfamily. They are typically expressed in the male germline and then aberrantly expressed in many cancers and therefore referred to as cancer-testis antigens. Their expression in tumors is often associated with poor patient prognosis. There is a significant gap in understanding the mechanisms that regulate the expression of Type I MAGE genes. While cancers often express more than one MAGE gene, this study focuses on MAGEB2, an exemplary member of the Type I gene family and a bona fide cancer-testis antigen. Using DNA methyltransferase (DNMT) inhibitors and bioinformatics analysis of MAGEB2 promoter, we have discovered that while CpG methylation regulates the expression of MAGEB2, transcription factor JunD is recruited to the MAGEB2 promoter in cells expressing this gene. Remarkably, when normal cells are threatened with toxins and DNA damage, they resort to expressing the MAGEB2. In addition, we have discovered that expressing MAGEB2 provides non-transformed cells with a proliferative advantage and allows cells to grow in an anchorage-independent manner by dampening TGF signaling. Taken together our data indicate that MAGEB2 is a single gene driver of cellular transformation.

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

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Poster Category: STEM Research

Implementing a Course-based Undergraduate Research Experiences (CURE) Program in the Biological Sciences

Shakhawat Bhuiyan, Jarvis Christian College
Glendora Carter, Jarvis Christian College

Jarvis Christian College (JCC) Course-based Undergraduate Research Experiences (J-CURE) program is an aggressive and comprehensive sequence of undergraduate involvement designed to inspire, engage, educate and train a diverse group of students and expose them to the cutting edge educational and research activities in the biological sciences. To prepare students for active learning and problem solving in the classroom, General Biology (BIOL 1406), a freshman-level course in cellular and molecular biology, was redesigned with an extensive collection of online activities for students. We utilized the free online interactive resources or Pearson Campbell's MasteringBiology to enhance the biology curriculum. In Fall 2017, the General Biology course included a lecture-based face-to-face instruction with the Campbell textbook as a learning resource. During academic years of 2018 and 2019, the General Biology course included supplemental Online Learning Initiative (OLI) incorporated during class sessions and outside of the classroom setting. The OLI allowed students to be engaged in interactive activities, constructive feedback and critical thinking that improved students' overall learning performance.

Moreover, the OLI provided the instructor with the ability to identify areas were students possessed the most common knowledge or most common challenges, allowing for targeted instruction. The J-CURE program sought to draw the Biology/ Chemistry students into the research program in biological sciences. The participants were required to conduct an independent research project on biological sciences with a member of the Jarvis faculty and to present their research at scientific regional and national conferences. The J-CURE program recruited five students in each summer (2017-2019) for 8 weeks, and three students in each academic year. During summers 2017-2019, a total of 15 undergraduate students completed their undergraduate research projects, published research abstracts in the conference database, and presented their research in the Annual Biomedical Research Conference for Minority Students (ABRCMS) or/and Emerging Researchers National (ERN) Conference in STEM. The overall students' research engagement and presentation in national conferences increased significantly in 2017-2019 as compared to the previous years. The number of students enrolled in the Biology program slightly increased over the 2018-2019 academic year, however, the retention rate increased significantly during the first and second year of obtaining the J-CURE program.

In conclusion, this program is a strategy for increasing the capacity of JCC to produce more STEM graduates who are competitive for graduate school and STEM careers.

Funder Acknowledgement: NSF grant: Award #1719607

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Poster Category: STEM Research

Engaging Undergraduates in NAD-Capped RNA Function and Metabolism Research

Tyrell Carr, Saint Augustine's University
Florence Fields, Lashan Knowles, and Ka'shawn Robertson, Saint Augustine's University, Raleigh, NC

Saint Augustine's University has been awarded a National Science Foundation (NSF) - Research Initiation Award (RIA) to support research in the Carr Lab focused on the function of nicotinamide adenine dinucleotide (NAD)-capped RNAs in regulating plant stress tolerance. The Carr Lab will isolate and characterize plant NAD-capped RNAs in response to different abiotic and biotic stress conditions using Arabidopsis thaliana and Nicotiana benthamiana as primary systems. Additionally, the Carr Lab will characterize NAD-capped RNA metabolism in altered plant hormonal and post-translational modification signaling backgrounds. The intellectual merit of the research is centered both on alternative capping of plant RNAs with metabolites (i.e. NAD, FAD, CoA, and UDP-Glucose) and metabolite-capped RNA stability and translation in plants compared to non-plants. Potentially, NAD-capped RNAs and other metabolite-capped RNAs might comprise additional layers in the regulation of gene expression that is coupled to metabolic networks. The broader impact of the research is the participation of undergraduate students in authentic, cutting-edge, course-based undergraduate research experiences (CUREs) in preparation for the STEM workforce and/or graduate studies. Presented are integrated approaches that will be exploited to gain detailed understanding of plant NAD-capped RNA function and metabolism by the Carr Lab and collaborative laboratory CUREs at Saint Augustine's University.

Funder Acknowledgement: NSF HBCU-UP RIA

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Poster Category: STEM Research

Antimicrobial Resistance and Biofilm Formation by Commensal Neisseria Species

Maira Goytia, Spelman College
Skylar Jordan and Kacey King, Spelman College, Atlanta, GA

Commensal Neisseria species are highly related to pathogenic Neisseria, N. gonorrhoeae (Ngo) and N. meningitidis. Ngo in particular is highly resistant to most antibiotics used to treat it. We are running out of options to treat N. gonorrhoeae. In this project, we want to address whether commensal Neisseria species may be reservoirs of antimicrobial resistance genes of pathogenic Neisseria. Given the similarities between all Neisseria species, we set out to (1) characterize antimicrobial resistance and biofilm formation in commensal Neisseria species, and (2) identify the genes that provide antimicrobial resistance and that affect biofilm formation in these species. We used several standardized antimicrobial sensitivity testing and static biofilm formation assays. Our results suggest that commensal Neisseria species may be up to 32 times more resistant than reference Ngo strains for specific antibiotics including current first line treatment antibiotics. We also demonstrate that commensal Neisseria species form less biofilm than Ngo strain FA19, and that the polyamine spermidine increases rather than decreases the formation of biofilms in these species, in contrast to published research (Goytia, 2015, FEMS). We are currently in the process of identifying the genes involved in antimicrobial resistance among the resistant species, using molecular biology and the natural competence expressed by Neisseria species. Overall, this research could describe new antimicrobial resistance mechanisms, genes and gene networks involved in biofilm formation, and possibly be part of a quorum sensing system, and demonstrate the importance of commensal species in the evolution of antimicrobial resistance trait acquisition among pathogens.

Funder Acknowledgement: NSF - HBCU-UP # 1800691

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Poster Category: STEM Research

STEM Research Activities of the TSU UPMP-Mentor Research in Biology, Chemistry, Physics and Mathematics

Alamelu Sundaresan, Texas Southern University
Vivek Mann, Courtney Williams, Gabriella Tavera, Mark Harvey, Reine Yandouma, John Sapp, Sheku Turay, Azime Saydam, Nabras Abdelrahman and Maitreyi Chaganti; Texas Southern University

In the summer of 2019 we emphasized summer research internships for the mentors. Interns were exposed to primarily Biology-based research projects with inbuilt STEM curriculum use i.e., using mathematical, physics and chemistry in a biological system to understand the effects of different paradigms on living human cells, and how they would change in their activity to protect themselves by changing their shape and function depending on their exposures. The projects incorporated Math, Physics and Chemistry via fluorescence microscopy and gene expression data experiments. We experimented with exposure of bone, brain and immune cells to sources of environmental toxins and analog micro gravity to study effects and relationships via simple linear mathematical modeling. This enabled students to explore concepts in injury to cells (also be able to extrapolate to the whole organism) but also to explore the uses of using Mathematics, Physics and Chemistry in Biology-based STEM projects. This allowed for cross training of the mentors and also build understanding that a Biological system heavily involves the principles of Math, Physics and Chemistry in order to exist.

Funder Acknowledgement: Grants from Amino Up Chemical and NSF TIP 1719318

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Poster Category: STEM Research

NSF-CREST Center for Cellular and Biomolecular Machines

Carrie Kouadio, University of California, Merced
Sayantani Ghosh, Kara McCloskey, Ajay Gopinathan, and Victor Muñoz, University of California, Merced

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

Funder Acknowledgement: National Science Foundation (NSF-HRD-1547848)

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Poster Category: STEM Research

The CREST Puerto Rico Center for Environmental Neuroscience (PRCEN)

Mark Miller, University of Puerto Rico Medical Sciences Campus

The Puerto Rico Center for Environmental Neuroscience seeks to implement a multidisciplinary approach to address gaps in our understanding of impacts of environmental degradation at molecular, cellular, organismal and ecosystem levels. The nervous system can provide sensitive and reliable measures of biological responses to environmental perturbations at time scales ranging from neural signaling (milliseconds) to neural development (days) to brain and behavioral evolution (years/generations). The PRCEN explores anthropogenic perturbations on the nervous systems of organisms from aquatic (marine, rivers, and estuaries) and terrestrial habitats. In the long term, we expect to establish the use of neural-behavioral effects for improved accuracy and speed in evaluating the environmental impact of human activities.

Funder Acknowledgement: NSF HRD-1736019.

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Poster Category: STEM Research

Testing the Mechanisms Underlying Noise Avoidance by Animals - Year 1 Reflections

Louise Allen, Winston-Salem State University
Jesse Barber, Boise State University, Boise ID; Nickolay Hristov, Center for Design Innovation, Winston Salem NC; Kari Dawson, Lakhia Fuller, Joseph Lightsey, Cecelia Miller and Bailey Taylor, Winston-Salem State University,Winston Salem NC

This project examines the influence of noise on wildlife; specifically, understanding why animals avoid noisy areas. Noise is an important and growing component in both natural and human systems. A substantial body of work has revealed that organisms change behaviors and distributions in noise, yet the underlying mechanisms remain largely unknown. Three hypotheses have been proposed to explain noise avoidance by animals: 1) masking of important auditory information (when the signal and noise acoustically overlap), 2) distraction, a limitation of available processing resources (independent of signal and noise overlap), and 3) noise aversion (associated with a stress response). To tease these hypotheses apart, researchers and students are conducting a series of lab-based experiments focused on performance and foraging behavior in animals foraging in noise. In Year 1, the team trained bats to locate prey-generated sounds in exchange for a food reward. During the experiments, the animals were tasked with foraging in quiet control or two noisy soundscape conditions (with different frequency profiles). Over

300 foraging trials were recorded. Data collection ended in October; we will share preliminary data analysis. To date, five undergraduate researchers have been engaged in this cutting-edge behavioral work; two in preliminary data collection and three in Year 1 of the funded project. Students learned about wildlife sampling, including state and federal permitting, scouting locations and animal capture. They also learned about lab-based behavioral research, including CITI animal use training, experimental design, advanced instrumentation, and animal handling, care and training. Two of the recent research students will continue to analyze video recordings and serve as teaching assistants in the PI's field-biology research-intensive course in Spring 2020 and will help the PI recruit new students to work on this project.

Funder Acknowledgement: NSF 11800687; NSF 11514766

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Poster Category: STEM Research

Course-based Research Experiences: A model for Improved Retention

Shubha Ireland, Xavier University of Louisiana
Joanna Haye, Mary Carmichael, Hector Biliran, and Andrea Edwards, Xavier University of Louisiana, New Orleans,

The Historically Black Colleges and Universities Undergraduate Program (HBCU-UP) through Targeted Infusion Projects (TIPs) provides support to achieve short-term, well-defined goals to improve undergraduate STEM education. In the current TIP at Xavier University of Louisiana (XULA), two freshman-level lab courses are being redesigned as Course Based Research Experiences (CUREs). Merits of early research experiences are well-documented yet fewer than 10% of XULA Biology freshmen have research opportunities in their first year. The XULA TIP aims at bridging this gap by infusing two authentic research projects in Biology's foundational labs. The first, entitled the 'Yeast ORFan' project, in collaboration with Juanita College, PA, aims at characterizing unknown genes to determine their functions in yeast.

The second, in collaboration with the USDA, SRRC, LA, is centered on discovering novel regulatory genes in Aspergillus (filamentous fungus) species known to damage crops of human consumption. Although CUREs are gaining attention for their ability to offer research opportunities to all students in a classroom setting, few undergraduate minority-serving institutions currently have established CUREs as part of their curricula. There is therefore a great need to study CUREs and their impacts on underrepresented minority (URMs) students' learning and retention. The XULA CURE-infusion project is the first of its kind at an HBCU (XULA) and is poised to make important contributions in the area of science education. Currently in its pilot year, this poster will share the exciting experiences of the project's first semester, completed in December 2019. These will include designing the syllabus (for over 200 students in 11-12 sections), selecting and optimizing molecular assays, scientific activities and bioinformatic modules, developing instruction and assessment tools and designing student-learning resources. Preliminary data from internal and external evaluations and how they will shape the second semester (Spring 2020) will also be discussed.

Funder Acknowledgement: National Science Foundation HBCU-UP, Targeted Infusion Project # 1912437

Chemistry and Chemical Sciences

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Poster Category: STEM Research

Microwave Synthesis of Imidazole Compounds as VCP Inhibitors

Jacqueline Smith, Bowie State University
Brenda Tankeu, Ike Nwadike, Kayla Tucker, and Bayanna Melchishua, Bowie State University Bowie MD

There are many biological processes of which the scientific community is still working to fully understand. Due to their stability, reversibility and selectivity, small molecules can be used to understand how specific proteins play a role in cellular pathways. The cell has many adaptive mechanisms used for the cellular repair during endoplasmic reticulum (ER) stress. If proteostasis is not re-established, unfolded proteins are tagged for clearance through the ubiquitin-proteasome system (UPS). Aberrant cells have been shown to exploit these prosurvival mechanisms as a way to circumvent cell death. However, proteasome disruption leads to cell death. Valosin-containing protein (VCP) is a key component of the UPS which can be targeted to investigate its role in proteostasis. Small molecule heterocycles such as imidazoles have the potential to allosterically bind to VCP to disrupt the UPS in rogue cells. We have synthesized a small library of novel imidazole compounds to be used as allosteric VCP binders. Using a microwave-assisted multi-component reaction, a variety of imidazole compounds have been rapidly synthesized. We have explored many factors which may affect MCRs and/or microwave reactions including reaction time, temperature, reagent stoichiometry, as well as the substituent position, steric and electronic effects. Thus far, we have found that temperature plays a significant role on this reaction as elevated temperatures result in higher yields. Ultimately these compounds will be used to identify the structural features which are key for allosteric binding to VCP through biochemical and cell proliferation assays. Understanding how these small molecules affect proteins involved in cellular stress and repair can help scientists understand and control cell death.

Funder Acknowledgement: NSF Award # 1800165

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Poster Category: STEM Research

Self-Healing Green Composites

Karina Chavez, Cornell University
Anil N. Netravali

Microcapsules (MCs) with poly(lactic-co-glycolic acid) (PLGA) shell and soy protein isolate (SPI) core were produced by using a water-in-oil-in-water (w/o/w) emulsion and solvent evaporation technique. A water-in-oil emulsion consisting of SPI in water and PLGA in ethyl acetate, created spherical micelles that were made to elongate by forcing the water-in-oil emulsion through a 25-gauge needle into an aqueous poly(vinyl alcohol) (PVA) bath while pulse stirring. The PVA served as a stabilizer and also provided hydroxyl groups on the MC surfaces and improved MC/resin interfacial bonding. This can be expected to improve the self-healing efficiency of the resin as well as the green composite. The resulting w/o/w emulsion containing micelles was then sheared between concentric cylinders (one cylinder was spun at 300 rpm while the other cylinder remained stationary) while allowing the ethyl acetate to slowly evaporate and solidify the PLGA shell. The effect of SPI solution pH on MC formation was also studied. Alkaline pH of 12 resulted in MCs sticking together to form clusters, particularly with excess PVA, while a higher pH of 14 led to a fine powder containing individualized MCs. The size and shapes as well as healant content of the SPI-PLGA MCs were confirmed using optical, electron and confocal laser scanning microscopy. The surface chemistry of MCs was characterized using attenuated total reflectance infrared spectroscopy. The MCs made with green materials will be used as the self-healing mechanism and to repair microcracks as they are created and thus, increase the durability of green SPI-based resins as well as cellulose fiber reinforced green composites.

