HBCU-UP/CREST PI/PD Meeting

PROGRAM BOOK

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2015 HBCU-UP/CREST PI/PD Meeting

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

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

AAAS
ADVANCING SCIENCE, SERVING SOCIETY

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Contents

Overview of the Meeting

2015 HBCU-UP/CREST PI/PD Meeting

The objective of the **CREST – HBCU-UP 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. 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. 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.

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) and the institutional mission, and plans for expanding institutional research capacity as well as increasing the production of doctoral students, especially those underrepresented in STEM.

Broadening Participation Research (BPR) in STEM Education projects create and study new models and innovations in STEM teaching and learning; enhance the understanding of the underlying issues affecting the differential participation and success rates of students from underrepresented groups; add to the research knowledge base; and inform STEM education practices and interventions. Broadening Participation Research proposals should describe evidence-based research studies that contribute to understanding the participation of and successful outcomes for underrepresented groups in STEM. Proposals should consider new evidence-based strategies and practices and institutional structure models for broadening participation in STEM and increasing the capacity of scholars in minority-serving institutions to conduct this type of research.

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

Historically Black Colleges and Universities (HBCUs) have awarded a large share of bachelor's degrees to African American students in science, technology, engineering and mathematics (STEM), and nine of the top ten baccalaureate institutions of African American STEM doctorate recipients from 2006-2010 are HBCUs. [1]To meet the nation's accelerating demands for STEM talent, more rapid gains in achievement, success and degree production in STEM for underrepresented minority populations are needed. The Historically Black Colleges and Universities Undergraduate Program (HBCU-UP) is committed to enhancing the quality of undergraduate STEM education and research at HBCUs as a means to broaden participation in the nation's STEM workforce. To this end, HBCU-UP provides awards to develop, implement, and study evidence-based innovative models and approaches for improving the preparation and success of HBCU undergraduate students so that they may pursue STEM graduate programs and/or careers. Support is available for Targeted Infusion Projects, Broadening Participation Research Projects, Research Initiation Awards, Implementation Projects or Achieving Competitive Excellence Implementation Projects, and other funding opportunities.

Targeted Infusion Projects (TIP) provide support to achieve a short-term, well-defined goal to innovate or improve the quality of undergraduate STEM education at HBCUs. The Broadening Participation Research (BPR) in STEM Education track provides support for research projects that seek 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) provide support for STEM faculty at HBCUs to pursue research at the home institution or at an NSF-funded research center, a research intensive institution or a national laboratory. Implementation Projects provide support to design, implement, study, and assess comprehensive institutional efforts to increase the number of students receiving undergraduate degrees in STEM and enhance 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.

[1]National Science Foundation, National Center for Science and Engineering Statistics. 2013. *Women, Minorities, and Persons with Disabilities in Science and Engineering: 2013*, Special Report NSF 13-304. Arlington, VA. Available from *http://www.nsf.gov/statistics/wmpd/*.

About NSF

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

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

HRD Vision:

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

HRD Mission:

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

Strategic Goal 1:

The creation of new knowledge, innovations, and models for broadening participation in the STEM enterprise.

Strategic Goal 2:

The translation of knowledge, innovations, and models for broadening participation in STEM for use by stakeholders.[1]

Strategic Goal 3:

Expand Opportunities: The expansion of stakeholder capacity to support and engage diverse populations in high quality STEM education and research programs.

HRD Theory of Change:

HRD's fundamental mission of broadening participation in STEM is embedded in the greater EHR and NSF goals. A basic premise of all HRD programs is that increasing the successful participation of individuals from historically underrepresented groups in STEM will result in a diverse, highly capable STEM workforce that can lead innovation and sustain U.S. competitiveness in the science and engineering enterprise.

Therefore, HRD has an overall goal to increase the successful participation of underrepresented minorities, women and girls, and persons with disabilities in STEM. This is done through the implementation and testing of evidence-based practices, critical review of program results to assess impact, data-driven continuous improvement, and broad dissemination of program findings for wide adoption or scale-up of effective strategies.

[1]Stakeholders include a wide range of organizations and individuals such as but not limited to: NSF and other Federal agencies, federally funded STEM labs and centers, institutions of higher education including minority-serving institutions, state and local governments, education researchers and practitioners, policy makers, STEM employers, professional STEM societies, STEM organizations, and private funders.

The American Association for the Advancement of Science (AAAS)

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

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

Membership and Programs

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

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

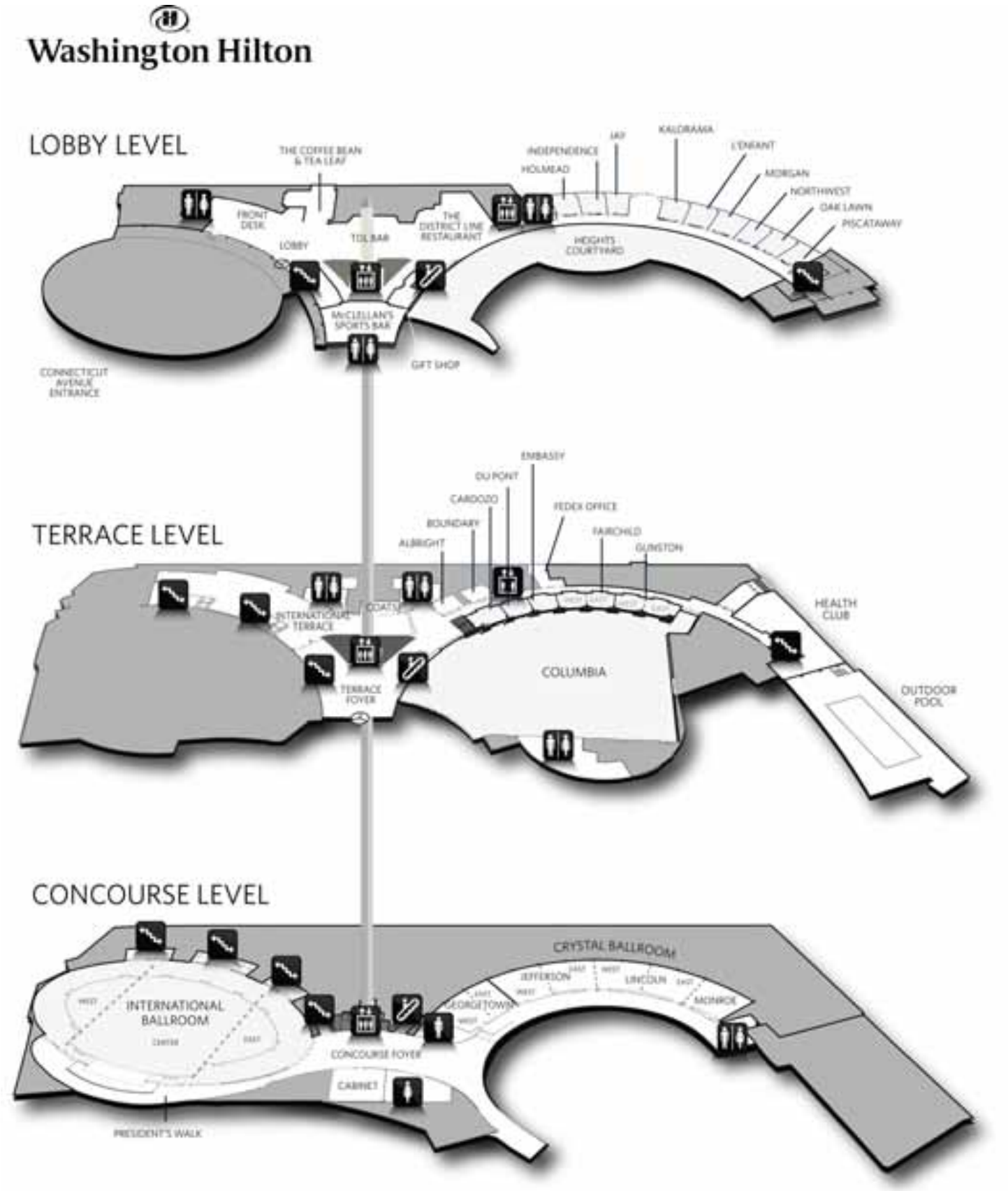
AAAS Mission

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

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

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

Hotel Floor Plans



Wednesday, February 18, 2015

2:00pm — **HBCU-UP/CREST PI/PD Meeting Registraton**
Terrace Foyer

3:00pm - 3:45pm — **Opening Plenary Session 1**
Columbia 5 and 7

Welcome:
Jermelina Tupas, *Acting Division Director, Human Resource Develop ment, NSF*

Remarks:
Joan Ferrini-Mundy, *Assistant Director, Education and Human Resources (EHR), NSF*

Speaker:
***Maria Zacharias**, The Role of the Office of Legislative and Public Affairs*

4:00pm - 5:30pm — **Concurrent Business Meetings**
Columbia 9-12

A. CREST Business Meeting
Columbia 9 and 10

Victoria Santiago and Andrea Johnson, *Program Officers, NSF*

This meeting includes a session about *CRESTWeb* by Joseph Humenik, Fallon Page, and Mary Sanders, *IFC International*

B. HBCU-UP Business Meeting
Columbia 11 and 12

Claudia Rankins, **Earnestine Easter, and Andrea Johnson**, *Program Officers, NSF*

5:45pm - 8:00pm — **Poster Session and Reception**
Columbia West

Thursday, February 19, 2015

Breakfast On Your Own

8:30am - 9:30am — **Concurrent Breakouts – Session 1**

A. Division of Grants and Agreements
Lincoln East

Rashawn Farrior, *Grant and Agreement Specialist, NSF*

B. Evaluation 101
Lincoln West

Jan Middendorf, *Program Officer, NSF*

C. Funding Opportunities for EHR Programs
Jefferson East

Earnestine Easter and Mark Leddy, *Program Officers, NSF*

D. Funding Opportunities in the Directorate for Mathematical and Physical Sciences
Jefferson West

Kathleen McCloud and Sean Jones, *Program Officers, NSF*

9:30am - 9:45am — **Break**

9:45am - 10:45am — **Concurrent Breakouts - Session 2**

A. Division of Grants and Agreements
Lincoln East

Rashawn Farrior, *Grant and Agreement Specialist, NSF*

B. Evaluation 101
Lincoln West

Jan Middendorf, *Program Officer, NSF*

C. Funding Opportunities for EHR Programs
Jefferson East

Earnestine Easter and Mark Leddy, *Program Officers, NSF*

D. Funding Opportunities in the Directorates for Biological Sciences and for Geosciences
Jefferson West

Scott Edwards, *Division Director, NSF*
Lina Patino, *Program Officer, NSF*

E. Funding Opportunities in the Division of Undergraduate Education
Cabinet

Niki Bennett, Karen Crosby, John Haddock, and Gul Kremer*, Program Officers, NSF*

10:45am - 11:00am **Break**

11:00am - Noon **Concurrent Breakouts - Session 3**

A. Funding Opportunities in the Division of Graduate Education
Lincoln East

Earnestine Easter*, Program Officer, NSF*

B. Funding Opportunities in the Directorates for Computer and Information Science and for Engineering
Lincoln West

Thyagarajan Nadagopal and Bevlee Watford, *Program Officers, NSF*

C. Funding Opportunities in the Division of Undergraduate Education
Jefferson East

Niki Bennett, Karen Crosby, John Haddock, and Gul Kremer, *Program Officers, NSF*

D. Excellence Awards for Science and Engineering
Jefferson West

Nafeesa Owens, *Program Director, NSF*

Noon - 2:00pm **Plenary Session 2 and Lunch**
International Ballroom West

Introduction of Speaker:
Claudia Rankins*, Program Director, NSF*

Keynote Speaker:
Kelly Mack, *Vice President for Undergraduate STEM Education, Association of American Colleges and Universities*

2:00pm - 3:00pm **Closing Remarks**
International Ballroom West

Andrea Johnson, Claudia Rankins, and Victor Santiago, *Program Officers, NSF*

Joan Ferrini-Mundy, *Assistant Director, Directorate for Education and Human Resources, NSF*

Joan Ferrini-Mundy began her career as a high school mathematics teacher, and received her BS in Mathematics Education and an MS in Mathematics from the University of New Hampshire, where she completed her PhD in Mathematics Education in 1980. She taught mathematics and co-founded the SummerMath for Teachers program at Mount Holyoke College, and served on the mathematics faculty at the University of New Hampshire from 1983 through 1999. From 1999 through 2010 she was at Michigan State University, serving as Associate Dean for Science and Mathematics Education in the College of Natural Science. Joan was a faculty member in the MSU departments of mathematics and Teacher Education, and was named a University Distinguished Professor of Mathematics Education.

Ferrini-Mundy has had a number of public policy-related positions, including as Director of the Mathematical Sciences Education Board at the National Research Council (1995-1999), and in various positions at the National Science Foundation (program officer in Teacher Preparation and Enhancement, 1989 -91; and inaugural director, Division of Research on Learning in Formal and Informal Settings, 2007 – 2010). Currently Ferrini-Mundy is the NSF Assistant Director for Education and Human Resources, a position she has held since 2011, serving as a member of the U.S. Government Senior Executive Service.

Ferrini-Mundy was an ex officio member of the President's National Mathematics Advisory Panel, and co-chaired its Instructional Practices Task Group (2007-08). She was co-chair of the Federal Coordination in STEM Education Task Force which produced the 2013 *Federal Science, Technology, Engineering, and Mathematics (STEM) Education 5-Year Strategic Plan.* She has been a member of the Board of Directors of the National Council of Teachers of Mathematics, the Board of Governors of the Mathematical Association of America, and the American Mathematical Society's Committee for Research in Undergraduate Mathematics Education. She was president of the organization *Women and Mathematics Education*. Her research interests include calculus teaching and learning, mathematics teacher learning, and STEM education policy.

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

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

George conducts evaluations, workshops and reviews for the National Institutes of Health and National Science Foundation, as well as for private foundation and public agencies, including the European Commission. She develops and coordinates conferences and workshops related to STEM undergraduate reform and recruitment and retention of minorities, women, and persons with disabilities in STEM. She works with UNIFEM, UNESCO, L'Oreal USA and Paris, and non-governmental organizations on gender, science, and technology initiatives related to college and university recruitment and retention and women leadership in STEM.

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

George serves on a number of boards or committees, including: Maria Mitchell Women in Science Awards Committee; McNeil/ Lehrer Productions Online Science Reports 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. She 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.

Andrea Johnson, *Program Director, HRD, NSF*

Andrea Johnson joined the National Science Foundation in 2014 as a rotator Program Director in the Division of Human Resource Development (HRD) in the Directorate of Education and Human

Resources (EHR). She manages the Historically Black Colleges and Universities Undergraduate Program (HBCU-UP) and the Centers of Research Excellence in Science and Technology (CREST) program. Prior to coming to NSF, she was a Research Assistant Professor in the NOAA Living Marine Resources Cooperative Science Center (LMRCSC) at the University of Maryland Eastern Shore (UMES) where she conducted research in the areas of physiology, reproductive biology and life history of marine and estuarine fish species.

During her tenure at UMES, she served as the Associate Director for the National Science Foundation's CREST Center for the Integrated Study of Coastal Ecosystem Processes and Dynamics in the Mid-Atlantic Region. She has also directed several K-12 STEM education and outreach activities for teachers and students. Johnson obtained her BS degree in Marine Science from the University of Miami, her MS in Marine Science from the University of South Florida and her PhD in Comparative Biomedical Sciences at the North Carolina State University College of Veterinary Medicine.

Kelly Mack, *Vice President and Executive Director, Project Kaleidoscope, Office of Undergraduate Science Education (PKAL/STEM), AAC&U*

Kelly Mack is the Vice President for Undergraduate STEM Education and Executive Director of Project Kaleidoscope, a non-profit organization focusing on undergraduate STEM education reform, at the Association of American Colleges and Universities (AAC&U). Prior to joining AAC&U, Mack was the Senior Program Director for the National Science Foundation (NSF) ADVANCE Program while on loan from the University of Maryland Eastern Shore (UMES) where, as a Professor of Biology, she taught courses in Physiology and Endocrinology for 17 years. During her tenure at NSF, Mack managed an annual budget of approximately $17 million, facilitated the inclusion of issues targeting women of color into the national discourse on gender equity in the STEM disciplines and significantly increased the participation of predominantly undergraduate institutions, community colleges and minority serving institutions in the ADVANCE portfolio.

At UMES, Mack served in many capacities including Biology Program Director, where she was responsible for providing leadership and strategic vision for the intellectual, educational, and professional development of biology majors and for the coordination of faculty in providing quality instruction, research, and development activities. She also served as Principal Investigator, Director or Co-Director for externally funded projects that totaled over $12 million dollars, including the UMES ADVANCE Program, which focused on issues related to African American women faculty in the STEM disciplines and led to the initiation of several institution-wide practices to promote the professional development of all faculty.

Mack earned the BS degree in Biology from UMES and, later, the PhD degree 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. Most recently, her research focus has involved the use of bioflavonoids in the regulation of estrogen receptor positive (ER+) and estrogen receptor negative (ER-) breast tumor cell proliferation.

Mack has served as a member of the Board of Governors for the National Council on Undergraduate Research and is a current member of the National Institutes of Health Review Subcommittee for Training, Workforce Development and Diversity. She also recently completed a brief stint as Executive Secretary for the NSF Committee on Equal Opportunities in Science and Engineering, which is the congressionally mandated advisory body that focuses on efforts to broaden the participation of underrepresented groups in the STEM disciplines.

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

Shirley M. Malcom, Director for Education and Human Resources (EHR) Programs at AAAS, has served as a program officer in the NSF Science Education Directorate; an assistant professor of biology, University of North Carolina, Wilmington; and a high school science teacher. Malcom received her PhD in Ecology from the Pennsylvania State University; Master's in Zoology from the University of California, Los Angeles; and Bachelor's with distinction in Zoology from the University of Washington. In addition, she holds 16 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 Science, the highest award granted 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.

Earnestine Psalmonds Easter, *Program Director, Division of Graduate Education, NSF*

Earnestine Psalmonds Easter is a program director in the Division of Graduate Education. As senior program officer and visiting scholar in the Policy and Global Affairs Division, National Academies, she served as study director for the 2009 Academies report entitled *Partnerships for Emerging Research Institutions* and co-study director of *Expanding Underrepresented Minority Participation: America's Science and Technology Talent at the Crossroads* (2010), a congressionally mandated study focused on the under-representation of minorities in science and engineering. She has represented the NSF on interagency science and engineering workforce initiatives including the Education and Workforce Development Subgroup of the National Science and Technology Council and consultation committee for the Department of Education Jacob K. Javits Fellowship Program.

Psalmonds Easter served on the board of directors for Oak Ridge Associated Universities and member of the North Carolina Board for Science and Technology, NASA Minority Business Resource Advisory Council, and executive committee of the Council on Research Policy and Graduate Education of the Association of Public and Land Grant Universities. She has held administrative positions at the Georgia Institute of Technology and Georgia State University, and she became the first vice chancellor for research at North Carolina A&T State University where she was also a professor of education. Psalmonds Easter served as principal investigator for projects funded by the National Science Foundation, National Institutes of Health, Department of Agriculture, Martin Marietta Energy Systems, Caterpillar Foundation, Environmental Protection Agency, and Department of Energy.

She has made numerous presentations, and is the co-author of copyrights to two software systems. She was honored by the Republic of Senegal through acceptance into the Order of the Lion. She received the Baccalaureate and Master's degree in Education from Tuskegee University and PhD in Higher Education Leadership with a concentration in Management Information Systems from Georgia State University.

Claudia Rankins, *Program Director, HRD, NSF*

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

Victor Santiago, *Program Director, HRD, NSF*

Victor Santiago is a Program Director in the National Science Foundation's Division of Human Resource Development (HRD). This Division manages programs and activities that enhance the quality and diversity of human capital engaged in the U.S. science, technology, engineering, and mathematics (STEM) enterprise. 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 has also served as Division Director and as Deputy Division Director.

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

Jermelina Tupas, *Division Director (Acting), Division of Human Resource Development, Directorate for Education and Human Resources, NSF*

Jermelina Tupas is the Deputy Division Director of the Division of Human Resource Development (HRD), Directorate for Education and Human Resources (EHR) at the National Science Foundation, and currently serves as acting Division Director for HRD. She was acting Deputy Assistant Director for EHR from June-December 2014 before returning to her home division. Prior to coming to EHR at NSF, she held the position of Division Director for the Division of Community and

Education at the National Institute of Food and Agriculture (NIFA) - U.S. Department of Agriculture from October 2009 to August 2012.

Before working at NIFA she managed a portfolio of student training, fellowship, and faculty research as a Program Director in the Division of Minority Opportunities in Research at the National Institute of General Medical Sciences, NIH from August 2006 to September 2009. She first joined NSF in 2004 as a Program Officer for more than two years, at the Division of Molecular and Cellular Biosciences, Biological Science Directorate at the National Science Foundation. Thus after stints at two other federal agencies (NIH and USDA), she has returned to NSF. Before moving to NSF, Tupas was a faculty member at the University of Hawaii at Manoa (UHM), where she taught graduate courses and carried out her research in hormone signaling and transcription regulation, while managing two undergraduate student research training and student development programs focused on increasing diversity in biomedical sciences.

Jermelina Tupas holds a Bachelor's degree in Zoology and a Master's degree in Microbiology from the University of the Philippines, and a PhD in Molecular Biology from the Institute of Medical Sciences, University of Tokyo, Japan.

Abstracts

Biological Sciences

1
Poster Category: STEM Research

STEM Initiatives at Savannah State University

Chellu S. Chetty, Savannah State University
Co-Author(s): Jonathan Lambright and Kai Shen, Savannah State University

During the last five years, Savannah State University embarked on its most comprehensive program to date to strengthen STEM education at the University through the implementation of the NSF HBCU-UP Program, Minority Access for Graduate Education and Careers (MAGEC-STEM) Plus. The program focused on enhanced teaching and student support services in certain defined areas, mentored research experiences, seminars and student research presented at national, regional and local conferences, which has served more than 100 students over the 5 year term. Moreover, the program enabled the University to deepen, expand, and sustain the successful STEM activities to maturity for continued institutionalization. It strengthened the culture of STEM excellence at the University by continually expanding and deepening our outreach, teaching, and mentoring activities through the following three objectives: 1) Curricular Development, Revision and Enhancement Reform, 2) Expanding Pathways for Undergraduate Recruitment, Enrichment, Retention and Research Experience, and 3) Strengthening the Faculty Development Activities.

The program was further expanded and enhanced by utilizing new initiatives to foster growth and increase the diversity through: 1) Creating a new Undergraduate Research and Mentoring Office, and 2) Building new networks and collaborations with international universities by sharing international research experiences.

The impacts of the program activities include: a) 48% increase in the STEM enrollment through active recruitment from targeted high schools; b) increased coordination with external entities including higher education, industry, K-12 educators and researchers; c) expansion of an international network global competencies; and d) developing BS in Forensic Science and MS in Mathematics programs.

Funder Acknowledgement: We thank NSF for awarding the HBCU-UP Implementation project (0928454) titled 'Minority Access for Graduate Education and Careers (MAGEC) in STEM Program Plus: Strengthening/Sustaining the Culture of Excellence for STEM Education at Savannah State University.

2
Poster Category: STEM Science and Mathematics Education

HBCU Student Perceptions of Institutional STEM Career Development Experiences

Lawrence O. Flowers, Livingstone College
Co-Author(s): Lamont A. Flowers, Clemson University

In response to the low percentage of minorities currently in the STEM workforce in the United States, the present study was done to examine academic interventions at HBCUs designed to improve participation in the STEM labor force. Educational research literature supports the inclusion of cutting-edge pedagogical approaches to improve STEM employment outcomes of HBCU graduates. The purpose of this study was to investigate HBCU students' perceptions of institutional STEM career development initiatives and effectiveness. Employing a qualitative research design, this research study examined undergraduate students' career-related academic experiences. The study provides potentially beneficial data for HBCU STEM faculty, student affairs professionals, and administrators interested in improving STEM employment prospects of HBCU graduates.

Funder Acknowledgement: National Science Foundation (HRD-1505098).

3
Poster Category: STEM Science and Mathematics Education

Developing Quantitative Expertise in the Undergraduate Biology Curriculum

Raphael D. Isokpehi, Bethune-Cookman University, Daytona Beach, FL
Co-Author(s): Katharina Wollenberg Valero, Ahkinyala M. Cobb-Abdullah, Shukdeb Sen, and Elizabeth R. Congdon, Bethune-Cookman University, Daytona Beach, FL

The HBCU-UP Targeted Infusion project *Developing Quantitative Expertise in the Undergraduate Biology Curriculum (QEUBiC)* at Bethune-Cookman University (B-CU) has the goal to develop quantitative and computational skills of undergraduate biology majors for biological discovery and analysis. The project has two specific objectives: (1) to infuse data science competencies in research-oriented courses; and (2) to develop three new courses. Students are being taught how to work with large data sets to understand biological systems and to solve problems in biology. Assessment metrics that integrate quantitative literacy, scientific literacy and strategic learning are being developed as part of the overall evaluation of the project. Three new courses being developed are in the areas of bioinstrumentation, cloud computing in biology and computational genetics. The project goals and objectives have been widely distributed through the B-CU Press Release website; major news outlets in Volusia

County, Florida; as well as the Journal of Blacks in Higher Education. A key data source research article (https://peerj.com/articles/578) was completed and provides data sets on gene interaction networks for vertebrate thermal adaptation. The following assessment instruments have been developed: (1) student disposition to life-long learning (learning power); (2) use of quantitative and computing capabilities; (3) awareness and use of research-based instructional strategies; and (4) biology faculty research interests and willingness to mentor. Initial analytics of the pilot data is ongoing. The project has led to the adoption of data science as a unifying theme in the trans-disciplinary enhanced B-CU College of Science, Engineering and Mathematics. On October 16, 2014, the members of B-CU Board of Trustees were informed about the Targeted Infusion Project. This highest decision making assembly at B-CU encouraged the project to help accomplish the radical transformation agenda of the university to the service of the data-driven society.

Funder Acknowledgement: National Science Foundation, Historically Black Colleges and Universities-Undergraduate Program (HBCU-UP) Grant #1435186.

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Poster Category: STEM Research

Effects of Tributyl Phosphate (TBP) on the Crab Cardiac Ganglion

Mark W. Miller, University of Puerto Rico
Co-Author(s): Solymar Torres, Xochitl Perez, Manuel Pastrana, Yerlin Perez, and Loretta Roberson, University of Puerto Rico

Tributyl phosphate (TBP) is an organophosphorous compound that is used as a solvent in inks, synthetic resins, adhesives, herbicides and fungicides. TBP has been identified as a potential emerging contaminant in the San Juan Bay Estuary (SJBE), where it has been measured at concentrations up to 3.66 µg / liter (Pérez et al., in preparation). This study examined effects of TBP on the electrophysiological activity of the cardiac ganglion (CG) of the blue crab, Callinectes sapidus, a major crustacean species indigenous to the SJBE. When isolated from the crab heart, the CG central pattern generator (CPG) produces repetitive bursts of motor impulses that drive the in vivo heartbeat. Addition of TBP (200 ppm) to the medium bathing the CG, reduced the frequency of CG bursting (control: 61.3 ± 14.2 bursts per minute, TBP: 12.3 ± 14.2 bpm, wash 56.7 ± 16.4 bpm; $F_{2,18} = 23.00$; $p < 0.0001$). Intracellular recording from individual motor neurons showed that TBP produced a depolarization of the membrane potential (4.3 ± 1.2 mV, n = 6). Bursts that did occur were less rhythmic than under control conditions and did not appear to be driven by premotor synaptic activity. Motor neuron burst durations were reduced (control: 183 ± 22 ms, TBP: 78 ± 18 ms, wash: 163 ± 30 ms). All effects of TBP were reversed by wash with normal Ringer's solution. These effects were not produced by the solvents (acetone or DMSO) at the concentrations used to achieve TBP solubility. It is proposed that tributyl phosphate could inhibit the crab heartbeat by acting on the cardiac ganglion CPG network.

Funder Acknowledgement: NSF CREST HRD-1137725.

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Poster Category: STEM Research

FKH-8 Regulates C. Elegans Dopaminergic Neuron Function

Brian L. Nelms, Fisk University
Co-Author(s): Erica Tross, Bobby Jones, Corey Roach, Ke'Ara Brown-Smith, Bryan Cawthon, and Kai Bracey, Fisk University, Fisk-Vanderbilt Masters-to-PhD Bridge Program

Throughout the animal kingdom, the neurotransmitter dopamine (DA) is a critical regulator of fine motor control, learning, and reward pathways. Precise DA signaling levels are maintained through tight control within the DA neurons of DA biosynthesis, vesicle packaging, neuron excitability, release, and reuptake. While some of the molecular components involved in these processes are known, the transcriptional control of their gene expression is not fully understood, and there are many more molecules yet to be discovered. We use the model organism C. elegans, which has a simple nervous system that can be easily observed and manipulated through genetic and pharmacological approaches, to probe the transcriptional control of DA neuron function. We have identified the previously uncharacterized transcription factor, FKH-8 (a member of the highly conserved forkhead family of winged helix DNA-binding proteins), as an important regulator of DA neuron function. The fkh-8 gene is expressed in DA neurons and fkh-8 deletion mutants show a DA-related motor defect, swimming-induced paralysis (SWIP), similar to mutants with a deletion of the dopamine transporter gene dat-1. However, the fkh-8 SWIP defect appears to be independent of DAT-1, as dat-1 expression levels are unchanged, and DAT-1 function is intact. We are using genetic and pharmacological approaches to determine the position of FKH-8 within the dopamine signaling pathway, and RNA-Seq from sorted DA neurons to identify potential gene targets of FKH-8. This strategy should uncover additional novel regulators of DA neuron development, maintenance, and function.

Funder Acknowledgement: NSF HBCU-UP Research Initiation Award (Award #HRD14-01091) U.S. Dept. of Education Title VII grant (Award #P382G090004) NIH R25 *The Fisk-Vanderbilt Biomedical Bridge to the Doctorate* (Award #1R25GM107754-01).