Funder Acknowledgement: NSF-CREST

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Poster Category: STEM Research

Materials Genome Approach to Functional Materials Discovery Using the Cambridge Data System

Kimberley Cousins, California State University, San Bernardino
Luke Vincent, Sarah Rodriguez, Sergio Jacinto, Frances del Fierro, Douglas C. Smith, Department of Chemistry & Biochemistry, California State University, San Bernardino; Timothy Usher, Department of Physics, California State University, San Bernadino

The materials genome initiative seeks to discover novel materials for tomorrow's technology. At the CSUSB Center for Advanced, Functional Materials we harness UI (undergraduate intelligence) and the Cambridge Data System (CSD) to find functional materials demonstrating piezoelectric and ferroelectric properties among existing, known crystal structures as well as new materials suggested by features of existing structures. In this presentation, we will describe our multiple approaches for structure discovery using the CSD to suggest known and new materials, and will highlight several successful functional materials uncovered by this approach. Our team has used first principles (DFT) calculations and experimental methods for property characterization, and we will share some results of the materials that not yet published. Among known crystal structures we have uncovered and characterized—a highly responsive non-linear optical material and a novel electronic ferroelectric/piezoelectric co-crystal. In addition, two novel materials have been crystallized based on our investigation of known hydrogen bonding co-crystals in the CSD. While automation would undoubtedly speed the screening process, our manual investigations provide new insight into structure/function, as well as a highly valuable education experience.

Funder Acknowledgement: National Science Foundation, HRD CSUSB Center for Materials Science, NSF-HRD # 1345163

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Poster Category: STEM Research

Visible-range Heterojunction Nanofiber Photocatalysts for Water Splitting: The Effect of Co-catalysts

Keerthi Senevirathne, Florida A&M University
Nquel Bonner and Kahlil Washington, Florida A&M UNiversity

The major hurdles in photocatalytic water splitting are the availability of stable catalysts that absorb visible light and the prevention of recombination of photogenerated electron-hole carriers. Nanofiber heterojunction catalyst, In2O3/TiO2, has been studied as a model system to explore the effect of heterojunction structure of photocatalytic water splitting. In addition, new synthetic methods have been explored to make low cost co-catalysts utilizing core-shell type structure as an alternative to pristine noble metal co-catalysts such as Pt. The synthetic method of co-electrospinning technique utilized to fabricate multi-component heterojunction nanofiber photocatalysts and the correlation of the heterojunction structure with the activity of water splitting will be presented and discussed. Furthermore, the role of low cost core-shell type nanoparticle co-catalyst, Cu@Pt, synthesized by solution-phase method on photocatalytic activity will also be discussed. Physicochemical characterization of nanofibers catalysts and core-shell co-catalysts will be presented along with photocatalytic hydrogen generation analysis.

Funder Acknowledgement: National Science Foundation support through HBCU-UP-RIA catalyst grant.

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Poster Category: STEM Research

Dry Fractionation of Soybean Meals into Functional Protein-Rich Ingredients

Solmaz Tabtabaei, Howard University
Jamaka Thomas and David Gardner, Howard University, Washington DC

The main objective of this research is to develop a novel tribo-electrostatic separation (TES) technique for the fractionation of defatted soybean flour into functional protein-rich and fiber-rich ingredients in a water- and chemical-free environment followed by optimizing the separation operating parameters including air flow rates and electric field strength. The separation of defatted soybean flour into its constituent particles of protein and fiber depends significantly on the chargeability properties of these particles. Our results showed that protein particles in contact with polytetrafluoroethylene (PTFE) tribo-charger device have significantly higher chargeability properties compared to fiber particles which is mainly due to the presence of ionizable functional groups in proteins such as amine groups, carboxyl groups and side chains. Our Bioprocess Engineering Research Laboratory at Howard University has designed a custom-built tribo-electrostatic separator unit consisting of a tribo-charging tube, separation chamber with two oppositely charged electrodes, and fluidized bed. Herein, the soybean constitute particles were first charged in the PTFE tribo-charging tube to substantially different levels before being separated in the fractionation chamber under the influence of an external electric field. The optimization of process parameters was performed at two different laminar and turbulent air flow rates as well as three different plate voltages (±1kV, ±3.5kV, and ±6.5kV). At the most optimal process conditions, the initial protein and fiber contents of soybean flour were increased from 55.3% and 15.3% to 58.4% and 19.6%, respectively, accounted for 66.5% of the total protein and 60.8% of the total fiber. Further enrichment of protein content in defatted soybean flour will be performed by optimizing the design configuration of the separator through multi-stage TES processes.

Funder Acknowledgement: NSF Grant No. HBCU-UP RIA - 1900894

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Poster Category: STEM Research

Interdisciplinary CREST Center for Nanotoxicity at Jackson State University

Jerzy Leszczynski, Jackson State University

While nanomaterials are naturally occurring, the intentional and unintentional production of nano-scale materials has exploded in the past 50 years. 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. 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. Due to NSF investment and support of the Center for Nanotoxicity, we have pioneered development and applications of efficient methods to elucidate and predict toxicity of nanomaterials.

Funder Acknowledgement: NSF CREST

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Poster Category: STEM Research

One-pot Synthesis of Water-soluble Iron Oxide Nanoparticles with Narrow Size Distribution and their Potential Application for T1-weighted MRI

Yongfeng Zhao, Jackson State University
Pohlee Cheah, Paul Brown, and Terriona Cowan, Department of Chemistry, Physics, and Atmospheric Science, Jackson State University, MS

Ultrasmall iron oxide nanoparticles (IONPs) have shown great potential in T1-weighted magnetic resonance imaging (MRI). Monodisperse ultrasmall IONPs are conventionally synthesized by thermal decomposition procedure in organic solvent and required surface modification to make the IONPs water soluble for biomedical application. However, surface modification has proved to be sophisticated, time consuming and low efficient. In this study, ultrasmall IONPs with different functional groups were successfully synthesized via one-pot synthesis. The IONPs are prepared by first thermal decomposition of iron acetylacetonate Fe(acac)3 precursor in diethylene glycol (DEG), followed by mixing the surface ligands at the end of the reaction. This facile synthesis method enabled coating of different surface materials such as polyethylene glycol with thiol end group (thiol-PEG), and polyacrylic acid (PAA) onto the IONPs. The size growth of IONPs can be well controlled as evidenced by transmission electron microscopy (TEM) studies. The high water stability of nanoparticles was correlated with the change of hydrodynamic size and zeta potential. While TEM results showed no significant change in the nanoparticles core size before and after surface modification, hydrodynamic size slightly increases due to the presence of ligands molecules on the surface. The attachment of surface ligands was studied by FTIR and TGA. FTIR results indicated the corresponding functional group for each surface ligands as a result of surface modification. In addition, we confirmed the surface functional groups by conjugating fluorescence dyes on to the surface. The magnetic resonance phantom study show that the resulted nanoparticles can be used for T1-

weighted MRI imaging. The effect of surface ligands on the relaxivities of IONPs were also studied.

Funder Acknowledgement: This research is supported by the NSF (HRD-1700390 and OIA-1757220)

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Poster Category: STEM Research

Graphene Oxide Changes the Auto-Reduction Mechanism of Bis-Fe(IV) MauG

Manliang Feng, Tougaloo College
Alexandria Morgan, Ja'kyra Hicks, Jinhe Mao, and George Armstrong, Tougaloo College, Tougaloo MS

MauG catalyzes the post-translational modification of precursor methylamine dehydrogenase (pre-MADH). This 3-step reaction involves the insertion of oxygen on and cross-linking of two tryptophan residues at the active site of the substrate (pre-MADH). The oxidation equivalent is provided by a bis-Fe(IV) species which is formed by the reaction of di-ferric MauG with H2O2. Formation of high valent bis-Fe(IV) species results in a reduction of the Soret band intensity and a formation of a charge-resonance band at 950 nm. In the absence of the pre-MADH, the bis-Fe(IV) MauG undergoes auto-reduction to the diferric state. This is a complex multistep reaction involving both proton and electron transfers. The first step is a proton transfer from solvent that generates a Compound I-like state. The second step is a one-electron reduction that generates a Compound II-like state. Then another one-electron reduction with loss of water yields the diferric state. Graphene oxides (GO), due to the unique physical and chemical properties, have seen growing interest in energy storage, electronics, chemistry and biomedical sciences. In this research, we studied the kinetics of the auto-reduction reaction of high valent bis-Fe(IV) MauG on GO. It was found that GO increases the rate constant of the first step of the auto-reduction by almost 10 times, which implies that GO alters the reactions mechanism. The electron donor of the auto-reduction reaction is also likely altered by GO. Electron transfer (ET) reactions are involved in key biological processes, such as oxidative phosphorylation, respiration, photosynthesis as well as many reactions of intermediary metabolism. Therefore, the current studies on the electron transfer on GO using MauG as a model could give us insight of how GO affect the electron transfer reaction in the biological processes.

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Poster Category: STEM Research

Highly Stable Nanoparticle-Doped Metal-Organic Frameworks for Applications in Water Purification

Karl Jackson, Virginia Union University

This project seeks to determine the best synthetic protocols to analyze nanoparticle-doped meal-organic framework (NP@MOFs) systems for their water filtration and sanitation properties and to make structural modifications of these material based on observed performance. The proposed work explores the simultaneous elimination of biological and chemical contaminants in water through a one composite system. The objectives are to investigate the impact of the encapsulation of metal nanoparticles inside water stable MOFs on water purification properties and determine the stability and recyclability of new and existing NP@MOF systems when used for water purification applications. The work described herein describes the synthesis, characterizations, and organic dye absorption properties of UiO-66 and ZIF-8.

Funder Acknowledgement: NSF Research Initiation Award

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Poster Category: STEM Research

Phosphonium Ionenes as Solid Polymer Electrolytes in Lithium Ion Batteries

Asem Abdulahad, Xavier University of Louisiana

Solid polymer electrolytes (SPEs) have garnered significant attention as potential replacements to traditional liquid electrolytes. This is primarily due to safety concerns that are associated with overheating, puncturing of traditional lithium ion batteries, or short circuiting due to lithium accumulation at the surface of electrodes. Other drawbacks of using liquid electrolytes in lithium ion batteries include limited operating temperature range, corrosion of the inorganic electrode material, the need for hermetic sealing, and the growth of lithium metal dendrites with multiple charge/discharge cycles. Assuming roles as both the lithium ion transport medium as well as the electrode separator, SPEs offer a safer alternative to traditional liquid electrolytes and have the potential to increase the efficiency of lithium ion transport. The overall goal of this research is to understand and describe the fundamental relationship between polymer molecular structure and the properties SPEs. More specifically, this work focuses on probing two molecular level features that impact the properties of polycations: the distribution of charge along the polymer chain and polymer chain segmental motion. Using phosphonium ionenes (PhIn) as a model system, the influence of charge distribution along the polymer backbone on SPE properties will be reported in PhIn-PEG blends. Additionally, the influence of polymer segmental motion on SPE properties is

presented for PhIn-PEG copolymers, where the PEG content reduces the glass transition temperature (increases segmental motion) for PhIn-PEG copolymers.

Funder Acknowledgement: NSF HBCU-UP Award No. 1901479

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Poster Category: STEM Research

Investigating the Adsorption Strength of Industrially Relevant Small Gas Molecules on Hexagonal Boron Nitride and Planar Silicon Carbide Surfaces

Kevin Riley, Xavier University of Louisiana
Melissa Hoang, Calvin Nguyen, Catherine Nguyen, and Tommy Giang, Xavier University, New Orleans

Small molecule pollutants resulting from industrial processes are responsible for many environmental and health-related dangers. The first step to ameliorating issues associated with the presence of these small molecules is the ability to detect them in various settings. Many detectors are based on adsorption of small molecules onto a surface, with some associated measurable electrical effect. Semiconductor surfaces are particularly attractive, as there is often a measurable band gap change associated with adsorption. Here we investigate the relative strengths of adsorption for six industrially-generated small molecules, CO, CO2, NO, NO2, CH4, and SO2, on hexagonal boron nitride and planar silicon carbide surfaces using the BLYP-D3BJ/DGDZVP method. Three types of model surfaces, coronene-like (CN), circumcoronene-like (CCN), and circumcircumcoronene-like (CCCN), are investigated here. Calculations are carried out in gas phase and using an implicit solvation (SMD) water environment. It was found that differences in binding energies between CN and CCN surfaces are significant while binding energies for CCN and CCCN surfaces are generally very similar. SO2 is generally the strongest binder by a significant margin while CH4 is the weakest binder.

Funder Acknowledgement: NSF - CHE-1832167; ARO - W911NF -18-1-0458

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Poster Category: STEM Research

Investigation of Small Molecule Adsorption and Conversion on the Electrode/Ionic-Liquid Interface and Application to Sensing and Catalysis

Zhe Wang, Xavier University of Louisiana

This project entails both theoretical and experimental studies aimed at investigating the structures of electrode/ionic liquid interfaces, effective selective adsorption on these interfaces, effects of adsorption on adsorbant bond strength, and understanding of the molecular mechanisms involved therein. This is a fundamental study with strong implications for any future projects involving miniaturized sensors, gas separation, or high-performance catalytic conversion utilizing ILs. This systematic research is being conducted using state-of-the-art electrochemical, spectroscopy, surface science, and computational chemistry methods. The main goals of this project are to achieve a greater fundamental understanding of small molecule adsorption at the interfaces and to explore new chemistry and physics on these interfaces. ILs generate a unique solid-like interface; consequently, they can generate extremely high electric fields and induce exceptionally large charge densities at the solid/liquid interface. The electric double layer (EDL) charge density can be much higher than traditional field-effects and allows for new levels of electrostatic modulation to be accessible. The pure ionic structure of IL itself also brings an electrostatic environment, which can potentially be manipulated for facilitating certain small molecule activation. However, electrified IL/electrode interfaces with adsorbed gas molecules have not been either theoretically or experimentally studied. Here the strong interaction granted by electrode with the tunability of IL interfaces is exploited in order to achieve and evaluate gas adsorption that is both sensitive and selective by systematically studying adsorption behavior in the IL environment.

Funder Acknowledgement: HBCU-UP RIA; HBCU-UP EIR

Computer Sciences and Information Management

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Poster Category: STEM Research

Applying Machine Learning to Classify Player Importance in the NBA

Kirk Williams II, Bowie State University
Lawrence Jefferson III, Kalaye Lawrence

Machine-learning analysis for sports analytics involves the use of a data-programmed machine to make analysis. Usually sports data miners program these machines to detect similar playing patterns in individual players in the games of sport. Our analysis will use a machine to predict Real Plus-Minus scores for all players in the NBA. If we can teach the machine how to calculate this number without our assistance in the future, we will have a successful machine learning project. In this analysis, we will be using WEKA (Waikato Environment for Knowledge Analysis), which is a collection of “machine learning algorithms” for data mining tasks.

Funder Acknowledgement: Bowie State University; NSF

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Poster Category: STEM Research

CRISP Projects to Spark Interest in Computer Science Research

David Cooper, Cheyney University
Michelle Rogers, Drexel University, Philadelphia, PA

The Computational Applications Research Experience for Undergraduates (CARE-U) program presents a variety of research projects as a pathway for students of multiple disciplines to get involved in Computer Science research. The projects are all centered around detection and identification using audio and/or visual sensors. These are called Computational Research In Sensor Prototyping (CRISP) projects. Students applying to be researchers are presented with a number of challenge problems that they may be interested in such as person identification, activity detection, emotion detection, and multi-person localization. In addition, broader implications of the research are mentioned such as Ethical AI, lab vs. world conditions, integration with mobile platforms, and form and function of the sensors.

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Poster Category: STEM Research

Geospatial Problems for Teaching and Learning in Computing and Data Analytics

Sambit Bhattacharya, Fayetteville State University
Bogdan Czejdo and Valentin Milanov, Fayetteville State University

Educational research suggests that Computer Science curricula can benefit from creating pathways built from contexts that are application and domain areas covering core knowledge by providing explanations and motivation for students. By design, geospatial problems can help train students in computational and data-enabled science in the context of geospatial applications. Interdisciplinary, computation-oriented classes can be designed to provide a geospatial context in which computing students can apply their skills, and thus gain deeper knowledge of their discipline, while other students can learn additional skills to enhance abilities in their own non-computing disciplines. This interdisciplinary approach can open up new career possibilities for all students, since geospatial technologies have experienced robust job growth in the recent past, and this trend is expected to continue as the industry and government are projected to hire an increasing number of specialists in this area. During the poster, the speaker will describe the educational materials that have been developed and what types of courses may be suitable for inclusion of these materials.

Funder Acknowledgement: National Science Foundation

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Poster Category: STEM Research

iCREDITS at New Mexico State University: Summary of Accomplishments

Enrico Pontelli, New Mexico State University
Satish Ranade and Mari Langford, New Mexico State University, Las Cruces, NM

This poster will provide a summary of the research and educational achievements that the iCREDITS CREST Center has achieved over the last 5 years. The research has contributed to the establishment of fundamental advances in the areas of smartgrids, including results in the area of modeling and deployment, communication networks, multi-agent decision making, and protection. The educational accomplishments include the creation of outreach programs, the development of new degree programs (at the graduate and undergraduate levels), and the development of new sustainable collaborations.