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Poster Category: STEM Research

Salicylic Acid Elicitation on Production of βCarotene by Carrots, Daucus carota (L): A Focus on the Effect of the Acid on Plant Growth

Anne Osano, Bowie State University
Co-Author(s): LyAvia Goodwin, Janeen Osei, and Eric Bonsu, Bowie State University, MD

The goal of this research was to use Salicylic acid as a chemical elicitor to enhance the carotene content of carrot plants grown in the green house. β carotene is a carotenoid of increasing demand as a precursor of vitamin A and has also been ascribed a central role in cancer prevention and therapy. Elicitors can be used as enhancers of plant secondary metabolite synthesis and can play an important role in biosynthesis pathway to enhance production of commercially-important compounds. Salicylic acid (SA) is a well-known inducer of plant systemic acquired resistance (SAR) in plant –pathogen interaction. Salicylic acid was added in 0.1µM, 10µM and 100µM concentrations to the carrot seeds overnight before planting. The same concentrations were applied to plants two times a week throughout the growing season. Our findings revealed that salicylic acid-treated seeds had 100% germination rate. The plant growth characteristics measured as plant height throughout the life of the plant and as yield had no significant difference from the control. Salicylic acid therefore has no negative effect on plant growth and is therefore a good candidate for chemical elicitation. Further work on the analysis of the enhancement of SA on total carotene production by HPLC is in progress and will be reported on a different paper.

Funder Acknowledgement: This research has been funded by NSF: HRD 13-32572 grant.

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Poster Category: STEM Science and Mathematics Education

Vertical Training of STEM Students from High School Through PhD Candidates

Shishir Shishodia, Texas Southern University
Co-Author(s): Jason Rosenzweig, Daniel Vrinceanu, and Hyun-Min Hwang, Texas Southern University, Houston, TX.

A pilot study to determine the effectiveness of vertically integrating STEM research training from the high school (HS) student through the PhD candidate was initiated in summer 2014 (May-August). The research projects included environmental microbiology, eukaryotic cell signaling, environmental computer modeling, and environmental sampling. Students were additionally provided professional training workshops that would make them more marketable (for employment or additional graduate training/programs). Workshops included: resume preparation, literature mining/searching, preparation of manuscripts, presentation of data, and critical reading of peer-reviewed articles. Participants included 5 rising HS juniors/seniors, 6 undergraduate college students, 6 MS degree graduate students, and 4 PhD candidates. Within each of the aforementioned research labs, HS students were carefully paired up with undergraduate and graduate student mentors who trained students regarding: cell culture techniques, bacterial culturing, molecular biology, environmental sampling, and computational modeling. Students determined baseline environmental levels of platinum group elements in the Houston area soil. They observed that commercially purchased road dust negatively impacted bacterial growth of most organisms, positively impacted bacterial biofilm production, and activated MAP kinase signaling cascades in lung epithelial cells. Within each group, the HS students were required to make weekly presentations on behalf of their respective research clusters. This instilled the commitment needed for our HS student participants to generate meaningful, publication-quality data. With regards to measurable outcomes, the HS participants were successful in achieving the following: 1) prepared review articles in their respective area of research (that will eventually result in a peer-reviewed publication), 2) submitted their research data as part of an internal College proceeding publication, 3) Made both a poster and an oral presentation at the Texas Southern University Summer Program Symposium, 4) are currently working on manuscripts for submission to peer-reviewed journals, and 5) maintaining relationships with their respective labs and TSU mentors enabling continued research opportunities through the 14-15 academic year and beyond.

In conclusion, our pilot study was very successful in exposing putative STEM future workers (i.e. rising HS students and college undergraduates) to meaningful research experiences that translated into: 11 poster presentations, 11 oral presentations, 4 review articles (in preparation), and improved attitudes towards STEM Careers (as measured by a self-survey).

Funder Acknowledgement: This study was funded by NSF HBCU Research Infrastructure in Science and Engineering Award Number HRD – 1345173.

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Poster Category: STEM Science and Mathematics Education

Targeted Infusion to Invert the Classroom in Fish and Wildlife Science Disciplines: Experiential Learning Opportunities Across the Curriculum

William E. Stone, Alabama A&M University
Co-Author(s): Heather Howell and Yong Wang, Alabama A&M University

Minorities are significantly underrepresented in the fish and wildlife professions that manage and conduct research on these

publically-owned natural resources. African Americans and Native Americans remain less than one half of 1% of professionals in the workforce in these scientific disciplines. Our goal is to diversify the scientific professional workforce in fisheries and wildlife by producing qualified minorities that possess appropriate educational competencies and training experiences that allow them to be productive professionals. Our approach is the overhaul the educational strategy in six undergraduate college courses that constitute the fish and wildlife concentration area in a Forestry BS major that is the only professionally accredited (SAF) forestry degree at an HBCU. Course lecture materials are currently being incorporated into on-line learning modules using Blackboard Learn and 'homework assignments' are being developed into lab and field hands-on exercises that will include written and oral reports. The impact of these changes on student learning objectives are being measured using previously constructed core competencies on course performance assignments. Furthermore, three fish and wildlife interns have been identified to collect data on research projects with partners/ employers at federal and state fish & wildlife agencies. These external professional partners will evaluate the accomplishments of these activities. Research has been initiated to characterize and control white-nose syndrome disease on bats in a nearby national forest, investigate habitat relationships of aquatic reptiles at a local national wildlife refuge, and evaluate effectiveness of best management practices to preserve and protect sensitive freshwater fish and mussels in these, and other publically-owned, lands/streams.

Funder Acknowledgement: National Science Foundation, HBCU -Undergraduate Program USDA Forest Service Capacity Building Grant.

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Poster Category: STEM Research

New Tools for Resolving Amoebozoa Phylogenies: Testing the Phylogenetic Utility of Cytoskeletal Architecture to Understand Cochliopodium Diversity

Yonas I. Tekle, Spelman College

Identification and classification of one of the most abundant microorganisms, Amoebozoa, has been a challenge due to their dynamic shape and lack of definite shape. Traditional methods of light and electron microscope in observing and characterizing amoebas have failed to resolve the phylogenetic relationships among amoebas. Among the characters that have been extensively used for Amoebozoa taxonomy are characters related to pseudopodia. However, its use has been curtailed due to the limitations of the techniques used to study it. In this study we take a novel approach to study the architecture of pseudopodia using immunocytochemistry and confocal microscopy. The phylogenetic utility of the generated cytoskeletal structures have been tested to study the phylogeny of a Cochliopodium, a genus of amoeba with flexible cell coat. Aspects of the cytoskeleton studied include distribution, density, and co-localization of microtubules, actin, and paxillin, as well as presence of a centrosome. Our study identifies several cytoskeletal characters useful in species identification and relationship study within the genus Cochliopodium. Characters analyzed are congruent with molecular phylogeny of Cochliopodium further reinforcing the potential use of cytoskeletal architecture characters for use in resolving the evolution of the Amoebozoa.

Funder Acknowledgement: This work is supported by the National Science Foundation RIA Grant (1409587).

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Poster Category: STEM Research

Role of Astrocytes in the Development of Synchronized Bursting Behavior in Neuronal Networks

Murali K. Temburni, Delaware State University
Co-Author(s): Karla Sanchez, Nkoli Agbazue, and Melissa A Harrington, Delaware State University

Synchronous oscillations are thought to be necessary for establishing functional neuronal networks for normal vertebrate brain development – although the mechanisms of synchronization are not fully understood. Existing models of synchronous activity assume that it is a process intrinsic to neurons. However, glia have been shown to modulate oscillatory activity in networks of neurons during sleep, during prodromal oscillations of neurons preceding spreading depression, and the slow inward currents (SICs) resulting in synchronous activity in hippocampal neurons, thalamus and nucleus accumbens. Recently glial cells, particularly astrocytes, have been shown to participate in neuronal communication by releasing “gliotransmitters” like glutamate, ATP and D-serine. We hypothesize that astrocyte-neuron interactions are crucial for the development of synchronous activity seen in the developing vertebrate brain. We test this hypothesis by establishing pure and mixed (astrocyte and neuronal) cultures from the developing chicken brain (optic tectum) and recording total neuronal activity using the multi-electrode array system, MED64. Pure neuronal cultures were obtained by treating cultures with the mitotic inhibitor 5-fluorodeoxyuridine (FUdR) which kills mitotically active astrocytes but spares post-mitotic neurons. Neurons were kept alive in the absence of astrocytes by supplementing the culture medium with 50% astrocyte conditioned medium. Typically mixed cultures of astrocytes and neurons show random spiking activity in one week and synchronous activity in two weeks. Our initial results indicate that pure neuron only cultures show random spiking activity without synchronization even after three weeks thus clearly establishing a role for astrocytes in the development of synchronous activity. To further dissect the molecular pathways involved we are targeting three pathways within astrocytes that have been demonstrated to be crucial for communication with neurons – me-

tabotropic glutamate receptor (mGluR), purinergic (P2Y1) receptor and GABAB receptor. Activation of these G-protein coupled receptors by their respective neurotransmitters mobilizes intracellular calcium release leading to exocytosis of either glutamate or ATP. Using lentiviral vectors, we propose to express dominant negative peptides designed to disrupt downstream signaling pathways of these receptors and thereby calcium mobilization and exocytosis of gliotransmitters in chick embryo astrocytes.

Funder Acknowledgement: NSF HBCU-UP Research Initiation Award (HRD 1401026) to Murali Temburni and NIH-COBRE award (1P20GM103653-01A1) to Melissa Harrington.

Chemistry and Chemical Sciences

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Poster Category: STEM Research

Benzoic Acid Effect on Production of βCarotene by Carrots, Daucus carota (L): A Focus on the Effect of the Acid on Plant Growth

Eric Bonsu, Bowie State University
Co-Author(s): Nicholas Dickson, Anne Osano, and Eric Bonsu, Bowie State University, MD

The goal of this research was to use Benzoic acid as a chemical elicitor to enhance the carotene content of carrot plants grown in the green house. β carotene is a carotenoid of increasing demand as a precursor of vitamin A and has also been ascribed a central role in cancer prevention and therapy. In plants benzoic acid and its derivatives are important building blocks in a wide spectrum of compounds varying from metabolites like cytokinin and salicylic acid to secondary products with pharmacological activities such as the anti-cancer agent taxol and the local anesthetic cocaine. Since salicylic acid (SA) is a well-known inducer of plant systemic acquired resistance (SAR) in plant –pathogen interaction and therefore a chemical elicitor of secondary metabolites, we choose to study Benzoic because of its chemical relationship with SA. Benzoic was added in 0.1µM, 10µM and 100µM concentration to the seeds overnight before planting. The same concentrations were applied to plants two times a week throughout the growing season of the plants. Benzoic acid treated seeds showed 100% germination rate. The plant growth characteristics measured as plant height throughout life of the plant had no significant difference from the control. Benzoic acid therefore has no negative effect on plant growth and is therefore a good candidate for chemical elicitation. Further work on the analysis of the enhancement of benzoic acid on total carotene production by HPLC is in progress and will be reported on a different paper.

Funder Acknowledgement: NSF

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Poster Category: STEM Research

Biomaterials in Media VS Attached Have Varying Effects on Cell Processes

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One challenge facing the field of regenerative medicine is to produce a cellular scaffold that will allow cells to grow in the specific manner required to repair traumatic wounds, such as peripheral nerve injuries (PNI). Recent studies have investigated a variety biomaterials that assemble into scaffolds that guide cells in forming functional tissue structures in vivo. Results have been mixed, with some materials seeming promising in one experiment, but disappointing in the next. While a host of explanations could be responsible for the variation seen, one overlooked aspect is in what phase the biomaterial is presented to the cells. Many assays rely on biomaterials dissolved in aqueous media, while others utilize biomaterial coatings on slide plates. Adding to the complexity are unusual materials such as electrospun fibers, hydrogels, or seeded porous scaffolds. There are no published comparisons of different phases' effects on cellular processes.

Using an adherent Schwann cell line model, this study investigates several biomaterials, both naturally-derived and constructed, for their effects on cellular processes. Materials include human hair keratin, basal membrane extracts, commercially available synthetic scaffolds, laminin, fibronection, vitronectin, and poly-L-lysine, as well as combinations of these compounds. Schwann cells are either seeded on plates coated with biomaterials or are seeded on uncoated plates and biomaterials presented diffusively. Initial results show significant differences in proliferation for some biomaterials (but not all) based solely on whether the biomaterials are aqueous or coated. These results could potentially guide the design of more efficient and consistent regenerative techniques across cell lines.

Funder Acknowledgement: Funding provided in part by NSF HBCU-UP RIA Award # 1238797; DOD Award # W911NF-14-1-0066.

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Poster Category: STEM Science and Mathematics Education

HBCU-UP Implementation Project at Florida A&M University: Student Centered Active Learning and Assessment Reform (SCALAR)

Maurice D. Edington, Florida A&M University

Co-Author(s): Lewis Johnson, Desmond Stephens, Charles Weatherford, and Shanalee Gallimore, Florida A&M University

Results will be presented from the first two years of implementation of Florida A&M University's (FAMU) HBCU-UP Implementation project "Student-Centered Active Learning and Assessment Reform (SCALAR)." The goal of SCALAR is to significantly revamp and enhance the instructional approaches, course curricula, academic support services and co-curricular activities in the STEM programs of the newly formed FAMU College of Science and Technology. The project PI and Co-PIs will highlight key project strategies and present preliminary data demonstrating how the project has impacted student learning. Specific project activities that will be discussed include faculty development efforts designed to increase faculty use of active/ collaborative learning techniques and the use of effective methods for assessing and enhancing critical thinking skills, such as the Critical Thinking Assessment Test.

Funder Acknowledgement: National Science Foundation (NSF) Historically Black Colleges and Universities-Undergraduate Program (HBCU-UP).

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Poster Category: STEM Research

Jackson State University Research Infrastructure and Student Development Through the Chemical Design of Multifunctional Carbon Nanotubes

Ashton T. Hamme, II, Jackson State University
Co-Author(s): Jerzy Leszczynski, Paresh Chandra Ray, and Ashton T. Hamme II, Jackson State University

The JSU-RISE program utilized an interdisciplinary approach to improve University research infrastructure and to develop a research and educational program to prepare our chemistry undergraduate and graduate students to be productive chemists who focus on the theoretical and experimental development, design, functionalization, and molecular property investigation of nanomaterials as sensory and eradication platforms for bacteria. Multi-drug resistant bacteria (MDRB) present a great challenge in today's public health care where approximately 42,000 cases of salmonellosis are reported in the United States per year, and along with other strains of MDRB, these MDRB also cause one third of global mortality. As a means to address this need, multifunctional gold, iron, and SWCNT based bioconjugated nanomaterials were constructed. Detection of the targeted bacteria was achieved through surface-enhanced Raman spectroscopy (SERS), and aptamer based bioconjugation of the nanoparticles enabled the selective targeting of the MDRB of interest. Furthermore, when iron core-gold shell nanoparticles were used, separation of the bacteria was also achieved. Utilization of photothermal therapy techniques toward the targeted MDRB using 670 nm of light at 1.5 W cm-2 resulted in irreparable damage. The results from the aforementioned studies along with the theoretical investigation of the functionalization of two OH and SH Groups with (5,5) Armchair SWCNT, and the 1,3-dipolar cycloaddition functionalization of the SWCNTs will also be discussed. The JSU HBCU-RISE program has made a significant impact on graduate students. During the last three years, three RISE Fellows graduated with their PhD, three RISE Fellows are expected to graduate with their PhD by May of 2015, and one MS degree was also earned.

Funder Acknowledgement: National Science Foundation HBCU-RISE: HRD-1137763, PREM: DMR-0934218.

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Poster Category: STEM Science and Mathematics Education

Blended Instructional Strategies in the General Chemistry Course Sequence

Lisa B. Hibbard, Spelman College
Co-Author(s): Breche' Wells, Spelman College, Atlanta, GA

The purpose of this research project was to analyze the General Chemistry course sequence for majors at Spelman that has been revised using a semi-self paced, blended format that incorporates innovative instructional and assessment strategies. Quantitative and qualitative data were analyzed to determine the impact on concept mastery and student knowledge retention. Instructional strategies involved online delivery of course content, freeing class time for team-based activities such as Process Oriented Guided Inquiry Learning (POGIL) worksheets, case studies, and problem-solving sessions. Concept mastery was measured through "gated" chapter tests, which allow students multiple attempts at passing a test with a score of 85 or better. Knowledge retention was measured based on the standardized ACS General Chemistry First Term and Full Year exams given at the end of each fall and spring semester, respectively. The fall semester average final exam test scores increased from 39.1 (out of a maximum of 70 points) averaged over the 3-year period of 2010-2012 to an average score of 44.1 in fall 2013 for the Majors-only course. The spring semester cumulative final exam average test scores increased from 34.8 averaged over the 2011 and 2012 spring semesters to 42.8 in spring 2013. Over the four academic years 2010-2014, the fall semester average ACS final exam test scores for the majors-only course (CHE 111) increased by 30.3%, on average, as compared to the final exam scores earned by other science/pre-health concentration students enrolled in other sections of the same course. On average, the spring semester cumulative ACS final exam average test scores for the majors CHE 112 course increased by 26.6%, as compared to the other sections. Qualitative measures of student attitudes and perceptions were also obtained using a Qualtrics survey, which was sent to all students who had enrolled in the Majors-only courses. The data from the survey showed how students

felt about the gated test system. Many students agreed that the gated test system was effective when developing concept mastery.

Funder Acknowledgement: NSF HBCU-UP Targeted Infusion Grant #1332575 HHMI Undergraduate Education Program Award #52007559.

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Poster Category: STEM Science and Mathematics Education

Enhancement of Undergraduate Chemistry Program at Delaware State University Through Integration of Sustainable Chemistry in Course and Laboratory

Cheng-Yu Lai, Delaware State University
Co-Author(s): Daniela R. Radu

Through a combined effect of media, family and school education, today's college students are aware of sustainability as a global value. With growing public concern over climate change, scarce water resources, energy, food, and waste, students want to understand how human actions affect the health of our planet. Through our project, students of STEM concentration will have a unique opportunity to start at the ground floor of the exciting and expanding field of green chemistry in a sustainable context.

The overall goal of this Targeted Infusion Project (TIP) is to enhance the Undergraduate Chemistry Program in the department of Chemistry at Delaware State University (DSU), by infusing sustainable chemistry concepts in course and laboratory, toward increasing recruitment, retention, and graduation rates of chemistry students.

Ongoing projects in our laboratory value stewardship of natural resources and the human potential to operate with renewable resources toward either mitigating the current environmental problems or fostering the harvest of renewable energy. These projects have inspired the Targeted Infusion Project presented here, towards integrating science and education in green/ sustainable chemistry at DSU. The TIP targets to engage students via course, laboratory and summer research internships, and it is structured to enable the following activities:

Activity 1. Develop and implement a sustainable chemistry (SusChem) course with laboratory component, encompassing sustainable chemistry lectures and inquiry-based integrated instructional laboratory units (I3Us).

Activity 2. Transform existing departmental curriculum by infusing chemistry concepts into existing course/laboratory components.

Activity 3. Expand internship opportunities for undergraduate students by working with local companies that promote renewable resources utilization.

Activity 4. Enable hands-on application of sustainable chemistry by integrating education with research experiences in DSU faculty laboratories.

Activity 5. Utilization of institutional or external resources to implement outreach activities centered on sustainable chemistry for increasing campus awareness and toward increasing enrollment.

It is anticipated that the planned activities will increase understanding of the current global trends, potentially reflect back positively in increase confidence in the program and increased recruitment, retention and graduation rates of our undergraduate students.

Funder Acknowledgement: National Science Foundation, Department of Energy and United States Department of Agriculture.

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Poster Category: STEM Research

Interdisciplinary Nanotoxicity CREST Center 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. Currently there are at least 1400 commercial products based on nanomaterials. Understanding of structures, characteristics and biological activities of man-made nanomaterials is critical to prediction of their impacts on the environment and human health. Nanoparticle exposure is common, but short- and long-term exposure effects are currently not fully understood, especially since the primary and agglomerate sizes, surface area, and the characteristics of the surface play such important roles. Conversely, nanotechnology can also be used to create new nanomedicines, sensors, pollutant filters and nanocatalysts with important societal benefits. There is a compelling need of studying potential toxicity of nanomaterials and advancing of efficient, fast and inexpensive computational approaches able to predict toxicity of new species before their industrial applications.

The collaborative activities of the Center's faculty, staff and students focus on investigation of structures and properties of various nanomaterials, study of their potential applications and evaluation of their toxicity. This is accomplished by development of prominent interactions among experimental and computational groups and execution of joined research that would not be possible without the Center's organization. The Center's activities are essential to support safety advance of nanotechnology by providing tools for evaluation of toxicity of new nanoma-

terials before their commercial applications. The students supported by the Center are involved in training which combines the state-of-the-art experimental and computational techniques applied to nanomaterials. The educational and research activities are strengthen by interaction with the Jackson K-12 school system, the NSF Center for Chemical Evolution at Georgia Tech and International NanoBridges program supported by the European Union. The Center is a leader in the area of prediction of toxicity of nanomaterials and one of the largest producer of African American chemistry PhDs. There are two annual conference series that have been initiated and executed. For the last twenty two years we have been organizing and securing funding for a series of Conferences on Current Trends in Computational Chemistry (CCTCC). This is supplemented by 14 Southern Schools of Computational Chemistry and Materials Sciences (SSCCMS).

Funder Acknowledgement: The National Science Foundation; Georgia Institute of Technology (NSF CCE Program); Jackson Public School JROTC Program; NanoBridges Program supported by the European Union.

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Poster Category: STEM Science and Mathematics Education

Fisk University HBCU-UP Implementation Project for Deeper STEM Learning

Lee E. Limbird, Fisk University
Co-Author(s): Princilla Evans-Morris, Cathy R. Martin, and Steven Morgan, Fisk University, Nashville, TN

The Fisk University HBCU-UP Implementation Project was conceived after a productive STEM discernment process that identified the three key barriers at Fisk to student STEM success, retention, on-time graduation, and selection of STEM careers: 1) entry to Fisk with limited mathematics competence and confidence; 2) insufficient deep learning and content retention to incrementally build on fundamental concepts in courses over time; and 3) limited on-campus research experiences that assure every STEM major has the opportunity to "behave like a scientist", solving authentic research questions.

Our HBCU-UP Implementation Project embraces evidence-based trans-STEM curricular and pedagogical strategies and aligned professional development in order to: 1) Accelerate students' acquisition of STEM-required mathematics skills and confidence via innovation teaching in developmental courses and the introduction of face-to-face and on-line course modules targeting particular skills; 2) Achieve deeper student learning by adding required peer-led Supplemental Instruction to all STEM gatekeeper courses that currently are barriers for student progression and retention; and 3) Foster STEM interest and retention, critical thinking and experimental design skills by introducing authentic research into course-associated laboratories in two required courses per natural science pathway and one each in the mathematics and computer science degree pathways. The presentation will focus on our progress in innovations in Developmental Mathematics, Faculty Development in Student-Centered pedagogies to encourage deeper learning, and our incremental implementation of authentic research in course-associated laboratories/projects, as proposed.

The measurable outcomes of these efforts will be an increase in student STEM retention from 67% to 80% and a broadening of STEM interest beyond Biology, increasing majors in Chemistry by 25%, Math by 100%, Physics by 50% and Computer Science by 50%. In addition, completion of STEM pre-requisite mathematics courses will occur in 1 semester (or 4 modules) instead of 2 or more semesters, performance in targeted Gatekeeper Courses will increase by 1+ grade levels/ course, and STEM on-time graduation rates increase to 60% (from 46%). A longer term outcome will result in a 20% increase in Fisk graduate direct entry into PhD-granting programs or STEM careers.

Funder Acknowledgement: NSF HRD 1332284.

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Poster Category: STEM Science and Mathematics Education

Strategies for Success in Organic Chemistry

Leyte Winfield, Spelman College

Educators and researchers alike are working to elucidate and document impactful learning strategies. Likewise, the Department of Chemistry and Biochemistry at Spelman College is developing a comprehensive model that leads to improved student retention and performance in the major. To address success in the Organic Chemistry course, a number of pedagogical strategies are being utilized synergistically to promote concept mastery and critical thinking in the course. The course follows a blend learning format whereby students read course material and review video lectures outside of class. During the class period, students complete collaborative learning exercises (ChemDrills) that develop their cognitive ability related to chemical concepts. The distribution of activities in the ChemDrills reflects learning by analogies (5%), inquiry (45%), computational models (8%), and traditional drill/practice problem sets (42%). Learning outcomes have been assessed through online blogs and quizzes, in class quizzes aided by student response devices/apps, surveys, and peer-observations. This presentation will provide an overview of the approach. In addition, a summary of students' motivation for science and perceived learning gains will be discussed in comparison to the students' learning behaviors as reported by the peer learning apprentice (tutors).

Funder Acknowledgement: NSF HBCU-UP Targeted Infusion Grant #1332575.

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Poster Category: STEM Research

Ultrasensitive SERS Nanoprobes for Selective Detection of Ferric Ions

Fei Yan, North Carolina Central University
Co-Author(s): J. O. Onabanjo, R. A. Usman, J. M. Romeika, Charina L. Spurgeon, and Yam K. Shrestha, Department of Chemistry, North Carolina Central University, NC

Excess amounts of ferric or Fe3+ ions within the body have been associated with adverse health conditions such as Alzheimer's, Huntington's and Parkinson's disease. Despite considerable research advances in trace metal analysis, rapid and accurate detection of Fe3+ in an environmental and/or clinical setting poses significant challenges to the scientific community. In this presentation, we report a quantitative SERS method based on deserrioxamine B-functionalized silver nanoparticles (DFB-AgNPs) for detecting Fe3+ in aqueous solutions. It is expected that this SERS method can be further optimized to permit total iron measurement in biological matrices and become useful for diagnostic purposes in a point-of-care setting.

Funder Acknowledgement: Financial support from the US National Science Foundation (NSF) through a grant to FY (Award #1238441) and to the Quality Education for Minorities (QEM) Network (Award #1042681) is greatly appreciated.

Computer Sciences and Information Management

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Poster Category: STEM Science and Mathematics Education

Look Ma, I Can Play With My Quiz in the Smart Phone

Mohammad Muztaba Fuad, Winston Salem State University
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Keeping students engaged in a class is a challenging task. This problem is aggravated in recent years by the prolific use of mobile devices in the classroom. Students now have an easy way to diverge into something other than what the class is covering. In this research project, we investigate the applicability of using mobile devices in the classroom and incorporation of interactive problem solving using those devices to increase class engagement and active learning for students. There has been a plethora of research work performed to address the lack of student engagement and motivation during class time and a significant number of works have focused on incorporating mobile device in the classroom. However, this research is different as it introduces interactive problem solving, where student have to actively play with the problem at hand to devise the possible solution and answer. In an interactive problem, students have to traverse a set of steps for a particular problem before formulating an answer. In each step, students have to make key choices that will have impact on the next step of the interaction. During these interaction steps, students can go back and forth and change their answer. This will allow them to see what is the affect of different selection on the result and how every piece fits together. Problems can be started bottom up or at the middle to give students different perspective on the problem and assess their problem solving skills. Only after the student traverse each of the steps or the allotted time to answer a problem runs out, the result of their interaction is sent back to the faculty computer as their answer. Each interactive problem has a rubric that not only grade correct answers but also partial answers to gauge student's problem solving skills and thinking models. By allowing the students to solve problems in their preferred devices, this research expects to create a friendly learning environment where the students want to engage more in class activities. Towards this goal, a mobile response system (MRS) is developed that facilitates interactive problem solving during class and being deployed in classes to evaluate its effectiveness. Initial results show positive feedback from students and a lot of interest for it to become a part of every class.

Funder Acknowledgement: NSF fund #1332531.

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Poster Category: STEM Research

CREST-Cyber ShARE Center of Excellence: A Center for Sharing Cyber-Enhanced Resources to Advance Science and Education

Ann Q. Gates, University of Texas at El Paso
Co-Author(s): Deana Pennington, Craig Tweedie, Aaron Velasco, and Natalia Villanueva-Rosales, Computer Science, University of Texas at El Paso

The Cyber-ShARE Center of Excellence at the University of Texas at El Paso was established in 2007 with a mission to advance education and research through cyberinfrastructures that support information exchange and integration, as well as collaborative interdisciplinary research. The Center's cyberinfrastructure (CI) efforts are focused on: 1) CI, computational science, and technology-enabled science research that links methods across multiple fields in creative ways to innovate in scientific data acquisition, integration, and analysis; and 2) CI dissemination that focuses on making CI products and tools accessible and on training individuals on established and innovative tools that are outcomes of Cyber-ShARE and other CI research efforts.

As national leaders in the study of collaborative science and engineering, the Center has developed and applied models of

team-based, cooperative learning, interdisciplinary teamwork, and knowledge integration. Areas of advancement in cyberinfrastructure (CI) have been in data management, data analysis, and virtual organizations in support of collaboration. In particular, CI research has focused on scientists' ability to document data collection and product development in ways that enable sharing and reuse of scientific results by enhancing results with provenance and other critical information. Cyber-ShARE's research in analysis of climate change impacts on the environment and the modeling of Earth's structure has advanced through the Center's interdisciplinary approaches supported by CI.

Funder Acknowledgement: This material is based upon work supported by the National Science Foundation under Grant No. HRD-1242122.

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Poster Category: STEM Science and Mathematics Education

Transforming Computer Science Curriculum and Integration with STEM Courses

Sajid Hussain, Fisk University, Nashville, TN
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This TIP Award to Fisk University includes a four-objective plan to innovate the curriculum and the pedagogies for teaching and learning of computer science (CS) in order to create awareness, interest and success in CS as a discipline.

The four objectives are as follows: 1) Computational Thinking in CS courses for non-majors: Modify the CS curriculum for non-majors by revising the introductory CS course (CS 100; 3hr credit) to include computational thinking, and add two one-credit hour courses on Mobile Apps and on Web Apps. 2) Appealing Tools in Introductory Courses: Introduce CS tools perceived as "relevant" by students in introductory CS courses on the major pathway (specifically CS 110/120/241) and foster use of these tools in course- embedded student-engaged projects and faculty-student mentored summer research projects. 3) Computing in Cognate Courses: Introduce computational programming in cognate courses required for CS majors, namely mathematics and physics, in order to sustain the impact of computational thinking across the curriculum. 4) Peer Mentors (PM): Utilize peer mentoring/coaching to foster deeper learning of CS in CSCI110/120/241 and in cognate courses, such as Math101/Math110/Math120 and Physics 130/140, and to serve as "coaches" in course-assigned projects.