Funder Acknowledgement: NSF 1345232

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Poster Category: STEM Research

Toward the Convergence of Wave Physics and Deep Learning Solutions

Lei Huang, Prairie View A&M University

The classical scientific computing method to simulate the physical phenomena of wave motion is to use either the finite difference or finite element methods to solve the partial differential equations representing the physical rules. Deep learning is a data-driven numerical optimization solution based on statistics and probabilities. Both solutions have pros and cons to solve scientific problems. In this poster, we present our research efforts to compare and converge these two solutions to simulate the seismic wave motions in geophysics. We will compare the performance and accuracy of these two solutions, and discuss how to converge them to achieve superior performance.

Funder Acknowledgement: NSF HBCU-UP/CNS #1832034

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Poster Category: STEM Research

The Role of Disability Type on College Major, Highest Degree Level Attainment, and Job Occupation based on Culture in Country of Birth

Raymond Elliott, Savannah State University
Shetia Butler Lamar and David Simmonds, Savannah State University, Savannah, GA; Suman Niranjan, University of North Texas, Denton, TX

Because of disabilities, people may face many types of roadblocks or challenges. Many will go through life and manage to overcome obstacles that have the potential to stand in the way of them achieving their goals. People with disabilities tend to work in lower-skilled jobs with limited educational and experience requirements. Previous authors have evaluated the gap between disabilities and education level. Mizunoya and Mitra (2012) examined this gap in developing countries. While Brucker, Mitra, Chaitoo, and Mauro (2014) analyzed the gap between people with disabilities and poor income. We propose that the following factors will also affect people's ability to overcome challenges related to dealing with their individual disabilities: culture in country of birth, education level, and job occupation. In addition, we believe that different types of disabilities will either have a positive or negative impact on the person's career. We also look at the implications related to people with different types of disabilities and the highest degree they have attained. Based on Maroto and Pettinicchio (2013) who found that disability creates disconnects in the workplace and that women and racial minorities undergo segregation in the workplace, we go a step further by looking at the degree level attained as well as the chosen major and the job occupation. We believe that these factors will have different impacts based on country of birth. We will analyze, using OLS regression, the raw data from the Scientists and Engineers Statistical Data System.The total sample size for the 2017 National Survey of College Graduates, which was used, is 105,000. The 2017 Survey of Doctorate Recipients sample consisted of different cases of types of disabilities selected systematically across strata.

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Poster Category: STEM Research

Aggressive Deadline-Driven Standby-Sparing for Hard Real-Time Systems under Energy Awareness

Linwei Niu, West Virginia State University

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

Funder Acknowledgement: NSF HBCU-UP/RIA

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Poster Category: STEM Research

Leveraging Hi-C and Whole Genome Shotgun Sequencing for Double Minute Chromosome Discovery

Matthew Hayes, Xavier University of Louisiana
Angela Nguyen, Ethan Tran, and Derrick Mullins, Xavier University of Louisiana, New Orleans, LA

Double minute chromosomes are acentric, extrachromosomal circular fragments of DNA that are frequently observed in tumor cells of numerous cancer subtypes, engendering the malignancy cancer. They are highly amplified and contain oncogenes and drug resistance genes, making their presence a challenge for effective cancer treatment. Algorithmic discovery of double minutes (DMs) can potentially improve bench-derived therapies for cancer treatment. A hindrance to this task is that DMs evolve, yielding circular chromatin that shares segments from progenitor DMs. This creates DMs with overlapping amplicon coordinates. Existing DM discovery algorithms largely use whole genome shotgun sequencing in isolation, which could potentially incorrectly classify DMs that share overlapping coordinates. In this study, we describe a pipeline to predict DMs in tumor genomes by integrating whole genome shotgun sequencing and Hi-C sequencing data. The consolidation of these sources of information resolves ambiguity in DM amplicon prediction that exists in DM prediction with whole genome sequencing data used in isolation.

Funder Acknowledgement: NSF HBCU-UP Research Initiation Award: HRD-1901258

Ecology, Environmental and Earth Sciences

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Poster Category: STEM Research

Excellence in Research: Microbiome of the Eastern Oyster and its Denitrification Potential in Benthic Systems

Yungkul Kim, Bethune-Cookman University
Raphael D. Isokpehi, Bethune-Cookman University, Daytona Beach, FL; Ashish Pathak, Charles Jagoe, and Ashvini Chauhan, Florida A&M University, Tallahassee, FL

Oysters and their associated microbiomes provide significant environmental benefits, including removal of nitrogen, a major cause of coastal and estuarine eutrophication. However, the presence, abundance, metabolic activity and ecological significance of microbial endosymbionts within oysters, especially in warm temperate and tropical waters, remain poorly understood. Much of the oyster microbiome consists of taxonomically

unresolved and potentially novel microorganisms. Filling this knowledge gap is critical because oyster aquaculture and restoration of oyster reefs is greatly expanding in the Gulf of Mexico and south Atlantic coasts. Thus, we are investigating the microbiomes of wild and cultured oysters grown under different nutrient, temperature and salinity regimes. In addition to the microbiome community composition and potential identification of novel microbes, we are focusing on microbes associated with biogeochemical cycling, particularly denitrification. One major hypothesis is that oyster microbiomes provide a significant ecosystem service of nitrogen removal in estuarine systems. Several emergent 'omics' techniques are being deployed by a team of ecologists, microbiologists, bioinformaticians and biogeochemists from two Florida Historically Black Colleges and Universities (Florida A&M University and Bethune-Cookman University), thus supporting the development and expansion of research capacity at these institutions. The project also includes a significant education component, including funding for students and a postdoctoral fellow. Better understanding of the structure and function of oyster microbiomes will advance knowledge of estuarine ecology and may provide improved strategies for managing coastal water quality. Dissemination to the public includes news releases and news articles (https://www.news-journalonline.com/news/20190816/bethune-cookman-famu-to-study-oysters-ability-to-clean-water).

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Poster Category: STEM Research

Resource-Consumer Relationship Along a Gradient of Water Flow

Alex Mercado-Molina, Florida International University
Joel Trexler, Department of Biological Sciences, Florida International University

Periphyton is an association of autotrophs and saprophytes that is the primary source of energy and elements for many aquatic food webs. Periphyton-mat structure affects consumer access to food elements, also limiting resource transfer from basal to consumer portions of the food web. Few studies evaluate the relationship between environmental gradients and periphyton nutritional quality in wetlands, limiting our capacity to link it to population, and ultimately ecosystem, function. The aim of this work was to determine the impact of increasing water velocity on resource quality and resource-consumer relationships in the Everglades. We created a food-web fragment within enclosures established at three locations experimentally differing in water velocity (0 cm/s, 3-4 cm/s, 5-7 cm/s). The food web consisted of primary producers (periphyton mats and biofilm), a snail grazer (Planorbis rubrum), an omnivorous fish (Gambusia holbrooki), and a carnivorous fish (Enneacanthus gloriosus). The resource-consumer relationship across locations was evaluated using nutrient and fatty acid profiles, tools that relate the dietary sources of energy from basal resources to consumers. We found that phosphorus (P) concentrations tend to increase with water movement both in periphyton mats and in biofilm which led to significant decreases in the C:P and N:P ratios as water velocities increased. Differences in P enrichment did not affect the nutrient ratios in Gambusia holbrooki. In contrast, N:P and C:P ratios in Enneacanthus gloriosus were significantly lower at the site with low water flow. The proportion of essential PUFAs was also affected by the variation in water flow. The essential FAs in biofilm were significantly lower at under mid-water flow while being similar at the two other locations. In periphyton mats, on the other hand, essential FAs were less abundant under low and mid-water velocities. Lastly, the content of essential FAs in fish followed the same pattern as the one observed in the biofilm. Our results indicate that the quality of the food source both in terms of nutrients and FAs can be altered by local hydrological conditions and that such alteration can be reflected in the consumer.

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Poster Category: STEM Research

Micro RNA Isolation from Three Neurosensory Structures in CO2-Exposed Marine Fishes

Andrij Horodysky, Hampton University
Isaiah Milton, Carolina Bonin, Nefertiti Smith, Kendra Dorsey, Olivera Stojilovic, Janelle Layton, Kathryn Cruz, Deidre Gibson, Hampton University, Hampton VA

Declines in ocean pH have resulted in physical and behavioral changes in marine organisms, including changes in auditory performance in soniferous marine fishes. Yet physiological responses and underlying molecular mechanisms through which fishes respond to environmental change remain poorly known. MicroRNAs are small (~22 nt) non-coding RNAs known to “fine-tune” gene expression during physiological stress responses. They are highly conserved among taxa, allowing for the exploration of molecular responses in organisms lacking annotated genomes. We therefore assessed microRNA yields of three candidate neurosensory structures: eyes, brain, and endolymph-bathed otoliths obtained from two species, red drum (Sciaenops ocellatus) and Arctic cod (Boreogadus saida). Otoliths were manually pulverized for processing and all tissues were processed in duplicate. Structures were preserved frozen at -20°C in RNA later (Invitrogen) post dissection. Roughly 0.05g of soft tissue and 0.09g of otolith powder were processed per extraction. Small RNA extractions using a commercial kit (mirVana, Life Technologies) reveraled small RNA yields of 27.65 ng/µl (eye), 80.25 ng/µl (eye), 20.65 ng/µl (otoliths), while 260/280 ratios

ranged from 1.5 to 1.6. Our findings demonstrate successful isolation of microRNAs from all three structures, and suggest the utility of microRNA assays to mechanistically investigate neurosensory deficits in fishes facing environmental change.

Funder Acknowledgement: NSF HBCU-UP RIA 1600391; NSF CAREER 1845004

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Poster Category: STEM Research

Techno-Economic-Environmental Analyses of Chemical Looping Gasification (CLG) of Biomass with CO2 Recycling for Producing Biofuels

Micah Jasper, North Carolina A&T State University

This study is to analyze a novel chemical looping (CL) syngas upgrade loop within a gasification system for the production of high-quality syngas from biomass. The system includes two reactors: one for biomass gasification and the other one for syngas upgrading with an oxygen carrier. We also recycle CO2 directly into the gasifier as a co-gasifying agent. We are developing an Aspen Plus models for techno-economic analysis of producing Fischer-Tropsch liquids via biomass gasification using this novel CL technology. The process models will be validated by experimental data and used to investigate the energy efficiency, productivity, and energy and material flows of the integrated CL biomass gasification system with various process configurations for producing syngas at various qualities from various biomass feedstocks. An economic model will be developed and incorporated into the process model to determine the cost of the CL system at different production scales. We are also building life cycle assessment (LCA) models in GaBi and OpenLCA for evaluating environmental impacts of the biorefinery.

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Poster Category: STEM Research

Gasification of Biomass to Syngas and Fischer Tropsch Synthesis to Biofuels

Abolghasem Shahbazi, North Carolina A&T State University
Lijun Wang and Debasish Kuila, North Carolina A&T State University, Greensboro, NC

The combination of biomass gasification and subsequent Fischer Tropsch (FT) synthesis is a promising pathway to produce renewable, low carbon liquid fuels and chemicals. Biomass gasification in a fluidized bed gasifier involves complicated physicochemical and structure evolution of biomass particles and reactive gas-particle behavior. The impurities in syngas such as nitrogen and tar can severely interfere with downstream catalytic reactions involved in syngas utilization. This project investigates an integrated biomass gasification and FT synthetic process to produce liquid fuels from biomass. Five studies have been conducted which include: (1) experimental determination and mathematical modeling of physicochemical and structural evolution of biomass particles during gasification, (2) computational fluid dynamics (CFD) modeling of the multiphase reactive gas-particle flow behavior in a biomass fluidized bed gasifier, (3) investigation of a nickel-based catalyst for tar cracking and ammonia decomposition of hot syngas, (4) study of Fe-based and bimetallic catalysts for the F-T synthesis of liquid fuels from biomass-derived syngas with enriched CO2 in tubular and microchannel reactors, and (5) process simulation of the biomass-to-liquid fuel refinery. Advanced experimental and mathematical modeling techniques are used to generate fundamental knowledge and tools necessary for the development of a biomass-to-liquid fuel refinery based on gasification and FT synthesis. Specifically, experimental techniques including TGA-DSC, Frontier micropyrolyzer, elemental analyzer, GC-MS and infrared spectrometry are used to uncover the physicochemical evolution of biomass particles during gasification. Also, a two-phase theory model in conjunction with detailed kinetics of biomass pyrolysis and gasification was developed to simulate the hydrodynamics of a bubbling fluidized bed gasifier. Effect of heat transfer between bubble and emulsion phase on composition and concentration of different classes of tars is shown at different operating conditions. Nickel-based catalysts are investigated to catalytically remove tar and ammonia from the syngas. Bimetallic cobalt-based catalyst 10%Co 5%Fe MCM-41 were synthesized using the one-pot hydrothermal method and used to investigate conversion of syngas to higher alkanes using 3D-printed stainless steel microreactors. A mathematical model is developed in Aspen Plus and Gabi 6 to analyze the techno-economics and assess the environmental impacts of the refinery.

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Poster Category: STEM Research

Summer Undergraduate Research Experience (SURE) Program in Environmental and Interdisciplinary Sciences (EIS)

Maruthi Sridhar Balaji Bhaskar, Texas Southern University
Jason Rosenzweig, Shishir Shishodia, and Daniel Vrinceanu, Texas Southern University, Houston, TX

A Summer Undergraduate Research Experience (SURE) program was created and successfully implemented during the last five years in the Department of Environmental and Interdisciplinary Sciences (EIS) in the College of Science Engineering and Technology (COEST) at Texas Southern University (TSU) in Houston, TX. The objective of this program is to increase the students' critical thinking, software and communication skills and make them proficient in collecting, analyzing and interpreting the geospatial and environmental science data in the STEM fields of study. The recent increase in frequency and intensity of the urban flooding events and repeated inundation of the Houston watersheds makes it important to monitor the water and soil chemical, microbial and cytotoxic characteristics in the Houston-Galveston region. The objectives of the study are: 1) to collect and analyze the nutrient, heavy metal, microbial and cytotoxic concentrations in the water and soil samples along the various urban watershed bayous, and 2) to monitor and map the land cover changes and contamination profiles of these watersheds using remote sensing and Geographic Information Systems (GIS). A total of 20 undergraduate students and 15 graduate students participated in various activities to collect soil and water samples and to comprehensively analyze the chemical, microbial and cytotoxic characteristics of the samples. The data was further statistically interpreted and spatial and temporal maps of the study area were created. Our analysis indicates that the nutrient, metal and microbial concentrations along the bayous spiked following the flooding events; the downstream of the bayous are often more contaminated compared to the upstream locations. Our satellite and GIS analysis reveal that the impervious surface increased and vegetative surface decreased during the last three decades contributing to more urban runoff. The analysis of the metal, nutrient, and microbial concentrations in water and soil samples will enable us to identify the hot-spots of contamination within these watersheds, which can be better managed, remediated and restored to preserve the health of these urban watershed ecosystems.

Funder Acknowledgement: This research was primarily supported by NSF awards HRD-1400962 and HRD-1622993

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Poster Category: STEM Research

A Primal-Dual Approach for Joint Inversion of Seismic and Gravity Data: Gaining Insight Into the 3-D Geophysical Structure of Colombia

Azucena Zamora, University of Texas at El Paso
Anibal Sosa, Universidad ICESI, Cali, Colombia; Aaron A. Velasco, University of Texas at El Paso; Chengping Chai and Monica Maceira, Oak Ridge National Laboratory, TN

Studying the tectonic evolution of the Earth and its constant motion allows us to characterize, using geophysical surveys and analysis, the location of seismological faults in the lower crust and determine the possible hazards associated with them. We develop and use a novel approach to include physical constraints into the nonlinear joint inversion problem to determine crust and upper mantle structure. Previous studies have shown that combining surface wave group velocities and Bouguer gravity anomalies can help identify key features within the complex subsurface that may be overlooked by the individual geophysical surveys. Our approach enhances numerical aspects of geophysical inversion since it seems to introduce a regularization effect over the models, that avoids the expensive search for the so-called regularization parameters. Regularization or smoothing parameters act as the key part for convergence of inversion algorithms. Our primal-dual formulation of the inverse problem allows the inclusion of appropriate a priori information, that narrows the model space region of crust and upper mantle structure. We apply our approach using high quality disparate data sets recorded from the enhanced seismic network of Colombia and the gravity recovery and climate experiment (GRACE) Earth Gravity Model-2008 (EGM2008), aiming to shed light on some of the controversies related to the complex interactions of three major tectonic plates beneath Colombia. We expect not only to improve current state-of-the-art modeling of Colombia's Earth structure, but also to offer a creative approach to more accurate inverse modeling with an efficient solution for the non-linear inverse problems for Earth structure.

Funder Acknowledgement: NSF CREST Postdoctoral Research Fellowship; Fulbright Scholar Program

Mathematics and Statistics

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Poster Category: STEM Research

Variation in the Annual Progression of Snow Accumulation and Melt in the Sierra Nevada

Eduardo Montoya, California State University, Bakersfield
Wendy Meiring and Jeff Dozier, University of California, Santa Barbara

Snow in the Sierra Nevada Mountain Range is an important source of water for California. Snow water equivalent (SWE) seasonal pattern over each water-year exhibits variation in both the magnitude and timing of important snowpack features. Daily snow pillow SWE measurements dramatically increased the time frequency of in-situ measurements of the snow accumulation and melt continuous processes, compared to earlier manual snow course measurements. Here, we extract the dominant modes of variability in the daily snow pillow SWE measurements to reveal important features of the timing and magnitude of events in the annual progression of snow accumulation and melt processes in the Sierra Nevada. We then examine the association of these features with atmospheric and oceanic conditions. This study is important to the cryospheric field, and leads immediately to directions for further investigations.

Funder Acknowledgement: NSF Grant HRD-1547784

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Poster Category: STEM Research

Convergence Diagnostics of MCMCs for Reliable Prediction of Contaminant Transport

Arunasalam Rahunanthan, Central State University
Abdullah Al-Mamun and Felipe Pereira, University of Texas at Dallas

We consider the prediction of contaminant in a water aquifer. In order to predict the contaminant concentration in time, we first characterize the subsurface properties of the aquifer, such as permeability, by using very limited data in the form of fractional flow curves in monitoring wells of the aquifer. A Bayesian statistical framework is used for reconstructing the permeability distribution of the aquifer. In the framework we run several parallel Markov Chain Monte Carlo (MCMC) simulations. In this approach, we need to determine when it is safe to stop the MCMC simulations for a reliable characterization of the permeability field. There are several convergence diagnostics available for this purpose, and those diagnostics fall into two categories: the first entirely depends on the output values of the MCMC simulation and those in the second category use not only the output values but also the information on the target distribution. In the first category, Brooks and Gelman [1] proposed a convergence diagnostic that uses Multivariate Potential Scale Reduction Factor (MPSRF) to decide when to terminate MCMC simulations. In this poster presentation, we first propose a fitting procedure for the MPRSF data that allows us to estimate the number of iterations for the convergence. Then we present an analysis of ensembles of fractional flow curves suggesting that the number of iterations required for convergence through the MPSRF analysis is excessive. Also, the analysis, which is our proposed convergence diagnostic, provides a criterion to stop MCMC simulations for a reliable prediction of the contaminant in the aquifer. The prediction results indicate that the proposed convergence diagnostic is very reliable in our application. Reference: [1] A. Gelman and S. Brooks, General methods for monitoring convergence of iterative simulations, Journal of Computational and Graphical Statistics, vol. 7, pp. 434--455, 1998.

Funder Acknowledgement: HRD-1600818

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Poster Category: STEM Research

Optimal Power Allocation of Satellite Communications

Wei Wan, Claflin University
Yuanyuan Peng, Claflin University, Orangeburg, SC

Our research is to investigate optimal strategies in a satellite communication system to allocate power among competing user terminals that share a frequency-selective Gaussian interference channel and would be competing for limited radio resources to meet their selfish data rates. A discrete cooperative game model has been set up to study the optimal spectrum management strategies in multi-user frequency selective interference channels. The KKT conditions for this model must be analyzed and solved to get optimal solutions, which gives the optimal control scheme in terms of the direct channel gain and the noise power spectrum density.

Funder Acknowledgement: NSF 1900984.

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Poster Category: STEM Research

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

Sanjukta Hota, Fisk University

Through National Science Foundation TIP funding, Fisk University has launched a bio-track program to infuse quantitative biological content into its undergraduate STEM curriculum. The program introduces computational and data-enabled active learning into mathematics, biology and computer science, integrated with a faculty-mentored summer research internship program. My poster will share the program's results and its overall impact on our students and faculty, inviting comments and suggestions from the STEM community with similar goals.

Funder Acknowledgement: HBCU-UP-TIP 1719450

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Poster Category: STEM Research

Numerical Approach to the Near Field Refractor Problem

Henok Mawi, Howard University
Cristian Gutierrez, Temple University, Philadelphia, PA

In this presentation we will display a numerical algorithm used to approximate a solution to the near field refractor problem. This problem involves determining an interface (lens), between two media of propagation of light, that is capable of refracting a light beam with a given illumination intensity emanating from a punctual source, in medium I, so that the refracted rays in medium II will pass through a certain target set forming a prescribed intensity distribution on the target set located in medium II. A mathematical model of the problem and a method of iteratively constructing a free-form interface for the problem by using a set of primitive surface elements will be shown.

Funder Acknowledgement: NSF

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Poster Category: STEM Research

An Introduction of Fluid Poroelastic Structure Interaction (FPSI) Models

Mingchao Cai, Morgan State University

There are many important applications that involve interactions between fluid flow and poroelastic structures. Numerical simulations of such multi-domain, multi-scale, and multi-physics models are extremely challenging because (1) the subdomain models are of different types, (2) discretization schemes that mimic physical laws are difficult to design, and (3) the stability and accuracy are hard to preserve in partitioned numerical algorithms which decouple the computations of the coupled models. In this poster, I will introduce a general FPSI model and the degenerated models. Some possible spatial discretizations, time evolving algorithms, and preconditioning techniques will be discussed.

Funder Acknowledgement: NSF HBCU-UP Research Initiation Award: HRD-1700328; NSF HBCU-UP Excellence in Research Award: DMS-1831950.

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Poster Category: STEM Research

Activity Patterns of Neuronal Network with Voltage-Sensitive Piecewise Smooth Coupling

Choongseok Park, North Carolina A&T State University
Jonathan Rubin, University of Pittsburgh, Pittsburgh, PA

In this study, we present an analysis of activity patterns in a neuronal network, which consists of three mutually inhibitory cells with voltage-sensitive piecewise smooth coupling. This network model was motivated by recent development of a respiratory neuronal network model in the mammalian brainstem and is able to exhibit various activity patterns including the bistable relaxation oscillation solutions with a different order of activations. A reversed order of activations, which is observed in one of the bistable solutions, is contrary to the network architecture and characterized by a sudden 'turn-around' during transitions (fast jumps) between states. Standard fast-slow analysis provides the set of fixed points of fast subsystem and transition surfaces parametrized by slow variables, but due to the voltage-sensitive nature of coupling, it fails to describe the mechanism underlying the sudden 'turn-around' during fast jumps. To determine where fast jumps actually go, we consider the structure of a fast subsystem which is modulated by slow dynamics as well as fast dynamics. Piecewise smoothness of coupling enables us to consider a sequence of fast subsystems in a piecewise way. Our analysis shows that there are three possible scenarios during fast jumps, which incorporate the fast dynamics and slow dynamics. First, the fast dynamics succeeds to equilibrate at (or near) a presumed fixed point manifold and then the slow dynamics relaxes to its own fixed point, pulling the slaved, fast variables along the fixed point manifold. Second, while the fast dynamics tries to equilibrate at a fixed point manifold, the slow dynamics pushes the fast system through a bifurcation, which forces a second fast jump to a new fixed point manifold and then the slow relaxation follows. Third, the presumed fixed point manifold is either already lost by the slow dynamics or blocked by the structure of the fast subsystem, thus the fast dynamics is forced to approach a new fixed point manifold directly. In the second and third cases, we observe the sudden 'turn-around' during fast jumps.

Funder Acknowledgement: NSF 1700199

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Poster Category: STEM Research

A Flexible Bivariate Conway-Maxwell-Poisson Distribution

Kimberly Weems, North Carolina Central University
Kimberly F. Sellers and Tong Li, Georgetown University, Washington, DC

For modeling bivariate count data that exhibit data dispersion, we develop a bivariate Conway-Maxwell-Poisson (CMP) distribution based on the trivariate reduction method. One advantage of this distribution is that it has marginal probability mass functions with a flexible form that includes several special case distributions for certain parameter values. In addition, we construct maximum likelihood and method of moments estimators for the model parameters. We compare this bivariate CMP distribution to other distributions for bivariate count data, namely the bivariate Poisson, bivariate generalized Poisson, bivariate negative binomial, bivariate geometric, and another bivariate CMP distribution based on the compounding method. Through simulation studies and an application to real data, the performance of the trivariate-reduction-based bivariate CMP distribution is shown to be comparable to other bivariate distributions for overdispersed count data.

Funder Acknowledgement: NSF Grant #1700235 through HBCU -UP

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Poster Category: STEM Research

Study of Memory Effects for the Heat Conductivity of Random Suspensions of Spheres

Abhinandan Chowdhury, Savannah State University

Method of Stochastic functional expansions with random-point basis function is applied to the case of heat conduction of a particulate medium (suspension) subjected to a time-dependent

spatially constant temperature gradient. It is shown that within the first order of approximation with respect to the concentration, the equation for the kernel of the 1st-order functional integral is the equation of the disturbance introduced by a single spherical inclusion in a matrix subjected to a time varying spatially constant gradient at infinity. After solving the resulting initial-boundary value problem, the effective relation between the heat flux and temperature gradient is established. It turns out that the effective law involves a retardation (memory integral) of the temperature gradient. Approximate expression for the memory kernel is found by employing a method based on infinite series expansion. An interesting limiting case of filler material with infinite conductivity is discussed where memory integral becomes the Riemann-Liouville half integral. A quadrature involving the 2nd-order kernel of the functional expansion is also introduced which is shown to be associated with the presence of two spheres.

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Poster Category: STEM Research

Next Generation Multifunctional Composites Crest Center-Phase II

Patrick Mensah, Southern University and A&M College
Samuel Ibekwe, Guoqiang Li, Fareed Dawan, and Rachel Vincent -Finley, Southern University and A&M

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

Funder Acknowledgement: NSF Award# 1736136.

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Poster Category: STEM Research

A Hierarchical Model of Perceptual Multistability Involving Interocular Grouping

Yunjiao Wang, Texas Southern University
Zachary Kilpatrick, University of Colorado, Boulder; Kresimir Josic, University of Houston, Houston

Ambiguous visual images can generate dynamic and stochastic switches in perceptual interpretation known as perceptual rivalry. Most studies of this phenomenon have focused on rivalry between disparate images presented to each eye. However, there is growing interest in the neural mechanisms that drive switches between percepts obtained by interocularly grouping portions of the presented stimuli. Guillarmod et al. provided experimental evidence supporting generalizations of Levelt's Propositions for multistable rivalry with interocular grouping. These results point to canonical properties of neural circuits underlying visual perception of complex stimuli. We propose a hierarchical neural network model that exhibits dynamics consistent with these experimental observations by Guillarmod et al. The model consists of two levels, with the first representing monocular activity and the second representing activity in higher visual areas. The model exhibits stochastic switching between percepts, which depends on stimulus parameters in ways consistent with experimental observations and generalized Levelt's Propositions. Moreover, dynamics restricted to invariant subspaces of the model demonstrate simpler forms of bistable rivalry. Thus, our hierarchical model generalizes past validated models of binocular rivalry. This neuromechanistic model allows us to probe the roles of interactions between populations at the network levels. Generalized Levelt's Propositions hold as long as feedback from the higher to lower visual areas is weak, and the adaptation and mutual inhibition at the higher level is not too strong. Our results suggest rivalry is driven by competition between neural populations across the visual hierarchy in conjunction with slow negative feedback, and shows that perceptual multistability cannot be explained by noise-induced transitions alone.

Funder Acknowledgement: NSF-HRD-1800406

Nanoscience

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Poster Category: STEM Research

CREST: Center for Sustainable Lightweight Advanced Materials (C-SLAM)

Vijay Rnagari, Tuskegee University
Anil Netravali, Maria Auad, Shaik Jeelani, and Shaik Zainuddin

Center for Sustainable Lightweight Advanced Materials (C-SLAM) was established at Tuskegee University with funding from NSF for a period of five years starting October 2018. Collaborators from the US include Auburn University, Cornell University, and several industry and national laboratories. International collaboration is built upon existing relationships with researchers from Brazil and India. The research focus areas of C-SLAM include three synergistic subprojects: (I) nanobiomaterials extraction, (II) biopolymers design and synthesis, and (III) advanced green composites. Activities in Subproject I include synthesis of a variety of nanomaterials from waste resources like rice husk, bone ash, fish scales etc., extraction of cellulose in various forms and lignin from plants, and production of nanofibers. Activities in Subproject II include synthesis of biopolymers from lignocellulosic biomass, development of resins with excellent thermal and mechanical properties from agricultural and food processing wastes. Subproject III activities will focus on development of advanced green composites through use of plant fibers, fibers from liquid crystalline and bacterial cellulose. In addition, durability and toughening characteristics of advanced composites will be enhanced through development of autonomously self-healing polymers and composites, toughened fibers and resins. Partnerships from within the US and abroad and personnel from industry and national laboratories will ensure addressing basic science questions while solving global problems.

Funder Acknowledgement: NSF Award: HRD

Physics

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Poster Category: STEM Research

Design of Nanostructures for Energy Efficient Devices

Rami Bommareddi, Alabama A&M University
Matthew Edwards, Ashok Batra, Satilmis Budak, Vernessa Edwards, Kristopher Liggins, Bir Bohara, Samuel Uba, Eshirdanya McGhee, Ashley Owens, and Mersaydes Goodson, Alabama A&M University

Accomplishments: Two PhD students completed their dissertation work and secured jobs. Two Masters students completed their thesis work. Two more students will complete their Master's thesis by the end of Spring 2020 semester. Technical details: Oxide glasses embedded with rare-earth ions and silver were made by the melt quenching technique. Dy, Tb and Sm doped glasses emitted white light under diode laser excitation. Color co-ordinates were measured as a function of glass composition to evaluate the samples. Color coordinates for some of the materials are close to that of sunlight. Upon heat treatment of the glasses silver ions formed into metallic nanoparticles. Heat treated glasses exhibited enhanced emission under blue diode laser excitation revealing the plasmonic effect. Multilayered heterostructured thermoelectric thin films were deposited using sputtering and electron beam systems. They were annealed at different temperatures to cause the forming of quantum structures in the multilayers to increase the efficiency. After the completion of thermoelectric properties of Ni/Bi2Te3/Sb2Te3/Ni, Si/Si+Sb, Si/Si+Ge, two new systems of Sb/Sb+SnO2 and Sn/Sn+SnO2 multilayer thin films have been characterized. Si/Si+Sb, Si/Si+Ge, Ni/Bi2Te3/Sb2Te3/Ni multilayer devices reached their highest figure of merit (efficiency) values of 2.6, 0.37, and 4x10-3, respectively at some annealed temperatures. The figure of merit, ZT of Sb/Sb+SnO2 multilayer thin films reached 1.54, the figure of merit of Sn/Sn+ SnO2 multilayer thin films reached 3.40. A comprehensive characterization study based on the electrical transport, sensing and energy harvesting capabilities of nanocomposites has been evaluated. Pyroelectric coefficient and figure of merit enhanced with PLZT and PMN-PT content and temperature. The output voltage and power generated from PLZT/paint and PMN-PT/paint piezoelectric energy harvester is relatively small (51.7 mV and ~0.38 micro-Watt and 65 mV and ~1.0 n-Watt). The output voltage and power of PMN-PT/paint nanocomposite films-based cantilever harvester increased with a temperature gradient (of about 3 °C) and mechanical vibrations (61 Hz.) resulting in a maximum output voltage ranging from 53.6 mV to 61.6 mV at a load resistance of 4 MΩ. To determine the minimum energy and other thin film properties in relation to energy harvesting, under density functional theory, we have studied the weak perturbation nonlinear Klein-Gordon (KG) equation.

Funder Acknowledgement: NSF HBCU RISE Grant Number 1546965

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Poster Category: STEM Research

Advancing Success in STEM Undergraduate Research and Education (ASSURE)

Marius Schamschula, Alabama A&M University
Mohammed R. Karim, Nesar U. Ahmed, and Linda Skeete-McClellan, Alabama A&M University, Normal, AL; R. Keith Esch and P. Sean Smith, Horizon Research, Inc

Alabama A&M University's ASSURE HBCU-UP Implementation Grant set goals to enhance the quality of education by: mentoring students to improve graduation rates of STEM undergraduates, improving the Fundamentals of Engineering Exam passing rates for engineering graduates, increasing the retention of STEM students, expanding research opportunities, enhancing existing STEM curricula for undergraduate STEM students, and providing professional development for STEM faculty. ASSURE's approach is to: 1) develop a Faculty Tutoring program for STEM Engineering to strengthen students' basic skills in STEM areas and prepare them for the Fundamental of Engineering exam; 2) expand the STEM-SI Peer Tutoring program to encompass upper division courses and develop a Calculus Enrichment Program for STEM Gatekeeper courses; 3) enhance STEM curricula by creating a series of online and hybrid courses; 4) expand undergraduate research in all STEM-related disciplines to include freshmen and sophomores; and 5) organize a set of Professional Enhancement Workshops on the integration of modern STEM pedagogies, including some sessions taught by nationally renowned STEM education experts. This presentation reports ASSURE's successes and lessons learned.