The significant outcomes include: One hundred percent (100%) increase in enrollment in CSCI 241 - Data Structures, from 6 (Fall 2013) to 12 (Fall 2014). Sixty-one percent (61%) increase in CSCI 110 - Introduction to Programming from 24 (Fall 2013) to 39 (Fall 2014). Two hundred and fifteen percent (215%) increase in enrollment In CSCI 100 - Introduction to Computing, from 33 (Fall 2013) to 71 (Fall 2014). The GPA increased from 2.22 (35 students) to 2.99 (33 students) and 1.96 (19 students) to 2.89 (29 students) for Fall and Spring semesters respectively. Eleven (11) abstracts presented at National Student Conferences (Tapia, NIS/BKX, NCUR). Thirteen (13) abstracts presented at Fisk Research Symposium. Students obtained competitive internships (Google, IBM, Oracle, etc); 100% students (excluding freshmen) obtained competitive and paid internships.

In summary, we address the societal need for greater STEM literacy by introducing computational thinking in CS courses for non- majors. Further, we train a greater number of women and minorities for leadership in careers for which computer science knowledge is an essential platform for career progression.

Funder Acknowledgement: NSF HBCU/TIP HRD# 1332432.

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Poster Category: STEM Science and Mathematics Education

Using Git and GitLab as Teaching Tools for Distributed Software Development

Hyunju Kim, Jackson State University

The SOSS (Student-centered Open Source Software) Community has been established at the Department of Computer Science of Jackson State University to educate Computer Science majors through real-world software development activities. We utilized Open Source Software (OSS) community structures and OSS products for the SOSS Community so that students can be trained through use of OSS and various development activities, including communications and project management.

As part of the SOSS project, which is itself an OSS project, we investigated available OSS products that can be used to build such a community infrastructure. We adopted Git and GitLab and developed a distributed environment for student development projects. This poster describes the architecture of the SOSS Community system and useful features to teach topics on collaborative software development and reengineering. We also developed a series of user guidelines and teaching modules for Git and GitLab so that similar OSS projects can be easily replicated in other institutions. The SOSS Community is expected to provide a repository and knowledge base of student development projects as well as a virtual classroom for Computer Science majors at any level.

Funder Acknowledgement: This work has been supported through the National Science Foundation grant (HRD-1348565) on the SOSS (Student-centered Open Source Software) Community. The views and conclusions contained in this document are those of the authors and should not be interpreted as necessarily representing the official policies, either expressed or implied, of the funding agency.

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Poster Category: STEM Research

Multi-Disciplinary Research and Synergy

Wei Li, Texas Southern University

The Center research consists of three research sub-projects to conduct research in complex networks, including energy efficient wireless sensor networks, urban transportation environmental networks, and distributed computational networks. This research will be integrated with the science, technology, engineering and mathematics (STEM) education programs. The achievement of these goals will enable minority and under-represented students to pursue advanced graduate degrees, contributing to meeting the future critical workforce needs of the nation in STEM fields. The broader impacts that will result from the proposed CREST include the increase of the number of minority and under-represented undergraduate and graduate students, including PhD students, who will be motivated to pursue cutting-edge interdisciplinary research in STEM fields. The proposed activities will enhance the existing PhD program in Environmental Toxicology in the College of Science and Technology at TSU, and will also greatly facilitate the development of a new Master's degree program in the multi-disciplinary Computational Science and Engineering (CSE) at TSU. Beyond these local broader impacts, the proposed Center's research will provide a knowledge base for the understanding of complex networks that could allow for the development and implementation of policies for global environmental sustainability.

Funder Acknowledgement: This research work is supported in part by National Science Foundation under grant NSF-1137732 and NSF-1241626.

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Poster Category: STEM Research

Robust Facial Feature Extraction from Photos, Sketches, and Caricatures

Terry McKoy, CREST Center for Computational Center for Fundamental Applied Science and Education, North Carolina Central University, NC

In this project, we seek to develop a face recognition algorithm that could recognize normal face photographs, photographs with strong make-ups, sketches, and caricatures that may be useful in identification. Current work focuses on the first part of the project, on evaluation of current appearance-based algorithms on a mixed database contains photographs, sketches, and caricatures. Our goal is to understand, and then be able to extract robust facial features that are invariant to large geometrical and appearance changes. Recognition rate is currently at 49 percent. Deep-learning is one possible technique we plan to ultimately explore.

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Funder Acknowledgement: This work was supported by the National Science Foundation Grant HRD-1345219.

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Poster Category: STEM Science and Mathematics Education

Computing Pre-College Program: Initial Impact to First-Year Student in Computer Science

Jean Muhammad, Hampton University, Hampton, VA
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The Department of Computer Science at Hampton University was awarded the HBCU-UP TIP Project to reform three gateway courses and implement an intensive computing summer bridge program (SBP) in an effort to improve student academic performance and increase retention and graduation rates in the major. By integrating Computational Thinking into lower-level courses, the proposed project also seeks to strengthen Computer Science students and better prepare them to meet the modern demands in the field. In the first year of the project there have been several changes to the curriculum content of the gateway courses as well as the implementation of the summer pre-college program.

Summer 2014 was the first computing pre-college program. There were nineteen participants currently in the summer program. The students were engaged and excited to be a part of this program. The Computer Science Seminar course served as the initiative for a supplemental undergraduate research award request. The course focused not only ensuring the students understand computer science as a field of study, but also how computer science impacts all fields of study and everything in their daily lives. There were several speakers, FBI, Industry, University faculty, and previous graduates.

The initial results has been extremely rewarding as we noticed from their performance in the first semester program course, CS1. This poster will discuss the curriculum we used during the summer program, sample exercises, feedback from students as well as lesson learnt for us to improve next year program.

Funder Acknowledgement: National Science Foundation, Historically Black Colleges and Universities Undergraduate Program (HBCU-UP): Targeted Infusion Project, Award # 1332508- Increasing and Retaining Computer Science majors at Hampton

University through Computational Thinking and Curriculum Reformation.

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Poster Category: STEM Research

Center of Research in Design of Intelligent Technologies for Smartgrids

Enrico Pontelli, New Mexico State University
Co-Author(s): Satish Ranade, New Mexico State University, Las Cruces, NM

The goal of the interdisciplinary Center of Research Excellence in Design of Intelligent Technologies for Smartgrids (iCREDITS) is to provide a new epicenter for research and training in smartgrids. The need for an evolution in current electric grids has been long recognized.

Today's power-delivery paradigm is centralized; the requirement of providing instantaneous power on request leads to a rigid management structure, with the installation of excessive, expensive and unsustainable electricity generation capacity. The vision of iCREDITS is to obtain sustainable generation capacity by shifting the paradigm from power delivery to energy delivery, using smartgrid concepts. In an energy delivery system, energy is viewed as a commodity, which can be produced, stored, and exchanged. Producers and consumers establish continuous negotiations, where, e.g., producers provide prices of energy and consumers provide energy profiles, until they reach agreements on scheduled deliveries of blocks of energy over specific time periods; in these scenarios, customers can themselves enter in energy exchanges.

This paradigm will lead to better economic sustainability due to more efficient generation, transmission and usage. This vision accommodates the creation of small 'microgrids,' larger 'customer-driven microgrids' in a distribution feeder and, ultimately, the 'smartgrid,' which includes the generation, transmission, and distribution of the entire power system. While there is agreement that the energy delivery model will enable the smartgrid vision, there are profound challenges to its realization. The research focus of iCREDITS is to develop the fundamental science and engineering necessary for the energy delivery paradigm. The realization of the smartgrid vision requires solving a second fundamental problem: the dramatic shortage of smartgrids workforce, exacerbated by the lack of diversity in gender, ethnicity and cultural backgrounds.

iCREDITS builds on five objectives: (C) Create a Center infrastructure to enable interdisciplinary research and training in smartgrids; (R) Develop a research agenda to realize the energy delivery paradigm and sustain the design and development of smartgrids; (E) Develop a comprehensive interdisciplinary training pipeline in smartgrids; (D) Develop an agenda to promote participation of a diverse student population in smartgrids training and research; (S) Achieve international leadership in smartgrids research and training.

Funder Acknowledgement: NSF HRD-1345232

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Poster Category: STEM Science and Mathematics Education

Engaging Minority Students in Software Engineering Through Active Learning in Software Engineering

Rajendran Swamidurai, Alabama State University
Co-Author(s): David Umphress, Auburn University, Auburn, AL

This paper presents an experience in designing, implementing, and evaluating an undergraduate course which incorporates software engineering industry best practices. Equipping students with knowledge about practical software development is problematic in today's academic arena. Colleges teach students the principles of software development, but that instruction is mostly theoretical and abstract. Developing working software requires specific knowledge in software engineering industrial practices. The traditional university curricula do not address these areas in any depth. We have taken a first step in departing from the traditional curricula by orienting an undergraduate course to software engineering practices. Course material on software engineering, including software process, is readily available. What is missing is the mechanism to expose students to real-world software issues encountered in the software industry. Using the four aspects of engineering as a starting point, we cataloged a number of common industry practices for accomplishing analysis, design, construction, and test. In this paper, we describe the design and implementation of the software engineering course, and then present the preliminary results and observations from the course.

Funder Acknowledgement: NSF HBCU-UP

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Poster Category: STEM Research

Informed Traveler Program and Applications

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Co-Author(s): Scott Graham, Gerald Inberg, Daniel Lueckerath, and Naphtali Rishe, FIU

The Informed Traveler Program and Applications (ITPA) is an advanced traffic advice and management system currently under development by Florida International University's High Performance Database Research Center.

ITPA will provide comprehensive real-time and predictive decision support in the areas of multi-modal and inter-modal transportation. Its two main objectives are to optimize local decision making by providing individual customers with all custom-tailored information on available multi-modal and inter-modal transportation options, and to optimize global traffic management by providing transportation service providers with management support to improve efficiency and effectiveness of their respective services, and to reach a new level of service by facilitating synchronized intermodal collaboration.

ITPA is focusing on advanced real-time and predictive analytics rather than extensive in-situ hardware and sensor systems. It heavily utilizes both crowd-sourced data, e.g. collected by smart -phone apps, and publicly available data, e.g. from toll and traffic monitoring stations. Without dedicated sensors at its disposal, ITPA often does not have exact information but reaches high rates of accuracy by utilizing geospatial data-mining technologies, combined with agent-based traffic modeling and simulation, and both exact mixed-integer program solvers and combinatorial meta-heuristics like genetic algorithms and ant-colony optimization. The smart-phone app allows users to request information (real-time and predictive) on traffic conditions and inter-modal transportation options, to reserve and pay for parking and seats on express transit, to buy tickets for events and to request transit for the demand responsive community transit system.

The computational server hosts the heavy-duty simulation and optimization modules which would otherwise hinder a low-latency response, e.g. for demand responsive community transit and conditional express transit rerouting, and predictive user behavior, traffic and parking pattern analysis. The routing server enables inter-modal routing and recommendations, e.g. considering pedestrian and car traffic (including parking recommendations), taxi cabs, express and community transit, short-term car and bicycle rentals, and serves as a bridge to other participating transportation service companies. The data base server administers an extensive data base of historical traffic data, updated in real-time from smart-phones, vehicle interaction modules and public data sources. It also stores a history of predictions, thus allowing for further validation and improvements of the predictive models. The communications server serves as a bridge between user devices and the other ITPA components, guaranteeing a low-latency response. It attends to user requests and demands corresponding services from the data base, computational and routing servers. The operations center module provides an overview on the (real-time and predictive) state of the transportation system, and provides detailed decision support for transportation planning and operations. The vehicle interaction modules consist of two-way communications hardware on board the transit vehicles. They include GPS trackers, tablet computers installed next to the drivers' seats, camera systems, and passenger information displays. They communicate via cell-phone network with the communications server, transmitting e.g. the vehicles' position, number of passengers and special events notifications from the drivers, and receive dynamic routing information and passenger information (e.g. ETAs, kept or missed connections). They also provide a Wi-Fi for passengers.

Funder Acknowledgement: National Science Foundation, US Department of Transportation, Florida Department of Transportation, and Miami-Dade Expressway Authority.

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Poster Category: STEM Science and Mathematics Education

Developing Game-Like Instructional Modules to Enhance Student Learning in Lower Level Core Computer Science Courses

Jinghua Zhang, Winston-Salem State University
Co-Author(s): Mustafa Atay, Rebecca Caldwell, and Elva J. Jones, Winston-Salem State University

Statistics have shown that fewer African Americans are pursuing Computer Science (CS) degrees relative to their proportion of the overall population and among those who do major in CS very few are employed as programmers. Struggling with the lower level core CS courses is the main barrier preventing students from declaring CS major and retaining students in the program.In this poster, we present our project of developing game-like instructional modules to enhance student learning in those gatekeeper courses namely Computer Programming I, Computer Programming II and Data Structures. The project involves implementing three components: Education, Assessment and Dissemination. The education component includes developing game-like instructional modules for those three courses, which will allow students to learn the difficult concepts in a gaming context.The assessment component includes establishing an advisory board for the project and implementing the evaluation plan. The dissemination component includes disseminating results through national conferences, outreach programs, computer science HBCU consortiums, publications and a faculty workshop.Several modules have been developed and evaluated in the computer programming and data structures classes at Winston-Salem State University. Assessment results show that game-like instructional modules had a positive impact on student learning.

Funder Acknowledgement: This study is funded by a grant from the National Science Foundation (NSF HRD-1137548).

Ecology, Environmental, and Earth Sciences

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Poster Category: STEM Research

Geospatial Models to Map Mercury Dynamics at Watershed Scale

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Over the past several decades, substantial environmental and ecological changes have occurred in the East Fork Poplar Creek (EFPC), a small East Tennessee Stream in the South Eastern United States because of historical pollutant discharges from the US Department of Energy's (DOE) site of Y-12 national security complex. The goal of this project is to develop a comprehensive understanding of the spatial and temporal dynamics of Hg loading and distribution in the EFPC. The objectives of the project are: 1) to develop a geospatial database from the long-term monitoring data for mapping the Hg distribution and toxicity in the EFPC and 2) to develop a geospatial model to map and predict the Hg concentrations. A comprehensive geospatial database which incorporated all the spatial and analytical data of the EFPC watershed was developed in this project. Our spatial analysis included GIS cluster analysis, spatial interpolation analysis and mapping. The GIS cluster analysis and mapping indicated that the bioaccumulation of Hg in Redbreast sunfish is showing an increasing trend in Lower EFPC (LEFPC) compared to Upper EFPC (UEFPC). The spatial interpolation analysis of Hg concentrations in soils showed higher Hg levels at certain locations along the LEFPC. The geospatial and analytical data will be coupled with quantitative prediction models in future to allow for a more in-depth evaluation of the landscape and physical watershed factors that affect the transport and fate of Hg in EFPC.