Funder Acknowledgement: NSF HBCU-UP Implementation Grant #1436572

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Poster Category: STEM Research

The Preparation of Optimized TiO2 Layers for Perovskite Solar Cells

Qilin Dai, Jackson State University
Qiqi Zhang, Bo Li, Dream Box, and James Tatum Jackson State University Jackson MS

TiO2 electron transport layers have been commonly used in perovskite solar cells (PSCs) because of the high electron extraction efficiency of TiO2, leading to high efficiency of PSCs. In this work, flower-shaped titanium dioxide (TiO2) layers were obtained by the combination of chemical bath deposition (CBD) and dip-coating post-treatment methods, which were further used as a electron transport layer (ETL) and scaffold for perovskite solar cells (PSCs). TiO2 ETL was prepared by the combination of chemical bath deposition (CBD) and dip-coating post-treatment in 400 mM TiCl4 DI-water solution, followed by low-temperature annealing at 200° for 30 minutes. We fabricated perovskite solar cells based on TiO2 ETLs with and without dip-coating post-treatment. The device architecture is FTO/TiO2/CH3NH3PbI3 (MAPbI3)/spiro-OMeTAD/Au. In the case of PSCs based on CBD-TiO2, the compact TiO2 layer adhere strongly to rough FTO surface with a thickness of ~100 nm, while the flower-shaped TiO2 aggregates can be clearly observed at the bottom and middle of perovskite film, and, in turn, act as scaffolds in the architecture to improve electron extraction efficiency. The highest PCE of 16.2% was obtained for PSCs based on CBD-TiO2 and showed an open voltage (Voc) of 1.11 V, short-circuit current density (Jsc) of 20.96 mA/cm2 and fill factor (FF) of 71.3%. Owing to enhanced Jsc and FF, the improved PCE of 20.02% was achieved for PSCs based on dip-coating post-treated TiO2, which should be attributed to the enhanced electron extraction efficiency. In addition, we also observed the reduced hysteresis effect in reverse and forward J-V scans; the hysteresis index is 31.8% and 6.1% for PSCs with and without dip-coating post-treatment, respectively.

Funder Acknowledgement: NSF HBCU-UP Research Initiation Award: Novel Perovskite Solar Cells Based on Interface Manipulation (#1900047)

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Poster Category: STEM Research

Control of Magnetic Dipole Emission with Nanostructures

Natalia Noginova, Norfolk State University
Soheila Mashhadi, Alexis Bullock, Marvin Clemmons, Nelly Jerop, Festus Bett, Mikhail A. Noginov, Norfolk State University

Interaction of light and matter in natural materials is mostly determined by the electric component of light. In our research, we create and explore nanostructured systems, which respond to the magnetic component of the optical field. In the experiment, we used organic materials with Eu3+ ions, which have both electric dipole and magnetic dipole transitions in the emission spectra. Significant enhancement of the magnetic dipole emission has been demonstrated in the vicinity of metallic and dielectric metasurfaces designed to have magnetic resonance at optical frequencies. Our work can provide pathways for enhancing and controlling interactions of matter with magnetic component of light and add a new degree of freedom in photonics and optoelectronics, leading to novel materials and devices exploiting magnetic dipole transitions.

Funder Acknowledgement: NSF DMR EPM 1830886

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Poster Category: STEM Research

Comparing Sperm Collective Swimming with Flocking Transition

Chih Kuan Tung, North Carolina A&T State University

In viscoelastic fluid, bovine sperm are able to interact and align with their neighbors to swim in clusters. The formation of the polar liquid phase, or large flocks of sperm, however, did not solely depend on the number density and the alignment mediated by the fluid, but were strongly influenced by the initial conditions. If a pulse of flow was used to create an aligned initial condition, hundreds of sperm were able to form a flock swimming to the same direction. This suggests the transition to be a first-

order one with strong hysteresis. Analyzing these flocks, we found the decay of the orientation correlation function to be linear on a log-log plot. From our finite flock sizes, there was no indication that the correlation function decayed to a non-zero value, as suggested theoretically for the polar liquid phase. Further, the effective exponents of the correlation function were found to vary for the same flock at different time points, which made us wonder about some of the premises of continuum theoretical models. From tracking individually swimming sperm, we found that the rotational noise is an exponential decay, while the speed follows a Gamma distribution. Neither is commonly used in theoretical models.

Funder Acknowledgement: NSF HRD 1665004

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Poster Category: STEM Research

Breaking the Boundaries of Microfluidic Mixing with Sharpie Dots

Kausiksankar Das, University of Maryland Eastern Shore
Habilou Ouro-Koura and Ayobami Ogunmolasuyi, University of Maryland Eastern Shore

Here we report significant enhancement in mixing in low Reynolds number and passive microfluidic flows by creating asymmetric boundary conditions introduced by periodic hydrophobic regions. Mixing in microchannels is necessary for effective operation of any microfluidic reactors, but mixing is very difficult to achieve in those length scales, thanks to the weak nonlinear inertial effects at low Reynolds numbers. We assert that a correlation exists between slip surface periodicity and their geometries with mixing in straight microchannels numerically, and compared it with experimental observations. Furthermore, we show that mixing parameter is explicitly dependent on the geometry of the hydrophobic regions. We have observed two different types of mixing mechanisms: 1) mixing through Baker type transformation, where the component fluids are stretched and folded, decreasing effective striation length; and 2) mixing through chaotic advection, where counter rotating eddies help rapid mixing of the component fluids. We hypothesize that in straight channels, periodic stick-slip boundary conditions suddenly make transition of streamline properties across the stick-slip boundaries and introduce mixing in the flow.

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Poster Category: STEM Research

Subatomic Physics at VUU

Narbe Kalantarians, Virginia Union University

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

Funder Acknowledgement: NSF Award 1700333

Science & Mathematics Education

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Poster Category: STEM Research

Development of a Socioscientific Argumentation STEM Curriculum at a Historically Black University

Hector Torres, Bethune-Cookman University
Raphael Isokpehi, Bethune-Cookman University

This poster will provide a conceptual framework to examine the effects of socioscientific argumentation learning and development on student success in a higher education STEM-centered curriculum at Historically Black Colleges and Universities (HBCUs). We focus on the development of a framework conducive to conceptual understanding of content knowledge in biology and environmental science courses. These courses were particularly amenable to consider the impact of science-related challenges that have moral and ethical societal implications and can be classified as socioscientific issues (SSI) (Zeidler & Keefer, 2003; Zeidler, 2014). SSI are ill-structured, open-ended problems that have multiple solutions (Owens, Sadler, & Zeidler, 2017; Sadler, 2011). Further, SSI are utilized in science education to promote scientific literacy, which emphasizes the ability to apply scientific and moral reasoning to real-world situations. Examples of SSI are as diverse as genetic engineering, animal testing for medical purposes, oil drilling in national parks or offshore, among many others. Research studies have shown SSI to be effective at increasing students' understanding of science in various contexts, argumentation skills, empathy, and moral reasoning, and the development of character (Fowler, Zeidler &

Sadler, 2009; Lee, et al., 2012, 2013; Sadler & Zeidler, 2005; Zeidler & Sadler, 2008; Zeidler, Sadler, Applebaum & Callahan, 2009). Currently, knowledge is limited on the extent to which STEM students at HBCUs use socioscientific argumentation strategies in STEM courses or develop the expertise to do so. This paper contributes to the existing body of work to better articulate a framework for the concept of socioscientific argumentation in the context of HBCUs. This line of research suggests that when students engage in learning tasks that involve SSI, they can develop many of the same skills that are important for scientific argumentation—namely, evaluation of evidence, construction of arguments, and evaluation of competing claims. SSI-based instruction can also enhance students' content knowledge. In this paper, we advance a conceptual framework needed to develop intervention models for improving scientific argumentation development of students in STEM.

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Poster Category: STEM Research

A Model for Peer Mentorship to Encourage STEM Interest, Self -Efficacy, and Intent to Persist Among Women and Racial and Ethnic Minority Students

Jillian Wendt, University of the District of Columbia
Amanda Rockinson-Szapkiw, University of Memphis; Vivian Jones, Bethune-Cookman University; SaDaja Keith, University of the District of Columbia

The NSF HBCU-UP BPR Project described in this abstract is a collaborative effort between two historically black institutions, University of the District of Columbia (UDC) and Bethune-Cookman University (B-CU), and one public, minority serving institution (MSI) University of Memphis. The project extends a previously funded NSF pilot project (Award #1717082) and expands the development, implementation, and evaluation of a virtual science, technology, engineering, and math (STEM) peer mentorship program for underrepresented women and racial and ethnic minority undergraduate students. The goal is to examine the efficacy of a Virtual Peer Mentoring Program to assist students in developing mentorship and leadership skills that are culturally responsive, STEM self-efficacy, science identities, and, ultimately to promote their STEM degree and career persistence. The overarching goal is to broaden the participation of UMW in STEM fields. In this project, women and racial and ethnic minority graduate and senior-level undergraduate students will use a systematic process to mentor a group of freshman, sophomore, and junior STEM undergraduate students in a virtual environment. Prior to engaging in the virtual mentoring relationship both mentors and mentees will participate in a mentor or mentee case-based virtual training modules. The modules will socialize the mentors and mentees to the mentoring relationship as well as build skills in leadership, mentoring, and cultural responsiveness. Finally, self-efficacy, identity, and ultimately STEM degree and career persistence will be promoted through a one-year standardized, virtual mentoring relationship process. Measurable objectives for the project will be evaluated at the end of the program (i.e., summative assessment) and at specified points during the program development (i.e., formative assessment), and a rigorous mixed-method research approach will be employed to examine the efficacy of the program as a standardized, evidenced-based practice for mentoring within HBCU STEM degree programs.

In this presentation, the research team will explain the need for and rationale of the project based on the current research literature and findings from the previous funded pilot project, the conceptual model developed to attend to women and racial and ethnic minority STEM students' experiences within peer mentoring relationships, and the development of mentee training modules as part of the Virtual Peer Mentoring Program. Attendees will gain an understanding of the recent research literature and mentoring reports (e.g., National Academies of Sciences, Engineering, and Medicine, 2019), where effective peer mentoring practices remain under-researched, the development of a novel conceptual model for peer mentoring among women and racial and ethnic minorities, and research-based practices for implementing peer mentoring programs as HBCUs.

Funder Acknowledgement: NSF HBCU-UP Broadening Participation Research Project (Award #1912205)

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

For more than three decades, both educational and scientific communities have channeled efforts and resources aimed at increasing the number of African-American students completing STEM degrees and subsequently pursuing STEM careers both in the United States and internationally. As minority populations continue to increase, their participation in the STEM workforce will be critical to the health of the global economy. A significant facet of increasing minority student participation in the STEM workforce is to understand the role faculty should play in preparing these students and assisting with their matriculation to graduation and ultimately their participation in the workforce. Hence, a key emergent question then becomes: What factors are critical for faculty who prepare HBCU STEM majors for graduate and professional school as well as careers in the STEM

workforce? The overarching goal of this research is to create viable solutions to the conundrum of low representation of African Americans in the STEM workforce and to provide formal guidance to all interested stakeholders. Results will provide tangible data and recommendations to assist higher education institutions in their efforts to develop strategies that they, along with internal and external policymakers, can follow to achieve and maintain significant increases in the number of African-American students with STEM degrees.

Funder Acknowledgement: National Science Foundation

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Poster Category: STEM Research

Development of Shifting Scale for Black Women in STEM: Preliminary Results

Danielle Dickens, Spelman College
Naomi Hall-Byers, Winston Salem State University, Winston-Salem, NC; Maria Jones, Spelman College, Atlanta, GA

Black women in STEM encounter not only racism but also sexism, which poses barriers, known as sticky floors, that hamper their career advancement. To cope with experiences of discrimination and to contest the negative consequences associated with discrimination, Black women may alter their behaviors and how they talk (code switch) to fit in within a given environment, through what is known as identity shifting. The primary theoretical frameworks utilized in the current study includes intersectionality and a phenomenological variant of ecological systems theory (PVEST). The critical theory of intersectionality is used to understand the intertwining oppression of race and gender among other identities. Research indicates that the intersection of being Black and a woman are visible identities that impose limitations on other people's perceptions of Black women and perceptions of the self among Black women. PVEST posits that an individual's perceptions of societal expectations, cultural stereotypes, and biases influence how one will adapt to different cultural contexts across the lifespan. The current studies aim to develop a valid measurement to assess identity shifting among a sample of Black women in STEM. Based on previous work, interviews were conducted with early career Black women, and measurement items were created from the major tenets and themes of identity shifting from the interviews. Next, the 44 item Shifting Scale for Black Women was administered to a focus group of Black women to obtain their reactions to the measurement items. In 2019, data from 350 Black women enrolled in STEM undergraduate and graduate programs across various types of institutions (HBCUs and PWIs) and Black women employed full time in STEM fields completed the developed 87-item identity shifting scale. Exploratory factor analyses will be conducted to determine how and to what extent the item measurements are linked to specific constructs or sub-scales. Data collection will begin in 2020 to conduct a confirmatory factor analysis to test for good construct and concurrent validity. Preliminary findings support the utility and cultural relevance of identity shifting among Black women in STEM, which can be used to inform programmatic decisions in graduate programs and facilitate interventions that promote healthy identity development among Black women in STEM education and careers.

Funder Acknowledgement: National Science Foundation

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Poster Category: STEM Research

Strengthening Undergraduate Research in Interdisciplinary Logistics and International Trade Analytics at the University of the District of Columbia

Anshu Arora, University of the District of Columbia
Mohamad Sepehri, Amit Arora, Pradeep Behera, and Lei Wang, University of the District of Columbia, Washington DC

The Targeted Infusion Project in Logistics and International Trade (TIP-LIT) Analytics at the University of the District of Columbia (UDC) seeks to provide Engineering and Business undergraduate students at UDC with an innovative, integrated and interdisciplinary program of Logistics and International Trade (LIT) through the establishment of UDC's LIT Analytics Center. The TIP-LIT project focuses on the development and implementation of STEM and business-focused LIT Analytics program at UDC by incorporating supply chain, logistics, and international trade analytics curricula and fostering undergraduate student research in LIT areas across two UDC schools: School of Business and Public Administration and School of Engineering and Applied Sciences. According to the U.S. Bureau of Labor Statistics, employment in occupations related to global logistics and international trade analytics is projected to grow by more than 20% from 2016 to 2026, faster than other occupations. The LIT program through LIT Analytics Center at UDC will augment existing engineering and business programs by developing and infusing multidisciplinary courses and approaches (lectures, laboratory, and hands-on software applications) in global logistics, supply chains, transportation, international business, business research and analytics, sustainable entrepreneurship, and international trade analytics. During Fall 2019, two new courses have been developed: Global Logistics and Supply Chain Management (to be offered in Spring 2020 for both Engineering and Business majors) and Study Abroad (to be offered in Summer 2020 in collaboration with Beijing University of Chemical Technology, Beijing, China through HBCU-China Connection program). In this cutting-edge interdisciplinary STEM-Business focused LIT Analytics program, students will conduct research to understand, analyze and manage supply chains, logistics, transportation and risks that are centered on trade and monetary policy, where missteps could undermine economic growth and confidence, and thus expand their opportunities for future employment, scholarships and internships. The LIT Analytics Center organized the 2019 Second Annual Research Conference on December 3, 2019 that showcased the research work from 82 UDC (58 under-

graduate and 24 graduate) students, and was judged by 11 industry and academic leaders. The students did research in the diverse areas of artificial intelligence, social robotics, social media, reverse innovation, reverse logistics, opportunity knowledge, international joint ventures, and green supply chain management. In conclusion, the LIT program at UDC has the potential of benefitting engineering and business students by strengthening undergraduate student research opportunities, producing competitive graduates ready for graduate school and STEM-business careers, and transforming students as leaders in the 21st century workforce.

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Poster Category: STEM Research

Cultural Neuroscience Institute: Promoting Science Identity in Psychology

Michele Lewis, Winston-Salem State University
Nelson Adams and Naomi M. Hall-Byers, Winston-Salem State University

Black Americans are underrepresented in STEM disciplines. To better support a culture of science and to offer minority students intensive experience with psychological research, we developed an honors program and enriched our curriculum toward the goal of increasing black representation in STEM-related graduate programs. This program included a 2-week summer immersion program in cultural neuroscience which is an interdisciplinary field that investigates relationship between culture (e.g. values, practices and beliefs) and human brain functions. The Cultural Neuroscience Institute (CNI) was designed to cover the interplay of culture, brain, technology, and social issues such as biases, drug use, and health outcomes, and to serve the purpose of academic enrichment for new honors students or as preparation for future applicants to that program. Each of three summers 7-10 students participated in the program staffed by four faculty and a keynote speaker. Students spent approximately 6 hrs daily with faculty including lunch discussions of a thematic book related to CN. A variety of pedagogy was used including discussion-lecture, and afternoon discussion, brief presentations, and writing. Evaluations of students' experience showed that there was a significant increase of knowledge in CN based on pre- and post-measures from the questions "Rate your level of knowledge about cultural neuroscience" (p's $< .005$) or ratings of skills ($p < .01$). Students also showed enthusiastic support for the experience: Over 90% of the students across years were "very satisfied" with the CNI and would recommend it to others. The level of interest in CN engendered by the program increased across years from 33% strongly agreeing in the first year to an average of 82% in the latter two years. In general there was a trend of greater appreciation of the experience which may have reflected modifications by faculty. Ratings of strong agreement with "The CNI is well organized" changed from 11% to over 57%, and strong agreement with "meeting educational needs" rose from 33% to over 85% across years. Qualitative assessments were positive as well and across years faculty used critical feedback to improve the experience. Students in the most recent year are still enrolled, but overall results of professional aspirations show promise. The assessment results suggest that this type of summer enrichment provides meaningful exposure to and an increased appreciation of science.

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Technology and Engineering

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Poster Category: STEM Research

Comparison of Advanced Hydraulic Properties between Treated and Untreated Bauxite Residue

Joao Machado, California State University, Los Angeles
Wing Shun Kwan, Matthew; Arnaldo Rendon, Omar Cojulun, and Gustavo Menezes, Cal State LA, Los Angeles, CA; Matthew S. Gore, Golder Associates, Illinois, MO

The advanced hydraulic characteristic of treated and untreated Bauxite Residue (Red Mud) is studied and compared through the use of a Steady-State Centrifugation (SSC)Unsaturated Flow Apparatus (UFA). Red Mud is the by-product waste from Bayer process during aluminum production that has shown the potential of being reused as fill material in embankment construction. The basic geotechnical engineering properties of the residue have been investigated in recent studies, but there is a limited number of documented studies on its unsaturated hydraulic characteristic. This information is essential for utilizing Red Mud in geotechnical applications such as above-ground embankment. Furthermore, the high pH (>12) and high alkalinity of the bauxite slurry is a challenge for reusing the material. Past studies have shown two effective and economic pH neutralization methods: (i) mixing with seawater and (ii) addition of gypsum. This study utilizes Cal State LA centrifuge facilities to characterize the unsaturated hydraulic properties of the treated and untreated Red Mud. The experimental results are used to develop the Soil Water Retention Curve for the three types of Bauxite Residue: untreated, treated with saline solution with a salt concentration of 32 g/L, and treated with gypsum. The result will add to the body of knowledge on unsaturated hydraulic characteristic of the Red Mud and can shed light on neutralizing methods, leading to better opportunities for utilizing this widely available mining waste as a civil engineering material.

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terial are those of the authors and do not necessarily reflect those of NSF.

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Poster Category: STEM Research

Heat Transfer Enhancement in Wavy Micro-channels via Multi-harmonic Surfaces

Arturo Pacheco-Vega, California State University, Los Angeles
Justin Moon, California State University, Los Angeles; J. Rafael Pacheco, SAP America Inc., Tempe, AZ

In this study, three-dimensional numerical simulations were performed to investigate the enhancement of heat transfer in multi-harmonic micro-scale wavy channels. The focus was on the influence of channel surface-topography on the enhancing mechanisms. A single-wave device of 0.5 mm by 0.5 mm by 20 mm length is used as baseline, and new designs are built with harmonic-type surfaces. The channel is enclosed by a solid block, with the bottom surface within the sinusoidal region being exposed to a 47 W/cm2 heat flux. The numerical solutions of the governing equations for an incompressible laminar flow and conjugate heat transfer were obtained via finite elements. By using the ratio of the Nusselt number for wavy to straight channels, a parametric analysis – for a set of cold-water flowrates (Re = 50, 100, and 150) – showed that the addition of harmonic surfaces enhances the transfer of energy, and that such ratio achieves the highest value with wave harmonic numbers of n = +/- 2. Use of a performance factor (PF), defined as the ratio of the Nusselt number to the pressure drop, shows that, surprisingly, the proposed wavy multi-harmonic channels are not as efficient as the single-wave geometries. This outcome is thought to be, primarily, due to the uncertainty associated with the definition of the Nusselt number used in this study, and establishes a direction to investigate the development of a more accurate definition.

Funder Acknowledgement: NSF HRD-1547723 grant.

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Poster Category: STEM Research

RISE: High-Performance Additive Manufacturing of Composite Structures via Development of Reconfigurable Cyber-Physical Robotic (CPR) Systems - Year 3

Tarik Dickens, Florida A&M University
Hui Wang and Carl Moore, Florida A&M University, Tallahassee, FL

The FAMU RISE: CPR program is in the 3rd year of implementation and has had considerable success in promoting Master's students funded through this program to persist to doctoral programs. Three out three students are currently in doctoral programs in Industrial and Mechanical Engineering for one-semester or more. Two of those students graduated from the Industrial and Manufacturing engineering department. Additionally, part of the broadening impact of the RISE program has been on the broadening aspects of the joint “Engi-prenuerial program” at the NSF REU site. The RISE program has facilitated the coordination of these activities and achieved a record number of applicants from around the nation. Fourteen undergraduates students from around the country (e.g. Howard, University of Buffalo, BCU, etc.), pressed through the 10-week summer curriculum. The outcome of which demonstrates entrepreneurial insight into converting materials research into a marketable venture. Students utilized additive manufacturing as a fundamental materials concept and demonstrated its relevance in a 5 minute pitch for their research topic. Local entrepreneurs from Leon County participated as judges and four interns were award special recognition. Over the past few years, the REU has led to increased matriculation of internal students pursuing graduate degrees. The RISE REU addition has supported nearly 25+ interns. Highlights of the RISE: CPR grant includes novel applications of RISE technology in the 2019 SAMPE:CAMX graduate competition, where Marquese Pollard won first place. The research has reached the milestone of cloud-computing for robotic-printing. This is the first system with real-time controls for freeform manufacturing altering the nature in which we fabricate structural devices.

Funder Acknowledgement: NSF #1646897

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Poster Category: STEM Research

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

Subramanian Ramakrishnan, Florida Agricultural and Mechanical University
Tarik Dickens and Mandip Sachdeva, Florida Agricultural and Mechanical University, Tallahassee

With CREST program support, Florida Agricultural and Mechanical University (FAMU) will establish the Center for Complex Materials Design for Multidimensional Additive Processing. The Center will promote advancements in the manufacture of novel combined materials in the micrometer scale for applications in magnetic shielding, energy and bio-medical technology. The ability to pattern multiple materials on micrometer length scales in three dimensions is critical for several technological applications including composites, microfluidics, photonics, and tissue engineering. The Center will be comprised of an interdisciplinary team of faculty from Chemical and Biomedical Engineering, Industrial Engineering, Biological and Agricultural Systems Engineering, Chemistry, Pharmaceutical Sciences and Physics. Simulations coupled with experiments will result in a molecular level understanding of the forces governing self-assembly in different materials. Printing of three dimensional tumor cell cultures on a

chip using appropriate hydrogels will allow evaluation of the cytotoxicity of anticancer drugs and nanoparticles. Enhanced cell efficiency of printed photovoltaic cells will impact applications in portable electronics and power generation in automotive and space applications. The combined effect of flow and magnetic field induced orientation of novel nanoparticles will result in lightweight materials with enhanced dielectric properties for shielding and sensing applications. Undergraduate courses based on fundamentals of self-assembly, nanoparticle synthesis and characterization, additive manufacturing, nanomaterials in biology, and nanoparticles in medicine will be developed and offered to FAMU students. A laboratory course in materials will be offered to graduate and undergraduate students involved in materials research. In the poster, we will report on our progress on research and education over the last year and a half and our plans for the future.

Funder Acknowledgement: NSF Award #1735968

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Poster Category: STEM Research

Targeted Infusion Project: Enhancement of Materials Science Education through Active Learning at Florida A&M University

Subramanian Ramakrishnan, Florida Agricultural and Mechanical University
John Telotte and 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 our project include: 1) increasing the number of pre-engineering students who pick an engineering major, specifically chemical engineering, 2) increasing the number of students who 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 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 involves 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 are given an opportunity to present at the Florida ACS meeting and participate in the Polymers Division activities.

Funder Acknowledgement: NSF Award # 1623206

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Poster Category: STEM Research

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

Jerald Dumas, Hampton University

The merger of additive manufacturing (AM) and biomaterials have great implications in tissue engineering as it allows for the customization of medical instruments, prosthetics, and in vitro models. Polymeric composite materials used in bone tissue engineering present a challenge as particles (typically at high volume percentages) are used as fillers. Great advances have been achieved in the fabrication of biomaterials for bone tissue engineering using 3D printing. Such advanced platforms include sintered biomaterials that are based from hydroxyapatite and tricalcium phosphate, inorganic bone substitutes that resemble the mineral content of bone. However, such materials lack the organic collagen and other bone derived proteins that are critical in cell-bone matrix interactions. In this study, the dispersion of allograft bone particles in reactive polyurethane is studied to enhance its utility in AM.

Funder Acknowledgement: NSF Research Initiation Award 1700351, NSF NanoHU 1238838, NSF Partnerships in Research in Education and Materials 1523620

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Poster Category: STEM Research

Computational Research on Music & Audio - Achievements and Challenges Ahead

David Heise, Lincoln University

Computational Research on Music & Audio (CRoMA) and the CRoMA Team of Interdisciplinary Collaborators (CRoMA-TIC) were launched at Lincoln University in 2015 with the support of the National Science Foundation through an HBCU-UP award, establishing a research program to study aspects and applications of computational audio signal processing. This effort has facilitated collaborations between students and faculty researchers across a wide array of disciplines (including computer science, engineering, mathematics, psychology, biology, and

music) from over a dozen universities. Undergraduates have been intentionally involved in research activities, and students have presented research at national and international conferences. (One such presentation earned a first-place award at the 2017 Emerging Researchers National Conference in STEM.) Two students have successfully defended theses from this research, including one MS thesis and one undergraduate honors thesis. The PI has established a close working relationship with colleagues in biological sciences and continues to develop improved methods for acoustically monitoring pollinators (bumble bees, in particular), work that has important implications for conservation, agriculture, and ecology. The specific work in pollinator monitoring applies more fundamental research to incorporate attention into computational auditory scene analysis, research that has the potential to significantly advance automatic speech recognition, automatic music transcription, technology to mitigate hearing impairments, surveillance activities, and many heretofore unexplored potential applications of acoustic monitoring technology. This poster will summarize the accomplishments of CRoMA-TIC to date, the current state of research in the aforementioned areas, and anticipated directions moving forward.

Funder Acknowledgement: NSF Award #1410586

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Poster Category: STEM Research

Machine Learning in Support of Flood Resilience

Leila Hashemi Beni, North Carolina A&T State University
Asmamaw Gebrehiwot, North Carolina A&T State University

Unmanned aerial vehicles (UAVs) offer a great potential alternative to conventional platforms for acquiring high-resolution remote sensing data at lower cost and increased operational flexibility for flood modeling and management. Data processing and measurement is a key step in the development of UAV remote sensing for flood modeling and management. Various approaches have been developed and applied for accurate and near real-time extraction of orthorectified, DEM and the flood extent from UAV data including structure from motion (SFM) and image classifiers. These methods perform well when a very limited amount of data is used; however, the complexity grows as the data size increases when using a UAV for flood management and floodplain mapping. This project investigates an integrated method using Machine Learning and LiDAR analysis for near real-time inundation mapping and extracting water depth from UAV data (RGB and infrared) collected by the NC Division of Emergency Management over Princeville during flooding after hurricane Matthew in 2016, over Lumberton and Fair Bluff during flooding after Hurricane Florence, and NCAT & NCGS testbed in Tarboro for floodplain mapping in 2019. The results are compared and validated using USGS data.

Funder Acknowledgement: NSF grant #1800768 and North Carolina Collaboratory policy.

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Poster Category: STEM Research

A Unique Laboratory Setting for Student Learning: The Engineering Clinic

S. Keith Hargrove, Tennessee State University

This poster describes an evidence-based project regarding laboratory learning and instruction for first-year students. In healthcare education, it is common for students to participate in a structured environment designed to provide instruction and gain valuable practical experience related to physical and mental patient care. Commonly referred to as a 'Clinic', it is typically a classroom/laboratory whereby students gain knowledge and skills through practice, and is designed to immerse students in problem solving scenarios that increase confidence, familiarity, collaboration, and competency. This project describes a learning setting for freshmen engineering students in a clinic-like environment to reinforce basic engineering concepts and fundamentals, that complements a lecture-based course in the engineering curriculum. This poster will show several of the modules students completed and share some preliminary learning results through their experience in the Engineering Clinic.

Funder Acknowledgement: NSF HBCU-UP Implementation.

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Poster Category: STEM Research

CREST Center for Sustainable Water Use (CREST-SWU)

Lee Clapp, Texas A&M University-Kingsville
Mahesh Hosur, Shad Nelson, Selahattin Ozcelik, Tushar Sinha, and Benjamin Turner, Texas A&M University-Kingsville

The vision for CREST-SWU is to achieve regional multidisciplinary research, education, and stakeholder collaboration to advance the understanding of sustainable water use in South Texas in the context of complex physical, hydroclimatic, regulatory, and social-economical settings. We envision stimulating the development and assessment of water availability and quality monitoring networks, models, and management tools that will ultimately promote sustainable water use in South Texas and similar semi-arid regions. The goal for CREST-SWU is to integrate academic researchers, stakeholders, and regulatory policy experts to develop and assess alternative management strategies for attaining sustainable water use in South Texas, particularly from the perspective of the water, energy and food security nexus. The Center will develop a five-year program of research, education and outreach related to the following three overarching Research Subprojects: 1) Monitoring and Information Systems (MIS), 2) Modeling and Dynamic Forecasting (MDF), and 3) Deci-

sion Support Systems (DSS). The MIS Subproject will enhance the existing understanding of sustainable water use in South Texas by developing comprehensive inventories of water availability, quality and demand, identifying critical data gaps, developing and assessing wireless sensor networks (WSN), unmanned aerial systems (UAS), and advanced analytical methods (AAM) for monitoring water availability and quality, and developing and assessing a geoinformatics system to store, integrate, visualize and disseminate water quantity/quality information for the three regional Water Planning Areas (WPAs N, L. and M). The MDF Subproject will extend the understanding of water availability and demand, spatially and temporally, by developing a comprehensive inventory of existing regional water availability and quality models (WAQMs), identifying model gaps, delineating metadata needed to integrate WAQMs, and developing, disseminating and assessing targeted WAQMs. The DSS Subproject will inventory existing water management strategies (WMSs) in the South Texas region; survey agricultural producers about the existing WMSs; and develop, disseminate and assess accessible decision-support tools to help regional stakeholders and policymakers evaluate the long-term efficacy of alternative water management strategies.

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Poster Category: STEM Research

UAPB STEM Academy Model

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

The University of Arkansas at Pine Bluff (UAPB) is an HBCU, land grant institution located in the Arkansas Delta, home of Arkansas' largest Black population. The university has an enrollment of 2425 students. The UAPB STEM Academy is a well-integrated set of enrichment programs designed to help meet local, state and national human resource needs in STEM areas. As an HBCU with a land grant mission, the University of Arkansas at Pine Bluff has a legacy of service to underserved, rural and minority populations. The UAPB STEM Academy Model reflects this mission and has a particular emphasis on helping to increase the pool of well-prepared underrepresented minorities in STEM majors and careers.

Currently, there are three enrichment initiatives, including the NSF-funded HBCU-UP Comprehensive Implementation grant which is foundational to the STEM Academy; the NSF-funded Arkansas Louis Stokes Alliance for Minority Participation grant which is reflective of best practices learned in the HBCU-UP STEM Academy; and the U.S. Department of Education funded M.Ed. Degree in Computer Science Education Program. All are designed to help meet research, teaching and industry needs in STEM areas, with a particular emphasis on diversity in these critical sectors of education.