Funder Acknowledgement: DOE-VFP, ORNL, ORAU, NSF-HBCU-UP-RIA

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Poster Category: STEM Research

Estimating Breeding Origins and Sex-related Stopover Patterns of Four Migrant Songbird Species in Alabama Using Stable Isotope and Molecular Methods

Mercedes M. M. Bartkovich, Alabama A&M University
Co-Author(s): Yong Wang, Alabama A&M University, Normal, AL

Determining the breeding or natal origin of a population of migratory birds is essential for understanding factors that could be responsible for population changes. Migratory bird species have different migratory and energy reserve strategies that vary based on sex, age class, and breeding origin. This research examines the breeding origins and sex-related stopover patterns of four Neotropical migratory songbird species: Wood Thrush (Hylocichla mustelina; n=85), Eastern Wood-pewee (Contopus viren; n=79), Gray Catbird (Dumetella carolinensis; n=123), and Ovenbird (Seiurus aurocapilla; n=120). During the fall of 2007 and 2008 in the Walls of Jericho Management Area, Jackson Co., AL, 407 individuals were captured, banded, measured, and had two tail rectrices removed. Molt origin of these individuals was estimated using stable hydrogen isotope (deuterium, δD) analysis of the collected feathers. Deuterium values are stored in metabolically inert structures (e.g. feathers) where they are permanently retained until molting. These tissue isotope measurements contain information that can provide an estimated longitudinal origin of feather growth. In conjunction with isotope analysis, DNA extraction and polymerase chain reaction will be performed to determine the gender of each individual since these species are sexually monomorphic. Preliminary analyses indicate that Ovenbirds had the broadest and most northerly breeding grounds, while the Wood Thrush, Eastern Wood-pewee and Gray Catbird had more southerly and more similar breeding origins. There was a negative relationship between the deuterium values and timing of migration, meaning that individuals that bred the furthest north migrated through our stopover site later in the season. Most individuals of these species perform a trans-Gulf migration in the fall, and may use the inland forested sites in northern Alabama to prepare them for the long-distance non-stop flight over the Gulf of Mexico. Examining the breeding sites and sex-related stopover patterns such as timing, energetic conditions, and stopover length will improve our understanding of the connectivity of migration songbirds and enable the development of more effective conservation strategies for these bird populations.

Funder Acknowledgement: This study is supported by: National Science Foundation Centers of Research Excellence in Science and Technology (NSF CREST), Center for Forests and Ecosystem Assessment at Alabama A&M University (CFEA), Birmingham Audubon Society's Walter F. Coxe Research Fund, Alabama Ornithological Society's Dan C. Holliman Research Fund, and Alabama Experimental Program to Stimulate Competitive Research Graduate Research Scholars Program (ALEPSCoR GRSP).

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Poster Category: STEM Research

Impact of Soil Texture on Soil Ciliate Communities

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Soil water content and connectivity strongly influence microbial activities in soil, controlling access to nutrients and electron acceptors, and mediating interactions between microbes within and between trophic levels. These interactions occur at or below the pore scale, and are influenced by soil texture and structure, which determine the microscale architecture of soil pores. Soil protozoa are relatively understudied, especially given the strong control they exert on bacterial communities through predation. Here, ciliate communities in soils of contrasting textures were investigated. Two ciliate-specific primer sets targeting the 18S rRNA gene were used to amplify DNA extracted from eight soil samples collected from Sumter National Forest in western South Carolina. Primer sets 121F-384F-1147R (semi-nested) and 315F-959R were used to amplify soil ciliate DNA via polymerase chain reaction (PCR), and the resulting PCR products were analyzed by gel electrophoresis to obtain quantity and band size. Ciliate 18S rRNA sequences were obtained from a range of soil samples. Sequences were aligned against the NCBI GenBank database for identification, and the taxonomic classification of best-matched sequences was determined. Sequencing results demonstrate differences in soil ciliate communities in soils of different textures.

Funder Acknowledgement: NSF HBCU-UP Award #1238929; EPSCoR GEAR-RE program.

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Poster Category: STEM Science and Mathematics Education

Educational Partnership in Climate Change and Sustainability (EPiCCS)

Maurice Crawford, University of Maryland Eastern Shore
Co-Author(s): Andrij Horodysky, Hampton University, Hampton, VA

Our Education Partnership in Climate Change and Sustainability (EPiCCS) provides research and educational experiences thematically centered on sustainability and the effects of global climate change. EPiCCS builds on an ongoing partnership between the Hampton University (HU) Marine Science Department, Elizabeth City State University Biology Department, and VIMS (a leading research and educational institution) that have successfully trained underrepresented undergraduates and provided paths to graduate education in the geosciences. The EPiCCS project was designed to (1) support the development of underrepresented students in STEM (2) have new courses on Global Climate Change and Sustainability (3) use current technology to promote problem based learning and (4) engage the students in critical thinking and communication skills in the areas of Climate Change and Sustainability. We delivered a series of course modules that progressed from the basics of climate science, to recent global climate change effects, to solutions using green technologies and sustainable practices. We used Smartboard and video technology to deliver the course materials and share seminars between the universities. In addition, we advanced the training of students through workshops that developed their computer, presentation and communication skills. Students also participated in outreach projects to local communities centered on the sustainability theme. Finally, we involved the students in research projects during the academic year and worked to find students internships in REU and other summer research programs.

Funder Acknowledgement: Our project was supported by NSF HBCU UP, NSF REU and NOAA's LMRCSC.

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Poster Category: STEM Research

Attracting and Preparing Underrepresented Minority Students in STEM: Rethinking Bridge Programs

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Attracting and preparing underrepresented minority students in Sciences, Technology, Engineering and Mathematics (STEM) is crucial for the increasing workforce demand. Some universities made significant investments in summer bridge programs to better prepare STEM majors, but the attrition rate of underrepresented minority students remains relatively high. The traditional model of summer bridge programs often focuses on math or science. Unfortunately, the curriculum does not include soft skills such as teaching students how to learn and how to navigate a first career. The objective of this study was to design a summer learning experience centered on the student's perceived learning goals, cognitive awareness, social interactions, and attitudes towards the STEM sciences and assess the impact and outcome of a four week intentional summer program. As part of the National Science Foundation funded project at the University of the District of Columbia, a multi-disciplinary team of faculty developed and implemented an interdisciplinary hands-on course designed for junior and high school students. The program also was open to include incoming freshman students. The primary emphasis of this program included building students skills and abilities in the areas of: critical thinking, epistemology, creativity, analytical skills, technology competencies, team-building and collaboration, leadership, and self-esteem. We challenged enrolled students to meet high expectations by engaging them with critical research questions along with state-of-the-art computing and analytical lab technologies. The program was implemented over a three year period (2012-2014) for three different sub-groups of students. In the first year, we enrolled only the incoming freshman students and offered a tuition waiver for those who enrolled in the fall 2012 semester. The second year initiative, included senior and junior high

school students from the Washington, DC summer employment program, and the third year cohort included junior and senior students who self-identified as being interested in the STEM bridge program. The previous cohorts were not self-identified as interested in STEM. The content of the bridge program encompassed environmental computing, cloud computing, engineering design, mobile computing and a capstone project. The longitudinal results show that students perceived learning goals varied from cohort to cohort. In particular, the 2014 cohort of students demonstrated stronger entry-level preparation, which may correlate to recent core curriculum changes evident in the DC public school system. With better prepared students entering the bridge program, the outcomes were far stronger. Based on the results, one may conclude that including a comprehensive curriculum that weaves soft-skills into the objectives and a capstone project can attract and prepare underrepresented minority students for science and engineering curriculum.

Funder Acknowledgement: This project was funded by the National Science Foundation, Historically Black Colleges and Universities Undergraduate Program (HBCU-UP): Targeted Infusion Project Award No. 1137529.

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Poster Category: STEM Science and Mathematics Education

Strengthening STEM Academic and Research Programs at Kentucky State University

Buddhi R. Gyawali, Kentucky State University
Co-Author(s): Teferi Tsegaye, Jens Hannemann, Bruce Griffis, Maifan Silitonga, and Chi Shen

Kentucky State University has recently received two HBCU-UP Target Infusion Projects (TIP) to produce a competitive minority workforce in the STEM fields by designing, implementing and strengthening innovative teaching, learning, research, recruitment, retention and professional development strategies. The specific objectives of the projects are: (1) To increase the enrollment of students into the STEM programs; (2) To develop experiential research projects to enhance students opportunities in a broad range of scientific inquiry;(3) To enhance curricula of the STEM programs so that courses meet the highest possible standards and address the diverse backgrounds and learning capability of minority students; (4) To develop a minor in geospatial application; and (5) To develop student retention, faculty teaching and research enhancement programs. These goals and objectives will help integrate the KSU mission toward providing competitive education opportunities in STEM and liberal arts programs. To accomplish our goal and objectives, we undertake institutional reform and establish transformational strategies to strengthen and enhance STEM teaching, learning, research and to improve minority students' access to and retention in STEM programs by developing and adopting innovative strategies. These strategies include: developing cross-disciplinary teaching and mentoring programs for preparing student scholars and peer mentors, initiating an 'Adopt a STEM Student and High School Campaign' to develop STEM awareness and readiness activities for high school students such as summer apprentice programs and STEM Day; enhancing faculty expertise in the use of online teaching technology, laboratories and experiential learning sites; engaging students in project- and inquiry-based STEM research experiences; organizing student centered STEM events and networks; and initiating recruitment campaigns to target high schools through focused recruitment efforts, multidisciplinary dual-credit courses for STEM college preparation and learning skills enhancement efforts. The overall impacts of the project will be enhanced and quality teaching, innovative curricula and research, and increased production of competitive underrepresented students in the STEM disciplines.

Funder Acknowledgement: National Science Foundation-HBCU-UP-TIP

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Poster Category: STEM Science and Mathematics Education

International Research Experiences for Undergraduates and Graduates at Alabama A&M University, 2012-2014

Elica Moss, Alabama A&M University
Co-Author(s): Yong Wang and Lisa Gardner, Alabama A&M University, Normal, AL
Yulong Ding, Nanjing Forestry University, Nanjing, China

Alabama Agricultural and Mechanical University is a Historically Black University (HBCU) with a strong research focus in the agricultural and natural history fields. In the Department of Biological and Environmental Sciences, we have been building on a research and exchange program with Nanjing Forestry University (NFU) in China since 2009, through the China connections of Yong Wang, a research professor of ecology and statistics, and who is also co-PI with Elica Moss on this REU program. According to the National Science Foundation (2010), minority representation in the STEM fields is very low, accounting for only 16.4 % of all science degrees. Given this information, our two primary goals with this program are to (1) expose students underrepresented in the STEM (Science, Technology, Engineering, and Mathematics) fields to the entire research process, and (2) expose these same students to a new culture that is globally important and will allow them to compete in an increasingly competitive job market. Research is primarily focused on environmental and ecological effects of urbanization in a rapidly developing city. Students receive training in literature searches and scientific writing, research design and implementation, webpage production, PowerPoint poster and presentation creation, giving oral presentations, as well as a complete immersion in the Chinese culture for up to seven weeks. Students leave the program with an excellent understanding of what the entire scientific process entails, an understanding of the complexities of cross-

cultural collaborations, and a better understanding of their future research focuses.

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Poster Category: STEM Research

CSUB Center for Climate Change and Carbon Sequestration: A Progress Report After Three Years

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The central goals of CSUB CREST are to 1) conduct research constraining the effects of anticipated climate change on the people, industry, and environment of the San Joaquin Valley (SJV), CA and 2) conduct this research with students from the area as part of their education and developing aspirations to continue into PhD programs. This research will directly inform forecasts of water resources over the next several decades in addition to informing the selection of potential sites for geological carbon sequestration.

The first year focused on infrastructure buildup including construction of laboratory space, hiring and training of staff and faculty, and student recruitment. The focus then switched to research by a full cohort of faculty and students. Results began to bear fruit in the third year in the form of extensive presentations at regional, national, and international societal meetings. Presentations, mostly first-authored by CSUB students, were presented at the two most recent national meetings of the Geological Society of America. At the most recent meeting, CSUB CREST students formed one of the largest groups from any university in North America. In addition, an unprecedented 20% of the technical program of the West Coast meeting of the American Association of Petroleum Geologists in 2013 consisted of CSUB CREST presentations. Publication of this research is now maturing to print form in leading journals at a rate that will result in satisfaction of the Center's stated goals.

It was found that changes in river discharge into the SJV over the past 20,000 years has been driven by variations in sea-surface temperatures in the NE Pacific Ocean and stochastic processes have been identified that characterize the response of the areal extent and seasonal dependency of the Sierran snowpack to historical climate change. These two results will drive forecasts of changes in agriculture, geological hazards and natural vegetation in the valley and the adjacent Sierra Nevada mountain range, fruitful areas for future study that will benefit the citizenry of the area and serve as a global model for paired mountain/valley systems in other arid environments.

Two of the three candidate mature oil fields under consideration as targets for carbon sequestration have been fully characterized including reservoir structure, fluid production histories, and baseline descriptions of natural alterations in the host geological formations. Although these baseline studies show textures and chemical changes similar to those one would predict from the interaction of supercritical CO2 with the reservoirs, laboratory simulations show that, in one of the proposed reservoirs, CO2 injection may lead to alterations so severe that the integrity of one of the two reservoirs would potentially be compromised. The Stevens Sandstone reservoir of the North Coles Levee oil field maintained integrity after laboratory injection studies and has reservoir pressures that haven't changed appreciably over its production history. Thus it appears to be the best candidate of the three studied for sequestration.

Participation of students underrepresented in STEM fields was consistent with our high expectations. Despite the fact that there has only been time for one of three cohorts to graduate, we've already met 50% of the proposed number of graduates who would be accepted into PhD programs. Furthermore, an unprecedented number of CSUB students with Geology M.S. degrees are being recruited and hired by the petroleum industry and geotechnical industries.

The findings of a normative evaluation support the assertions that CSUB CREST has met or surpassed its expected outcomes after three years. Recommendations were forwarded for mid-stream changes in student mentoring and management that are being implemented. These include increased frequency of "all hands" meetings and richer interactions with independent student retention programs that already exist at CSUB.

Funder Acknowledgement: NSF HRD #113774

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Poster Category: STEM Research

Soil Organic Carbon Fractions and Hydrolysis in a Forest Ecosystem Following Prescribed Burning and Thinning

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The USDA Forest Service uses prescribed thin and prescribed low intensity, low frequency understory burning for forest restoration and regeneration following the detrimental southern pine beetle (Dendroctonus frontalis Z) epidemic at Bankhead National Forest. Fire regimes were imposed as: frequent fire (every 3 years), infrequent fire (every 9 years) and an unburned control. Stands density was manipulated by thinning the existing stands. This study evaluated the impact of prescribed burning and thinning on: (i) labile organic carbon fractions, (ii) carbohydrate hydrolases activities, and (iii) potential carbon mineraliza-

tion and components of dissolved organic matter. Soils used in this study were collected from the 0 to 10 cm depth in three replicates. Labile organic carbon were isolated using the density method whereas carbohydrate hydrolases activities were determined according to published protocols described in Methods in Soil Enzymology, and Methods of Soil analysis, Part 2: Microbiological and biochemical properties The soils were mostly acidic in nature with low nutrient content. Microbial biomass carbon content was higher in the reference plot than in the treatment plots. Thinning and burning insignificantly increase particulate organic carbon content compared to the reference plot. Enzyme activity was suppressed by various treatments although not significantly. Correlation analysis revealed a significant negative relationship between amino acid with xylanase and invertase. Particulate organic carbon and light fraction carbon significantly correlated with amylase, β-glucosidase and NAGase. Irrespective of treatment enzyme activity was in the order of xylanase > invertase > cellulose > NAGase > β-glucosidase > amylase. Minimal or no protein content was detected despite appreciable amount of amino acid content in this soil.

Funder Acknowledgement: This work was supported by NSF-CREST funds provided to Alabama A&M University. Trade or manufacturers' names mentioned are for information only and do not constitute endorsement, recommendation,or exclusion by Alabama A & M University.

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Poster Category: STEM Research

NSF CREST at the University of Hawaii Hilo

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The NSF CREST award #1345247, Understanding Biotic Response to Environmental Change in Tropical Ecosystems through a Place-Based Context, to UH Hilo's Tropical Conservation Biology and Environmental Science (TCBES) Program, focuses on three synergistic research themes:

1) Organismal Response to Environmental Change (OREC): The OREC team will examine the short- and long-term responses of key organisms to a range of environmental conditions, both steady and fluctuating, and will incorporate those results into models of landscape-level response to climate change.
2) Behavioral Response to Environmental Change (BREC): The BREC team will use emerging genetic and acoustic tools to examine the effects of anthropogenic change on important social behaviors in animals ranging from arthropods to whales.
3) Dynamic Interactions between Symbioses and Environment (DISE): The DISE team will explore the shift within the mutualism-pathogenesis-parasitism continuum in response to environmental changes in multiple culturally significant symbiotic systems, using genomics, transcriptomics, and metabolomics.
This work will: (1) advance faculty to a nationally competitive level in applying -omics to predict organismal responses to climate change and other environmental challenges; (2) produce PhD-level scientists who will be able to apply these concepts and techniques in a culturally relevant context; and (3) elucidate the impacts of climate change on the biological and social interactions among organisms over a wide geographic range in the Pacific region. We will also launch bioinformatics and bioacoustics laboratories, continue to engage underrepresented groups, and integrate environmental sciences and Native Hawaiian knowledge to further our understanding of the environment of Hawaii.

Funder Acknowledgement: National Science Foundation

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Poster Category: STEM Research

The Effects of Logging Slash on the Establishment of Big Bluestem Grass

Lorenzo Walton, Alabama A&M University
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Native forest restoration efforts often tend to neglect the herbaceous layer of the forest community and direct more attention to the desired tree species of the overstory. This is partially due to the lack of knowledge related to reestablishing the native ground layer concurrently with canopy restoration. Slash management techniques during harvest, and silvicultural treatments after harvest, such as herbicide applications, may prove to significantly impact the success of establishing native grasses. The purpose of this study is to examine how operational and silvicultural treatments affect native ground layer restoration. The study will be located in the Bankhead National Forest on xeric to xeric-mesic southern pine forest. The experiment will be organized as a randomized complete block split-plot design with three replicate blocks. Candidate sites with similar soil chemical characteristics will be chosen for the study. Three logging debris retentions representing different levels of surface coverage of slash (none, light, and heavy) will be compared. Slash treatments will also be compared with and without herbicide treatments. Plugs of big bluestem grass (Andropogon gerardii) will be planted after harvest treatments and herbicide treatments will be applied to designated plots. Success and growing rates will be examined through two growing seasons. Data will be analyzed using split-plot ANOVA with a random block effect. Outcomes of this research will benefit public and private landowners, who manage pine forests in the South, to have a better understanding in optimizing logging slash removal to improve site preparation while maintaining site productivity. Additionally, identifying effective ways of reestablishing bluestem grasses can develop ecosystems that are very beneficial for key game and non-game wildlife habitat that are preferred among hunters, bird watchers, and other forest visitors.

Funder Acknowledgement: NSF-CREST; McIntire-Stennis

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Poster Category: STEM Science and Mathematics Education

Increasing Minority Presence in Natural Resource Research Through Training

Yong Wang, Alabama A&M University
Co-Author(s): Lisa Gardner, Alabama A&M University

Alabama Agricultural and Mechanical University (AAMU) is a Historically Black University (HBCU) with a strong research focus in the agricultural and natural resource management. AAMU established the Center for Forest Ecosystem Assessment (CFEA) in 2004 with funding through National Science Foundation's (NSF) Center for Research Excellence in Science and Technology (CREST) program. The CFEA's mission is to 1) strengthen integrative, multi-disciplinary research for improved understand of forest ecosystems and 2) increase the number of trained professionals, especially minorities, engaged in research, teaching, and management of renewable natural resources. Over the past decade, CFEA has involved 44 faculty researchers and post-docs; 45 research assistants, associates, technicians, interns, and staff; 52 MS students; 17 PhD students; >150 undergraduate students, including >70 REU students; as well as many high school students participating in research. Many undergraduate students have continued on a research-oriented career trajectory. All graduate students and many undergraduate students have presented at professional meetings. Six received EPA STAR fellowship, 8 received NSF EPSCOR fellowships, 6 received NSF EAPSI fellowship and got the international training, 2 received NASA Fellowship, several have been awarded research funds, and many have received awards at national and regional meetings for their presentations or posters. Most of our graduates have gone on to successful careers in their fields; some are becoming leading researchers and science administrators making important discoveries or decisions for our nation's future.

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Poster Category: STEM Research

Center for Energy and Sustainability (CEaS): Development of a Premier Research Center at California State University Los Angeles

Feimeng Zhou, California State University Los Angeles
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The NSF-CREST Center for Energy and Sustainability (CEaS) was established at CSULA in 2009 with the mission to conduct research on and to increase awareness of sustainable energy and mentor and prepare for advanced degrees a group of students who have been underrepresented in the STEM fields. Faculty in the center (CEaS), have made significant strides in various areas such as (1) Photovoltaics: where multiple methodologies and materials are being tested to develop novel photovoltaic materials. (2) Fuel cells: where the broad goals of are to develop a novel microfluidic-based direct methanol fuel cell (µDMFC) and to assess its efficiency. (3) Carbon sequestration: that focuses on obtaining a predictive understanding of changes in the biogeochemistry of soils and the concomitant changes in water quality caused by leakage of subsurface carbon dioxide. (4) System modeling: where the focus is on the development of mathematical models, algorithms and numerical simulations of different energy-related phenomena and systems investigated by other research thrusts. Our success in achieving the mission of the center is reflected by: (a) the number of publications by the 13 Center faculty, which tripled since the first year; (b) 37 of our 83 graduating students are pursuing MS and PhD degrees in STEM; (c) the Center faculty were successful in obtaining more than 10 million dollars in external funding and; (c) research infrastructure at CSULA has been updated to the tune of over $3 million dollars, with many of the instruments being directly related to materials and energy research. These numbers are remarkable considering the bulk of the Phase I period coincided with the federal government's budget "sequestration" and the financial turmoil that hit the State of California. These accomplishments demonstrate the efforts and determination of the CEaS faculty and the institutional support for energy research. CSULA currently operates the largest university hydrogen fueling facility (4.4 million dollars through a combination of university investment and grants) in the US. Bolstered by the enhanced research infrastructure and elevated productivity during Phase I, CSULA has set as an institutional goal the development of CEaS as a premier research center among all masters level institutions in the Western US.

Funder Acknowledgement: National Science Foundation: CREST Program

Mathematics and Statistics

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Poster Category: STEM Science and Mathematics Education

Increasing Recruitment and Persistence of Underrepresented Minorities in STEM Career Pathways

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

Lawson State Community College currently has two grants designed to create pathways into professional careers in science, technology, engineering, and mathematics (STEM) through awareness activities, field experiences, teaching and learning through problem-based learning concepts, and the establishment of a college bridge program at Lawson State Community College (LSCC). The 2-Pi STEM Program and Georgia-Alabama Louis Stokes Alliance for Minority Participation (GA-AL LSAMP) at Lawson State has given students, teachers, and educational partners the opportunities to capitalize on their roles in the development of STEM career pathways. Additionally, faculty involvement in the partnership has increased their academic, technical performance, and knowledge of STEM careers. The projects have spanned more than eight-years with funding from the National Science Foundation, Association of Public Land-Grants, Lawson State Community College, educational partners, and business/industry. The three primary goals, identified to increase student recruitment and persistence in STEM career pathways was the establishment of 1) a mentoring program to address cross-curricular mentoring and learning communities for STEM students with an emphasis on improving STEM persistence and efficacy in STEM courses; 2) provide STEM enrichment and academic enhancement programs for high school and undergraduate students; and 3) the establishment of the STEM Bridge Pathways to College Project.

Funder Acknowledgement: The 2-Pi STEM Program is funded by the National Science Foundation's HBCU-UP Program. The Georgia-Alabama Louis Stokes Alliance for Minority Participation is funded by the National Science Foundation's Louis Alliance for Minority Participation.

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Poster Category: STEM Science and Mathematics Education

Development of Undergraduate Bio-track Program: A Targeted Infusion Project of Fisk University

Sanjukta Hota, Fisk University

Fisk University, Nashville, TN received HBCU-UP Targeted Infusion Project funding of NSF for the period of July 2013-June 2016 to develop an undergraduate bioinformatics and biomathematics track to enhance undergraduate STEM education, research, and future careers of Fisk students. In the poster I will highlight the major activities of this interdisciplinary project, accomplishments up to this point, challenges faced, its impact on the students and on various aspects of the institution and finally, the expected outcome in future.

Funder Acknowledgement: NSF

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Poster Category: STEM Research

NSF HBCU-RISE AMCA Center at North Carolina A&T State University

Yevgenii Rastigejev, North Carolina A&T State University
Co-Author(s): Y.L. Lin and G. Tang, North Carolina A&T State University

We have established HBCU-RISE Center for Advanced Multi-scale Computational Algorithms (AMCA) at North Carolina A&T State University (NCA&T). The center develops and enhances research and educational infrastructure in the area of advanced multi-scale numerical algorithms for computational modeling of tropical cyclone dynamics and atmospheric chemical transport at NCA&T. One of the major focuses of this project has been training of five Master's, seven Doctoral students and one Post-doctoral Researcher. We have been putting significant effort into recruitment and retention of underrepresented minority students and U.S. citizens. Specifically, six Doctoral and three Master's students are U.S. citizens or U.S. permanent residents. All U.S. students except two are under-represented minority and/or female students.

We have build a hierarchical structure of research personnel with a research faculty member in charge of leading research projects administratively and intellectually and a postdoctoral associate focusing on scientific tasks and offering constant support to graduate students participating in the research projects.

During the project period, the students have been working on:

- Development of the Optimized Wavelet-based Adaptive Mesh Refinement (OWAMR) numerical algorithm and numerical code for global Atmospheric Chemical Transport (ACT) modeling.
- Application of OWAMR numerical algorithms to computational modeling of challenging multi-scale Global ACT problems.
- Atmospheric flow simulations with concentration on tropical cyclone analytical and numerical modeling.
- Numerical simulations of cold-air damming with Weather Research and Forecasting (WRF) model and numerical code.
- Numerical simulations of orographic impacts on tornadic thunderstorms with WRF model and numerical code.
- Development of a real-time weather forecasting system (NCAST, http://forecast.ncat.edu) that is used for numerical weather forecast education and service to the university community.

A significant number of research papers have been published and submitted for publication by AMCA students and PIs in top-tier scientific journals. The results of scientific research have been and will be presented at top international and national meetings.

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Poster Category: STEM Science and Mathematics Education

Evolution and Impact of Interdisciplinary STEM Undergraduate Research Programs at North Carolina A&T State University

Guoqing Tang, North Carolina A&T State University
Co-Author(s): Caesar R. Jackson, School of Graduate Studies, North Carolina Central University

In this poster presentation we will present our ongoing efforts in developing and sustaining interdisciplinary STEM undergraduate programs at North Carolina A&T State University (NCA&T), a state-supported HBCU and National Science Foundation (NSF) Historically Black Colleges and Universities Undergraduate Program (HBCU-UP) Institutional Implementation Project grantee. Through three rounds of NSF HBCU-UP implementation grants at NCA&T, a concerted effort has been made in developing interdisciplinary STEM undergraduate research programs in geophysical and environmental science (in round 1), geospatial, computational and information science (in round 2), and mathematical and computational biology (in round 3) on NCA&T campus. We will present brief history and background information about the interdisciplinary STEM undergraduate research programs developed and sustained at NCA&T, give rationales on how these programs had been conceived, and summarize what has been achieved. Next we will give a detailed description on the development of undergraduate research infrastructure including building research facilities through multiple and leveraged funding sources, and engaging a core of committed faculty mentors and research collaborators. We will then present, as case studies, some sample interdisciplinary research projects in which STEM undergraduate students were engaged and project outcomes. Successes associated to our endeavor in developing undergraduate research programs as well as challenges and opportunities on implementing and sustaining these efforts will be discussed. Finally, we will discuss impact of well-structured undergraduate research training on student success in terms of academic progression, retention, graduation, continuing graduate study or after graduation job placement.

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Poster Category: STEM Science and Mathematics Education

Variational Method and Periodic Solutions in Celestial Mechanics

Zhifu Xie, Virginia State University
Co-Author(s): Tiancheng Ouyang, Brigham Young University, Provo, UT

In this poster, we introduce our current research on the variational method with Structural Prescribed Boundary Conditions (SPBC). We apply it to discover new periodic solutions and also to theoretically prove the existence of such solutions.
In the past decade, the existence of many new interesting periodic orbits is proved by using variational method for the n-body problem. Most of them are found by minimizing the Lagrangian action on a loop space with symmetric and/or topological constraints. Our new variational method by minimizing the Lagrangian action on a path space with SPBC largely complements the current variational methods. An exciting new stable choreographic solution which is called star pentagon choreography has not only been numerically discovered but also been theoretically proved by this method in the Newtonian planar four-body problem. Significantly different from the remarkable figure-eight solution, we proved that the unequal mass variants of the stable start pentagon are just as stable as the basic equal mass choreography. This fact makes the beautiful star pentagon orbit all the more remarkable because such periodic solutions actually have more chance to be seen in some quadruple star system.