Some key components of the STEM Academy initiatives include: Guest Lecture Series, Advisory Board, Summer and Saturday Academy, hands-on research/mentor experiences, internships, study groups, curricula and infrastructure upgrades. Currently, the STEM Academy is housed in a 29,000 ft^2 facility, which provides a central location for a synergistic approach to achieving STEM goals, objectives and activities.

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

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Poster Category: STEM Research

CREST Phase II Center for Water and the Environment at UNM

Kerry Howe, University of New Mexico

The CREST Center for Water and the Environment (CWE) at the University of New Mexico (UNM) is completing a Phase I award and starting a Phase II award. This poster will highlight the successes of the center over the last 5 years and the plans for the next 5 years. The Phase I CREST award greatly expanded the capacity for water-related research at UNM, provided research funding for over 90 participants who generated more than 140 publications, presentations, and theses and conducted outreach about STEM to thousands of participants during visits to local K-12 schools, public events, and professional conferences using custom-designed outreach activities built by our students. The Phase II award will build on those successes while expanding and redirecting the water-related research with new research questions, new partnerships with URM-supporting institutions, and a new emphasis on recruiting and retaining Native American students, a population that may be underrepresented even among CREST centers.

The Phase II CWE has three interrelated subprojects that focus on hydrologic processes in watersheds, water quality and treatment, and coupled water-energy interactions. The unifying research theme that connects these subprojects and meets the center objectives is the protection and restoration of water quality for downstream and rural communities, which is particularly critical in the arid southwestern US where limited water resources are essential for people's sustenance and livelihood and where the rural communities often contain high minority populations. The CWE will expand the outreach activities with a new outreach coordinator and connections to Native American communities and organizations, increase focus on citizen science, start new visiting scholar and visiting lecturer programs, fund seed grants to encourage university-wide participation in the center, collaborate with external organizations including NSF Engineering Research Centers, and develop curriculum and ac-

tivities that meet New Mexico's new STEM Ready! Science Standards.

Funder Acknowledgement: NSF Award HRD-1345169

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Poster Category: STEM Research

Cybermanufacturing Research and Education at Virginia State University

Zhenhua Wu, Virginia State University

Virginia State University (VSU) was awarded an NSF grant, 'Infuse Cybermanufacturing Concepts to Manufacturing Processes and Automation Courses,' in June 2018. In the first year of the project, there have been fruitful outcomes. Two new elective courses, MANE 201-Sophomore Laboratory and MANE 301-Junior Laboratory I, have been offered in the Spring and Fall 2019 respectively. MANE 201 focuses on a Manufacturing Processes lab and MANE 301 is for CAD/CAM lab (three Manufacturing Engineering students have taken these two courses). The third elective lab course, MANE 302-Junior Laboratory II, will be offered in Spring 2020 as an Automation lab. Over 10 undergraduate students have been involved in the research projects of digital design and manufacturing, data analytics, virtual reality, etc. Numerous publications and posters have been disseminated. An '4+1' agreement, which builds the pathway for VSU engineering bachelor graduates spending one extra year at Virginia Tech (VT) to earn the Master's degree in Industrial Engineering, was signed between VT Industrial System Engineering (ISE) and VSU College of Engineering and Technology in Fall 2018. Two VSU Manufacturing Engineering graduates are pursuing their degrees (one Master's and the other a PhD) at VT ISE through the '4+1' program. The laboratory enhancement and research infrastructures at VSU have been greatly strengthened also. New equipment has been purchased for research and education projects. With the pilot results from this TIP project, new grants from ARO, ONR, and NASA have been awarded to VSU in 2019. This poster summarizes the outcome and challenges of the TIP project.

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STEM Science and Mathematics Education

Biological Sciences

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Poster Category: STEM Science and Mathematics Education

From HBCU-UP Targeted Infusion Project to Integrative Ecological Physiology Excellence in Research Project at Bethune-Cookman University, Florida

Raphael Isokpehi, Bethune-Cookman University
Katharina C. Wollenberg Valero, Kaylynn Wilson, Antoinette Destefano, Kelly Carey, Shirma Ramroop Butts, Baraka Mapp, Seenith Sivasundaram, Martine Levy Nelson, Thomas Roper, Vivian Jones, Donald Spence, Junell McCall, Tracey Almon, Eranna Guruvadoo, Yung

In August 2014, the National Science Foundation's (NSF) Historically Black Colleges and Universities-Undergraduate Program (HBCU-UP) awarded Bethune-Cookman University (B-CU), a private HBCU in Florida, a grant to enhance its undergraduate biology curriculum by infusing learning experiences on data science competencies. The design of the enhanced B-CU undergraduate biology curriculum promotes comprehensive student academic success through career-relevant course offerings and connected courses that allow for preparation, practice and performance *(https://catalog.cookman.edu/preview_program.php?catoid=36&poid=3588).* The B-CU undergraduate biology curriculum is designed to support students to become expert learners and to gain professional expertise in biology. The design and development of teaching and learning resources in the curriculum are guided by the theoretical framework for producing the outcome of robust student learning. “Learning is robust when it lasts over time (long-term retention), transfers to new situations that differ from the learning situation along various dimensions, or accelerates future learning in new situations.” (https://www.learnlab.org/research/wiki/Robust_learning). The HBCU-UP Targeted Infusion Project at B-CU has provided the strong foundation for new NSF funded projects on [1] undergraduate STEM education (#1626602, #1829717); [2] STEM education research (#1623371, #1912205); [3] research experiences for undergraduates (#1755561); [4] developing mathematical sciences teachers (#1852783); and [5] faculty development (#1916086). Additionally, in October 2019, the HBCU Excellence in Research (HBCU-EiR) and the Integrative Ecological Physiology Program of the NSF funded a research project on oyster microbiome in collaboration with Florida A&M University (#1901377 and #1901371). Together, these education and research projects are facilitating an inclusive excellence goal in a community of learners, discoverers and innovators, using transdisciplinary data that is born connected across the discipline boundaries and

beyond academia to address societal needs (https://bit.ly/tdsdp).

Funder Acknowledgement: NSF HBCU-UP Awards 1435186, 1623371; awards 1901377 and 1901371 from NSF HBCU Excellence in Research (HBCU-EiR) and Integrative Ecological Physiology Programs; Department of Education Title III Program at B-CU; NSF IUSE Award 1626602; NSF CyberTraining Award 1829717; NSF REU Site Award 1755561; Robert Noyce Teacher Scholarship Program (1852783).

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Poster Category: STEM Science and Mathematics Education

Integration of Biotechnology in Upper Division Biology Courses at FVSU and the Impact on Student Success

Seema Dhir, Fort Valley State University
Celia Dodd and Kaneatra Simmons, Biology Department, Fort Valley State University, Fort Valley, GA

One of the objectives of the targeted infusion project is to integrate biotechnology concepts into three upper-division biology courses. New inquiry-based laboratory modules are developed to strengthen student's knowledge of core concepts in biotechnology. Additionally, the introduction of a new course in scientific communication, mentored undergraduate research, and integration of cyber-instruction to provide anytime, anywhere access to instructional modules and supplemental resources are sought to yield gains in student learning, self-efficacy and motivation to pursue a STEM career. A pre-/post-survey is administered in the newly designed courses to assess the impact of these interventions. Preliminary results indicate gains in research self-efficacy and interest in pursuing a biotechnology career.

Funder Acknowledgement: NSF TIP award no. 1818695

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Poster Category: STEM Science and Mathematics Education

Targeted Infusion Project: Mathematical Engagement for the Marine, Biological, and Environmental Realms of Science (MEMBERS)

Shawn Dash, Hampton University
Andrij Horodysky, Eric Lewallen, and Deidre Gibson. Hampton University, Hampton, VA

The MEMBERS program is a Targeted Infusion Project (TIP) that will enhance discipline-specific quantitative reasoning in the Departments of Biology and Marine and Environmental Sciences at Hampton University (HU). The project will emphasize the application of major-specific quantitative, graphical, and computer programming skills in existing courses, create new upper-level research-based course offerings, and support inquiry-based experiential learning and application opportunities for students via the support of undergraduate internships. Further, the program will provide life-skill training via workshops on scientific illustration and financial literacy and other topics n the environmental, marine, and life sciences.

Funder Acknowledgement: NSF HBCU-UP Targeted Infusion Project Award #1911928

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Poster Category: STEM Science and Mathematics Education

NSF HBCU-UP TIP: DaBuGs Flight Preparation

S. Catherine Silver Key, North Carolina Central University
Eric Saliim, North Carolina Central University, Durham, NC

The Historically Black Colleges and Universities Undergraduate Program (HBCU-UP) through Targeted Infusion Projects (TIPs) supports the development, implementation, and study of evidence-based innovative models and approaches for improving the preparation and success of HBCU undergraduate students in STEM graduate programs and/or careers. One goal of the project at North Carolina Central University (NCCU) is to infuse real-world research experiences into a sophomore-level, elective course. The research includes engineering design challenges (creating behavioral apparatuses) and measuring Drosophila behaviours using genetically unique fly strains. Development of the TIP has begun at NCCU in the Fall 2019 semester by 1) designing the course structure and receiving departmental approval, 2) piloting the Fabrication Laboratory (Fab Lab), engineering design of the course with the goal of measuring alcohol-preferences in a social-isolation setting, and 3) taking students to the State of North Carolina Undergraduate Research and Creativity Symposium (SNCURCS) at Duke University where they successfully exhibited the various iterations of their fabricated design to their peers. The following with be presented in the poster: 1) Drosophila Behavioural Genetics (DaBuGs) course and assessment design, 2) prototype behavioral measuring apparatus and 3) results of a pilot video reflection assessment.

Funder Acknowledgement: NSF Award #HRD-1912188

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Poster Category: STEM Science and Mathematics Education

Implementing Basic Research Technique Workshops at Tougaloo College

Jinghe Mao, Tougaloo College
Scharri Walker, Lianna Li, and Scoty Hearst, Tougaloo College, Tougaloo, MS

While cultural diversity has been predicted to be a key component in establishing a successful STEM pipeline, a decrease in

African Americans prepared for STEM courses and graduating in STEM disciplines has been witnessed. At Tougaloo, we have noted that less than 20% of freshman STEM students are prepared to handle the rigor of college-level science courses. This is further compounded by the fact that approximately 50% of those taking introductory-level biology or chemistry may fail the course. Of note, half of those who fail these classes will eventually change to a non-STEM major and/or leave the college altogether. Our curriculum needed to be changed to adapt to new environment and current generation of students. We hypothesized that early exposure to a hands-on research program enhances retention rates of underrepresented minority students in the STEM fields in the first two years and increases their confidence in doing biological research. One-day workshops in genetics, forensic science, microbiology and immunology were implemented and open to all STEM majors. About 90 participants participated. The most significant result we found is that the retention rate for this group of participants is 90% which is much higher than the typical numbers. Both students and faculty considered that the workshops were the best models for STEM students to have hands-on research experiences with real life applications.

Funder Acknowledgement: NSF HBCU-UP, Implementation Grant, Award # 1912191

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Poster Category: STEM Science and Mathematics Education

Coaching for Academic and Professional Success (CAPS) in STEM

Hendricus Van Antwerpen, Virginia Union University
Falcon Rankins, PRISSEM Academic Services, LLC, Richmond, Virginia

The present study aimed to determine the effect of 1) faculty development, 2) a summer enrichment program, and 3) the establishment of a STEM Career Coaching Team on the recruitment, retention, and graduation rates of undergraduate STEM majors at Virginia Union University (VUU). Mean enrollment of STEM majors during the 2011-2018 project period was 26.1% higher than the mean enrollment of students during the 2009-2011 baseline period. Recruitment of Biology majors, i.e., the mean number of first-time first-year students entering the Biology major, increased by 29.8%, but these gains were offset by declines in the recruitment of Chemistry, Mathematics, and Computer Information Systems (CIS) majors. Similarly, the first-year retention rate of Biology majors during the project period was on average 21.5% higher than during the baseline period, but again this gain was offset by decreases in the Chemistry, Mathematics, and CIS. Only the Biology major saw a substantial increase (33.5%) in the four-year graduation rate. STEM students who visited a Career Coach at least once during academic years 2016-2017 and 2017-2018 were more likely to have higher cumulative GPAs after their first year and more likely to graduate in four years, relative to peers. The CAPS in STEM project positively influenced the recent establishment of separately funded faculty research projects, as well as the establishment of a new Physics major, a new Physics/Engineering dual degree program, and a new Cybersecurity major at VUU. The impact of these research projects and new majors on STEM recruitment, retention, and graduation rates remains to be established.

Funder Acknowledgement: NSF HBCU-UP Implementation Grant

Chemistry & Chemical Sciences

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Poster Category: STEM Science and Mathematics Education

Redesign of Chemistry I and II with Adaptive Tools Supported High Touch Student Services

Eric Mintz, Clark Atlanta University
Conrad Ingram, Daniel Teodorescu, and Lauren Lopez, Clark Atlanta University, Atlanta, GA

We will describe the motivation for implementing course redesign in General Chemistry I & II, and how Clark Atlanta University piloted and assessed course redesign with digital and adaptive learning courseware. We will describe our path to scale up and scale out course redesign with digital and adaptive learning courseware, student learning outcomes and student perceptions of the intervention, faculty development activities to support implementation of course redesign at scale, and how we developed resources to support this effort. We will describe challenges to course redesign with digital and adaptive learning courseware and how we are working to overcome them. We will also describe the development and implementation of holistic student services enabled by analytics to further improve student learning outcomes.

Funder Acknowledgement: NSF grants #1818682 and 1912256

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Poster Category: STEM Science and Mathematics Education

Introducing Polymer Chemistry into the Undergraduate Curriculum at Johnson C. Smith University

Tracy Brown-Fox, Johnson C. Smith University

Polymer chemistry is a subject that draws upon all of the traditional subdivisions of chemistry: organic, inorganic, physical, analytical, and biochemistry. Furthermore, this subject opens up the doors to exciting research and creative innovation. It is in this area of chemistry that most students are most likely to find employment; thus, making it appealing for most chemistry undergraduate programs to include it their curriculum. Therefore, in the fall of 2019, 'Introduction to Polymer Chemistry and Re-

search Techniques' was introduced as an upper level special topics elective within the Department of Natural Sciences and Mathematics (NSM). A total of seven students enrolled, which was good for a newly developed course. Students in the course had already taken and successfully passed both semesters of organic chemistry. In this introductory polymer chemistry course, students learned about the chemical, physical, and mechanical properties associated with natural, biological, and synthetic polymers. To complement their course studies, students also learned how to conduct and designed experiments to characterize and analyze commercial polymers in a new established Thermal Analysis Instrumentation (TAI) suite - primarily supported by a prior National Science Foundation (NSF) HBCU-UP TIP grant. The TAI suite was equipped with a rheometer, a differential scanning calorimetry (DSC), and thermal gravimetric analyzer (TGA), instrumentation often used in infrastructure, aviation, space technologies, medical applications, and a host of consumer and commercial goods. The course also included research projects centered on students using Johnson C. Smith's MAKERSPACE to learn how to design and 3-D print objects or prototypes for sparking the interest of students exploring entrepreneurial opportunities. It was through this introductory polymer chemistry course that students learned how to think like scientists and improve in their critical-thinking and problem-solving skills, while obtaining marketable technical skills most STEM employers and graduate/professional schools are looking for in candidates.

Funder Acknowledgement: NSF: HBCU-UP

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Poster Category: STEM Science and Mathematics Education

POGIL Pedagogy Increased Student Success in Organic Chemistry I and II

George Armstrong, Tougaloo College

POGIL is an acronym for Process Oriented Guided Inquiry Learning. It is a student-centered, group-learning instructional strategy and philosophy developed through research on how students learn best. Because POGIL is a student-centered instructional approach, in a typical POGIL classroom or laboratory, students work in small teams with the instructor acting as a facilitator.

The objective of this project was to maximize the new pedagogy and technology to make chemistry more user friendly and to increase the % of students passing chemistry courses, increase retention and increase recruitment in the chemistry major. The author developed POGIL class material for Organic Chemistry I and II, using the textbook, Organic Chemistry 9th edition by John McMurry, making use of the PowerPoint that accompanies the book addition, and assigning online homework to reinforce the concepts coverage. The material contained key concepts, examples, then questions and or problem for the student to answer. The instructor moved about the class and observed each group. A student that seemed to have difficult was engaged and given assistance, including the group. Some topics that seemed complex began with a mini-lecture from the instructor. Most students actively engage in the groups. A higher % of students passed these courses than those in the traditional lecture. Students highly favor the POGIL course for grasping concepts, compared to traditional instruction. POGIL classrooms are characterized by a high level of activity, student discussions about the content, partnerships among students, and immediate feedback to the instructor about what students know and how they are thinking.

Funder Acknowledgement: NSF Target Infusion

Computer Sciences and Information Management

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Poster Category: STEM Science and Mathematics Education

Cyber-Physical System Education and Research Training in the College of Engineering at TSU

Swastik Brahma, Tennessee State University

Cyber-Physical Systems (CPSs) integrate computation, networking, and physical processes with the integrated system exhibiting multiple behavioral modalities and interactive capabilities that can adapt in a dynamic manner. Developing CPSs is an interdisciplinary task requiring expertise from several areas, such as, embedded system development, big data analytics, communications and control, sensing technologies, mechatronics, and cybernetics. The poster will discuss incorporation of learning modules into engineering programs in a top-down paradigm to impart essential knowledge and skills for preparing a competitive workforce in CPSs. The poster will also discuss the integration of research and education activities for enhancing student learning and addressing open challenges in CPSs. Key insights gained and important results obtained regarding research and education in CPSs will be provided.

Funder Acknowledgement: NSF Targeted Infusion Project (07/15/2019 - 06/30/2022)

Ecology, Environmental and Earth Sciences

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Poster Category: STEM Science and Mathematics Education

Interdisciplinary Environmental Studies and Sciences Program at Howard University: Training, Research and Experiential Learning

Janelle Burke, Howard University

The NSF-funded TIP project has supported the expansion of the Interdisciplinary Environmental Studies program at Howard University. In its 4th year, the Environmental Studies program currently has 16 majors who are pursuing internships and research experiences both on campus and with local partners in the Washington, DC area. The program on campus has also helped support student leaders who are helping to increase the visibility of sustainability and environmental issues on campus.

Funder Acknowledgement: NSF- HRD

Mathematics and Statistics

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Poster Category: STEM Science and Mathematics Education

Implementing Adaptive Learning Technology to Prepare STEM Students for Success in Mathematics: A Calculus I Study

Torina Lewis, Clark Atlanta University
Diane Plummer, Sandra Rucker, Daniel Teodorescu, Clark Atlanta University, Atlanta, GA

Clark Atlanta University (CAU) presents the process used to implement the adaptive learning courseware, Assessment, and LEarning in Knowledge Spaces (ALEKS) as a tool for STEM student success in mathematics. A comprehensive review and evaluation of student performance in foundational STEM courses offered in AY 2014-15 to AY 2016-17 provide motivation for the study. During the three years, approximately 61% of students enrolled in the courses earned a C, D, F, or W with about 28% of the students receiving a C. A goal of the calculus study is to improve students' mastery and use of mathematical concepts through course redesign, assessment, and implementation using adaptive learning technology. In spring 2018, ALEKS was implemented as a co-requisite approach. Using this approach, evidence of students' increased knowledge of mathematics was evident. While studying the co-requisite approach, we implemented a redesign of Precalculus I and II to enable students to learn precalculus concepts in one semester instead of two. Results from the strategies and future work are presented.

Funder Acknowledgement: NSF grants # 1818727 and #1818682

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Poster Category: STEM Science and Mathematics Education

Integrating Mathematics into the Teaching of Developmental Biology through a Peer-led Learning Community

Qingxia Li, Fisk University
Thomas Gross, Western Kentucky University, Bowling Green, KY; Patricia McCarroll, Fisk University, Nashville, TN

Low participation and retention of African-American STEM students remains a problem. However, integrated approaches have increased participation and retention in STEM programs. We created an intrusive Learning Community (LC) based on the Performance Pyramid Model that included peer-led weekly sessions to reinforce biology course content and connect biology with mathematics concepts through interdisciplinary projects. We compared LC students to separate biology and mathematics control groups on pre-post biology and mathematic quizzes, respectively. We compared all groups on post-test assessments of Performance Pyramid supports and student perceptions. The LC group had greater improvements on biology quiz scores than the biology control group (2= .19). The LC group reported higher rates of feedback compared to both control groups (d = .79 to .81), greater confidence (d = .62), and science knowledge (d = .72) compared to the math control group. Implications for applying this model will be discussed.

Funder Acknowledgement: NSF-HBCU-UP-BPR grant 1719262

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Poster Category: STEM Science and Mathematics Education

Characteristics of Student Survey on Confidence, Attitude, Self-Efficacy and Effort in College Mathematics Education

Seongtae Kim, North Carolina A&T State University
Guoqing Tang, Kathy Cousins-Cooper, Paramanathan Varatharajah, Nicholas Luke, Katrina Nelson, Stacey Zimmerman, Barbara Tankersley, and Kalynda C. Smith, North Carolina A&T State University, Greensboro, NC

This presentation focuses on preliminary results of our NSF HBCU-UP BPR project entitled, 'Effects of Innovative Mathematics Instruction Methods on Student Attitude, Self-Efficacy, Effort and Performance.' The goal of this BPR project is to examine the relationship between the two learner-centered instructional methods and students' self-perception such as attitude, self-efficacy, self-confidence and effort. As a preliminary analysis, we performed three different surveys: (1) academic confidence and effort, (2) attitude toward mathematics, and (3) self-efficacy in learning mathematics using more than 400 students in College Algebra and Calculus I courses in Spring 2019. This presentation characterizes students' responses and uncovers underlying hidden factors associated with students' self-perception toward mathematics courses. Exploratory data analysis showed that students tend to reveal more positive attitude and confidence in their learning mathematics. An exploratory factor analysis also discovered meaningful hidden factors for every thematic survey. For example, the academic confidence and effort survey revealed confidence and apprehension factors. In the sequential investigation, we will study an association between these exploratory findings and students' academic perfor-

mance to establish the knowledge base for connecting innovative learner-centered instruction methods and students' psychological factors such as growth mindset.

Funder Acknowledgement: NSF

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Poster Category: STEM Science and Mathematics Education

Insight and Experience Gained through Two Global Research and Education Experience Programs Supported by NCAT ACE DSA Project

Guoqing Tang, North Carolina A&T State University
Hong Wang, North Carolina A&T State University, Greensboro, NC; Zhong Jin, Nanjing University of Science and Technology, Nanjing, Jiangsu, China

It is well known that global learning experience is a high-impact educational practice that helps students explore cultures, life experiences, and worldviews different from their own. STEM fields are becoming increasingly global, and there is a growing demand for STEM professionals who can work effectively in international settings. However, only 16% of study abroad students were majoring in the STEM fields, compared to 23% of all US undergraduates and even fewer URM STEM students. The research and study abroad component of the North Carolina A&T State University (NCAT) ACE project addresses the latter issue by providing URM students from NCAT by offering a 2-week spring academic and research exploration (ARE) program at Henan Polytechnic University and a 8-week summer international research experiences for students (IRES) program at Nanjing University of Science and Technology in China to better prepare them to be globally competitive. In this poster presentation, we will share the insight and experience gained through two global research and education experience programs supported by our NSF HBCU-UP ACE Implementation Project entitled, 'Data Science and Analytics Advancing STEM Education at North Carolina A&T State University.' Specifically we will present both ARE and IRES program design, project activities, student experiences and reflection.

Funder Acknowledgement: NSF HRD 17-19498

Nanoscience

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Poster Category: STEM Science and Mathematics Education

UDC's Research Enabled Experiential Learning for Undergraduates

Pawan Tyagi, University of the District of Columbia
Kate Klein, Jiajun Xu, Hongmei Dang, Devdas Shetty, University of the District of Columbia, Washington DC

Engaging students in exciting research can create a long-lasting impact. At UDC, we are utilizing several highly appealing research topics to engage undergraduate students in experiential learning. Based on UDC faculty expertise, we are offering research projects in the field of nanotechnology, renewable energy, and additive manufacturing. So far,>25 undergraduate students have been engaged in nanotechnology research projects ranging from computer devices, energy conversion, to biomedical sensors. Several student groups have been engaged in renewable energy topics that include solar thermal heating, fuel cell technology, and solar cells. Many students found it very appealing to work in the field of additive manufacturing and were excited about the presence of an EOS M280 laser sintering machine at UDC. More than 10 students have worked in the area of post-processing of additive manufacturing components and also had opportunity to interact with our collaborating laboratories and industries such as National Institute of Standards and Technology (NIST), Navy Research Laboratories (NRL), Kansas City Nuclear Security Complex (KCNSC), NAVSEA, NAVAIR, NASA, and Oak Ridge National Laboratory (ORNL). Most of the students who had research project-based experiential learning at UDC are now employed in advanced careers at places like Boeing, Northrup Grumman, Howard Hughes Medical Institution, National Institute of Health, and NAVAIR, etc. Several students with exposure to research in the cutting-edge areas have opted for the Ph.D. program. In 2019 two UDC undergraduates applied for the National Science Foundation Graduate Research Fellowship (NSF-GRFP). Our NSF-CREST team at UDC has been mentoring undergraduate and publishing with deserving undergraduate students as coauthors in international peer-reviewed journals and conference.

Funder Acknowledgement: NSF-CREST Award Contract # HRD-1914751. Additive manufacturing education and workforce development are supported by the Department of Energy/ National Nuclear Security Agency (DE-FOA-0003945).

Physics

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STEM Science and Mathematics Education

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

Maurice Edington, Florida A&M University, Tallahassee, FL
Lewis Johnson, Desmond Stephens, Carl Moore, and Codjo A Akpovo, Florida A&M University, Tallahassee, FL

The overall goal of the Florida A&M University (FAMU) HBCU-UP Implementation project 'Science Community of Active Learners to Enhance Achievement and Retention (SCALAR II)' is to significantly improve student success rates in the STEM programs and courses offered by FAMU's College of Science and Technology

(CST). Achieving this goal requires 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; 3) helping students develop positive attitudes about their ability to learn; 4) placing students in productive learning environments; 5) providing students with sufficient academic support resources throughout their academic career in STEM, and 6) developing and enhancing critical thinking skills. In response, we detail herein a Scientist Life Skills course for all freshman biology, chemistry, computer science, mathematics and physics majors which is successfully teaching students the academic skills necessary to succeed. We also present a six-week-long learning community that trains faculty on how to effectively stimulate students' ability to think critically, persist with grit, and grow their mindsets. Finally, we provide the framework for Preparing STEM Scholars for Success (PS3) Bootcamp for incoming CST first -year students. The PS3 Bootcamp utilizes the ALEKS, peer mentoring best practices, all in an intensive week-long residential program to help students enter their freshman year calculus ready and better prepared to tackle the rigors of the college experience.

Funder Acknowledgement: NSF HBCU award HRD-1719546

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Poster Category: STEM Science and Mathematics Education

Improving the Soft Skills of Undergraduate STEM Students

Corisma Akins, Grambling State University
Connie Walton, Grambling State University, Grambling, LA

Although students are being trained with technical skills, many are lacking the soft skills needed to thrive in their careers after completing their degree. According to a study by Harvard University, the Carnegie Foundation, and the Stanford Research Center, 85% of job success comes from well-developed soft skills while only 15% comes from technical or hard skills. This presentations will focus on the importance of soft skills, discuss strategies to implement soft skills trainings for undergraduate STEM students, and provide lessons learned from the training techniques used at Grambling State University. These transferable skills that are taught will not only increase productivity in future employment, but will help improve performance in the classroom.

Funder Acknowledgement: NSF HRD 1818697

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Poster Category: STEM Science and Mathematics Education

From Shore to the Stars: Enhancing Astronomy Education in the U.S. Virgin Islands

Antonino Cucchiara, University of the Virgin Islands
D. Morris and L Cummings, University of the Virgin Islands; N. Jones, Southern University, Baton-Rouge

Historically Black College and University have struggled in the past decades in providing a strong pipeline of STEM students from K-12 system to college and the workforce. Thanks to the NSF HBCU UP Target infusion grant we were able to rise the level of preparedness of University of the Virgin Islands (UVI) Physics students especially in astronomy education. The usage of a planetarium, solar telescope, and commercial telescope has enabled UVI students to learn 21st century observational astronomy techniques, while being introduced to some of the most fascinating discoveries of the centuries (from the first galaxies to Gravitational Waves). Furthermore, the curriculum created by the PI is now online and available to other institutions around the country, while USVI educators have introduced astronomy and physics in their local environment with tremendous response from their students. UVI students have assumed the role of educators and outreach experts themselves, significantly contributing to raising awareness of STEM in the Territory, including Physcs/Astronomy and STEM career paths.

Funder Acknowledgement: NSF HBCU-UP TIP #1719265

Science and Mathematics Education

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Poster Category: STEM Science and Mathematics Education

STEM Enrichment by Design Project - Successes, Challenges, and Changes

Jessica Lopez, St. Philip's College
Maria Rodriguez, St. Philip's College, San Antonio, TX

The STEM Enrichment by Design (STEMed) Project has had some success but has also faced some challenges which led to changes. Our poster will provide a summary of the objectives and preliminary results connected to those objectives. Additionally, it will discuss the challenges and changes made throughout the four-year implementation of this project as well as tracking information for all grant participants. As of Spring 2019, we reported a total of 41 student participants. Recruiting efforts include sharing grant information with the college advisers, the college's Veteran's office and members of multiple schools within the local school district. Of the 41 students, 15% were veteran students, 88% were traditionally underrepresented students, and 88% were first-time college students. All participants who have completed the Accelerated Math Preparation Program (AMPP) have received their incentive laptop with appropriate Maple software. All current participants have been mentored weekly, and previous participants continue to meet with the PI at the beginning and end of each semester. The rate for students who successfully completed at least three courses within the AMPP is an overall 81%. The rate for students who success-

fully completed the entire 4-course AMPP is an overall 50%. We have faced challenges with enrollment, keeping/finding an external evaluator, and student institution withdrawals. To meet these challenges, we have, as an institution, made the AMPP strongly encouraged for all STEM students, found and signed an external evaluator, and added scholarships for students who complete the AMPP. Due to these changes, this fall 2019 semester we have had 11 students enrolled in the AMPP; all are on target to complete at least three courses within the AMPP, and 10 are on target to complete the entire program on time. This data represents a 49% increase in enrollment and a projected 52% increase in AMPP success.

Funder Acknowledgement: NSF HBCU-UP TIP Award Number 1623270

Technology and Engineering

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Poster Category: STEM Science and Mathematics Education

Infusion of Data Science and Analytics Across Undergraduate Disciplines and Research Experiences

LaTanya Brown-Robertson, Bowie State University
Azene Zenebe, Augustin Ntembe, and Basirat Haroon, Bowie State Univerity, Bowie, MD

Big data and analytics are becoming ubiquitous. As a result, more and more employers are requiring foundational knowledge and application of data analytics and data science process. Many disciplines such as economics, chemistry, biology, psychology, and health sciences are data-driven; thus, infusing data analytics into these disciplines will provide students with the skills and knowledge to analyze complex data and provide solutions to discipline-specific problems. Furthermore, there is a growing need to infuse data science and analytics competencies in existing courses to satisfy the need for data analytics-enabled and data science jobs. The goal of this three-year HBCU-UP Targeted Infusion Project is to Infuse Data Science and Analytics (DSA) into undergraduate courses and research at Bowie State University (BSU) and set the foundation for establishing internships and research opportunities as well as an upper-level undergraduate certificate in DSA. The objectives of the project are: 1) Develop DSA course modules and deliver them in the targeted disciplines: Biology, Finance, Management Information Systems, and Economics; 2) Create new courses and integrate the DSA modules into existing courses that will eventually lead to an undergraduate certificate (UC) in DSA; 3) Offer undergraduate research opportunities in DSA; 4) Establish DSA faculty training and a learning community. This poster addresses the effect, and the knowledge gained from of the DSA module infusion pilot and the DSA undergraduate researcher experience. During the Fall 2019, the DSA Infusion Project enabled students from several departments such as management information systems, biology, psychology, finance, economics, and accounting to collect relevant data and apply DSA tools to real-life projects. In addition, the DSA undergraduate researcher experience provided students with workshops and mentoring to develop their research in DSA.

Funder Acknowledgement: NSF HBCU-UP Targeted Infusion

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Poster Category: STEM Science and Mathematics Education

CREST CREAM at NSU: Successful Students Job Placement

Messaoud Bahoura, Norfolk State University, VA

Over the past three years of the NSF-funded CREST Center for Renewable Energy and Advanced Materials (CREAM) at Norfolk State University, the CREST CREAM scholars landed a 100% job placement rate at different industries. Some of students were offered job even before graduation. These industries include Intel, Northrup Grumman, NASA, Audi, Boston Scientific, IBM, and national labs such as Sandia Labs. We present our efforts in retaining the students, training them on different instruments, and professionally preparing them for jobs.

Funder Acknowledgement: NSF CREST-CREAM HRD 1547771

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http://www.emerging-researchers.org