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Nanoscience

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Poster Category: STEM Science and Mathematics Education

Hands-on Scanning Probe Microscopy for High School Students

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Introducing Science, Technology, Engineering and Mathematics (STEM) in general and nanotechnology concepts in particular to pre-college students through hands on activities is a great venue to engage, inspire and stimulate youngsters about these fields and potentially opening their eyes to choosing them as careers. Through multiple and focused outreach activities, we aim to raise awareness of the importance of STEM education from early ages for a diverse population. We strive to encourage under-represented students including women and minorities to pursue STEM careers. We believe that these outreach efforts would inspire the next generation of scientists and engineers and build a strong STEM pool of U.S. citizens talents at different levels much needed for the nation. In academic year 2013/2014 we reached more than 1,300 K-12 students through outreach events on and off campus. Among our successful outreach programs, is the high school summer research program. We report on the 2014 high school summer research program where we hosted 22 high school students from 17 local high schools mainly from the Hampton Roads in VA. There were 13 female and 9 male students among them 17 minorities including African

American and Asians. The goals of the program are to broaden the student's experimental experience and develop critical thinking through reasoning, inquiring, and problem solving. In addition, the program aimed for the students to gain independence and confidence in performing lab work, to work in team environment and to learn by doing. We have adapted the activity "Building "Macro" Atomic Force Microscopy (AFM) For High School Classrooms by Paul Fedoroff et al. After laboratory safety training and introduction to nanotechnology concepts and scanning probe microscopy, the high school students were split into three groups. The students were trained on the safe use of power tools and were able to follow directions to build three setups of the Macro-AFM: the contact mode, the tapping mode and the magnetic mode. The students were asked to choose random objects to scan using the three modes of the Macro-AFM. Using MS Excel, students were able to realistically reproduce the surfaces of the scanned objects. The students were trained on the use of a laboratory Vecco AFM and scanned few surfaces. The students took real scans at the micro and nano levels for few objects. The internship lasted 5 weeks and the participating students presented their results in public poster session at the closing ceremony. The students received a stipend and a certificate of participation upon completion of the program.

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Poster Category: STEM Research

Modification of the Co-Precipitation Method to Synthesize Iron Oxide Nanoparticles with Higher Specific Absorption Rates

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Thanks to advances in nanotechnology, it has become possible to synthesize, characterize, and especially modify the surface of nanoparticles for biomedical applications. Due to their promising properties, several investigations have been carried out in the biomedical field using nano-scaled iron oxide magnetic nanoparticles, usually called ferrofluids, such as magnetite (Fe3O4). The properties of iron oxide nanoparticles are remarkable, particularly for their promising role in the biomedical field especially in diseases like cancer. However, the preparation method of these nanoparticles has become a challenge primarily because their properties are strongly influenced by particle size, shape, agglomeration and size distribution. These nanoparticles have demonstrated superparamagnetism characteristics at room temperature, in which is obtained an accurate ratio and pH range when compared to the conventional protocol. The hypothesis of this project is that by optimizing the conventional co-precipitation synthesis protocol, nanoparticles with a smaller hydrodynamic diameter can be produced along with less agglomeration, higher magnetization properties and a higher Specific Absorption Rate (SAR). To this end, an experimental design was developed to investigate the effect of temperature and peptization on the resulting SAR values. Focus was given to temperature at a range of 20˚C-30˚C and 80˚C along with the condition of peptization, incorporating the use of an ultra-sonicator probe. To increase the magnetization properties of the particles sodium hydroxide (NaOH) was added in a scaled down co-precipitation synthesis with two different experimental set ups. Nanoparticle characterization techniques like Dynamic Light Scattering (DLS) and UV-Vis spectroscopy were carried out to measure the hydrodynamic diameter and the iron concentration, respectively. Preliminary results indicated a decrease in the diameter of the nanoparticles at room temperature and a more effective peptization. Lately, by understanding and optimizing the conventional co-precipitation protocol, our findings will improve the heating efficiency of the nanoparticles which will increase their potential for biomedical applications.

Funder Acknowledgement: This study was supported by a research grant from RISE-2-Best Program, NIH-R25GM088023, and Center for Research Excellence in Science and Technology (CREST), NSF-HRD-1345156.

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Poster Category: STEM Science and Mathematics Education

CREST: Center for Functional Nanoscale Materials at Clark Atlanta University

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Clark Atlanta University's Center for Functional Nanoscale Materials (CFNM) was established in 2006, through the NSF CREST Program. The Center for Functional Nanoscale Materials constitutes a concentration of researchers, teachers and resources devoted to addressing the need for increasing the pool of talented scientists and maintaining technical competitiveness in the nanosciences. The Center's work is substantially impacting and increasing the number and participation of talented minority scientists and is maintaining the technological competitiveness of this nation. The Center is a true success in a time when number of doctorates awarded to African and Hispanic Americans are far less than their proportion in population. The Center's success also reflects the important role HBCUs are playing in developing the next generation of STEM graduates. The Center for Functional Nanoscale Materials has been extremely suc-

cessful in developing the research infrastructure, programmatic offerings and intellectual resources to transform Clark Atlanta University into a major player in materials science research. Twenty-two graduate students are currently carrying out their research under the auspices of the Center of Functional Nanoscale Materials. The Center has become a major producer of doctoral students from groups underrepresented in the science and technology areas.

Accomplishments over the past five years include:

- graduating fifteen (15) doctoral students and seven (7) masters students
- over eighty (80) refereed papers

The Center has significantly impacted the precollege community by conducting the CFNM/PRISM (Problems and Research to Integrate Science and Mathematics). This program engaged precollege teachers in learning to use the Problem Based Learning technique (PBL), which is an active learning technique that seeks to engage students in problem-solving activities. Each CFNM/PRISM teacher Fellow was paired with a graduate student at the beginning of the summer, during which time they learned the Problem Base Learning techniques and worked alongside their graduate student partner in the laboratory. The teacher-graduate student team then developed a Problem Based Learning case and during the subsequent academic year the teacher-graduate student team field tested these cases in the classroom.

Additionally, the Center for Functional Nanoscale Materials conducts a very successful summer research program for undergraduates from campuses across the Nation. Participants in this program carry out meaningful research and participate in a number of academic enrichment experiences. Additionally, beginning in the summer of 2011, the Center became an ACS project SEED site with the goal of engaging high school students from low income settings in cutting edge materials research. As an ACS Project SEED site, the Center is now tapping into the vast group of talented, determined and gifted young men and women.

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Poster Category: STEM Research

Li-doped ZnO Nanoparticles for Potential Photodynamic Therapy Applications

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Photodynamic therapy (PDT) is an alternative to traditional cancer treatments. This approach involves the use of photosensitizing (PS) agents and their interaction with light. As a consequence, cytotoxic reactive oxygen species (ROS) are generated that, in turn will destroy tumors. On the other hand, ZnO is a biocompatible, nontoxic, and biodegradable material with the capability to generate ROS, specifically singlet oxygen (SO), which makes this material a promising candidate for 2-photon PDT. Doping ZnO with Li species is expected to induce defects in the host oxide structure that favored the formation of trap states that should affect the electronic transitions related to the generation of SO. The present work reports the effect of the level of Li-doping on the ZnO structure and its capability to generate SO. Li-doped ZnO nanoparticles were synthesized under size-controlled conditions using a modified version of the polyol route. The X-Ray diffraction measurements confirmed the development of well-crystallized ZnO Wurtzite; the average crystallite sizes ranged between 13.3nm and 14.2 nm, with an increase in Li content. The corresponding band gap energy values, estimated from UV-vis spectroscopy measurements, decreased from 3.33 to 3.25 eV. The Photoluminescence spectroscopy (PL) measurements of Li-ZnO revealed the presence of emission peaks centered on 363nm, 390nm, and 556 nm; these emission peaks correspond to the exciton emission, transition of shallow donor levels near of the conduction band to valence band such as interstitial Zn, and oxygen vacancies, respectively. The observed increase of the emission intensity of the 390 nm emission peak, relative to the intensity of the main emission peak at 363 nm, was attributed to the promote of trap states due to interstitial Zn or Li-incorporation into the host oxide lattice. SO measurements evidenced the enhancing effect of the Li concentration on the capability of the doped ZnO to generate this species. This Li - dependence of SO generation can be attributed to the enhancement of the concentration of trap states in the host ZnO, as suggested by PL measurements. Accordingly, Li-ZnO would become cytotoxic to cancer cells via photoinduced ROS generation and enables this nanomaterial to be considered a potential direct PS agent for cancer treatment by the 2-photon PDT approach.

Funder Acknowledgement: This material is based upon work supported by the National Science Foundation (NSF) CREST Grant No. 0833112.

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Poster Category: STEM Research

Effect of Eggshell Nanopowder on the Thermal and Mechanical Properties of Eco-friendly Polymer Matrix

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In order to examine the effect of a bio sourced filler material on a high green content polymer formulation, eggshell nanopowder (ENPs) was prepared using mechanical attrition and ultrasound techniques. This was characterized with XRD and TEM. Super Sap 100/1000 bio based epoxy/ENPs composites were then fabricated and characterized using XRD, AFM, TEM-EDS, thermal, thermomechanical and mechanical testings equipment. The results showed significant improvements of 7-22% in the storage moduli as well as 3-17% reduction in coefficient of thermal expansion (CTE). Also, major delays in 5% decomposition temperatures and increases in char yields were realized. The flexure strength, modulus and toughness significantly increased by 6-31%, 11-37% and 10-36% respectively due to the addition of ENP. Microstructure analysis of fractured surfaces showed deflected crack paths which contributed to improve the toughness.

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Poster Category: STEM Research

Computational Biology and NanoBiotechnology Undergraduate Research and Education (CNURE) Program

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The HBCU-UP CNURE Program at ASU includes various strategies to strengthen undergraduate curricula, research, recruitment and retention activities in STEM disciplines with emphasis in the area of computational biology and nanobiotechnology. These approaches aim to train minority students in STEM disciplines to increase the numbers of minorities in the work-force, specifically in high demand STEM areas.

CNURE targets enhancement of STEM courses and curriculum; research experience to undergraduates through academic and summer research opportunities at major institutions, private companies, international institutions and federal laboratories; faculty research and professional development; infusion of technology into teaching and research; and retention and transition of STEM students through high school to graduate school. Currently, CNURE has provided research and educational opportunities to 46 students (24 STEM undergraduates/22 high school students). Sixteen (16) high school students have so far matriculated to ASU and six (6) STEM undergraduates have transitioned to STEM graduate programs. Since 2011, faculty and students have presented over 290 presentations at national and international conferences, published 57 manuscripts in prominent journals and conference proceedings, 41 guest speakers from research intense institutions were invited to present scientific seminars to both faculty and students and a total of 10 grant awards have been funded to STEM faculty. To bring the accomplishments of STEM disciplines and science programs at ASU to the community, a Science@ASU magazine is published annually.

The project is disseminated widely through conferences, meetings and publications and program website (www.alasu.edu/hbcuup).

Funder Acknowledgement: National Science Foundation HBCU-UP Program - Award Number: 1135863.

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Poster Category: STEM Research

Center for NanoBiotechnology Research (CNBR) at Alabama State University (ASU)

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The CNBR at ASU aims to enhance research infrastructure to perform world-class research and advance knowledge in the areas of nanobiotechnology and nanogenomics; enhance research capability at ASU to become a highly competitive research Center; develop human resources for the future with focus on minority workforce; integrate research into education and collaborate with U.S. institutions, industries and global partners to become globally competitive in emerging scientific technologies.

The Center supports three integrated research projects with goals to develop novel nanomaterials, which are biologically active and explore their applications in viral, bacterial and eukaryotic systems. The effect of novel nanomaterials is studied at genomic levels in both the host and the pathogen. Currently, the Center works with over 20 national and international institutions and industries. Since its establishment, more than 450 national and international scientific conference presentations were made, over 130 manuscripts published in prominent journals and conference proceedings, have trained 15 PhD students in microbiology, 18 M.S. students in biology, 43 STEM undergraduates, 69 high school students, and hosted 6 international scholars. The Center has been awarded its first US patent (US 8,815,295 B1) for development of a new nanomaterial to treat

respiratory syncytial virus (RSV). A second patent for development of a novel nanomaterial to control inflammation is currently pending.

The project is disseminated widely through conferences, meetings and publications and program website (www.alasu.edu/crest).

Funder Acknowledgement: National Science Foundation CREST-Award Number: 1241701

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Poster Category: STEM Research

Tunnel Junction Based Molecular Spintronics Devices

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Scope of molecule based devices may govern the advancement of the next generation's logic and memory devices. Molecules have the potential to be unmatched device elements as chemists can mass produce an endless variety of molecules with novel optical, magnetic, and charge transport characteristics. However, the biggest challenge is to connect two metal leads to a target molecule(s) and develop a robust and versatile device fabrication technology that can be adopted for commercial scale mass production. This paper discusses distinct advantages of utilizing commercially successful tunnel junctions as a vehicle for developing molecular electronics and molecular spintronics devices. We describe the use of a tunnel junction with the exposed sides as a testbed for molecular devices. On the exposed sides of a tunnel junction molecules are bridged across an insulator by chemically bonding with the two metal electrodes; sequential growth of metal-insulator-metal layers ensures that separation between two metal electrodes is controlled by the insulator thickness to the molecular device length scale.

This paper critically analyzes and discusses various attributes of tunnel junction based molecular devices with ferromagnetic electrodes for making molecular spintronics devices. Here we also strongly emphasize a need for close collaboration between chemists and magnetic tunnel junction researchers. Such partnerships will have a strong potential to develop tunnel junction based molecular devices for the futuristic areas such as memory devices, magnetic metamaterials, and high sensitivity multi-chemical biosensors, etc.

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Physics

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Poster Category: STEM Research

Crystal Growth and Spectroscopic Properties of Rare-Earth doped KPb2Cl5

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We report on the educational efforts and research training in the area of luminescent materials development at Hampton University. The luminescent properties of rare-earth doped solids have been under intense exploration for a wide range of applications ranging from displays and lasers to scintillators. Potassium lead chloride (KPb2Cl5) materials have recently emerged as new non-hygroscopic laser hosts with low maximum phonon energies (~208 cm-1), which lead to small non-radiative decay rates for trivalent rare earth dopants. In this work, the material purification, crystal growth, and spectroscopic properties of rare-earth ions (Eu3+, Ce3+, and Pr3+) doped KPb2Cl5 (KPC) were investigated for possible applications in infrared lasers and radiation detectors. Undergraduate students were involved in training from materials preparation/synthesis and crystal growth using Bridgman technique as well as laser-induced fluorescence spectroscopy. The trivalent praseodymium ion (Pr3+) offers a large number of laser transitions in the visible and infrared (IR) spectral regions. Under Xenon flash lamp excitation, preliminary spectroscopic results showed Pr3+ 5d-4f emission centered ~385 nm accompanied by weak Pr3+ 4f-4f emission ~480-680 nm in Pr:KPC. In addition, allowed 5d-4f emission centered at ~375 nm was also observed in Ce:KPC. Detailed spectroscopic results including time-resolved excitation and emission as well as temperature dependent emission studies of the investigated crystals will be presented at the conference.

Funder Acknowledgement: National Science Foundation through grant HRD-1401077

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Poster Category: STEM Research

The Center for Gravitational Wave Astronomy: Its Present and Its Future

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Co-Author(s): Matthew Benacquista

In this poser we examine the research and educational activities of the Center for Gravitational Wave Astronomy (CGWA) at The University of Texas at Brownsville (UTB). The CGWA was founded in 2003 through a grant from the NASA URC program. It has been supported by CREST since 2007. We present the successful strategies adopted to develop a quality research capacity at UTB and the changes experienced by the institution during this time. We examine the evolution of its research portfolio over the years and its relationship to recruitment and retention of undergraduate and graduate students in physics and engineering. We discuss the future of the CGWA in the context of two major changes at the institutional and regional level. First, state law is dissolving UTB and the University of Texas Pan American (UTPA) and merging their infrastructure to create a new university -- the University of Texas Rio Grande Valley (UTRGV). This new institution is charged to become a research intensive university. Second, SpaceX, one of the most powerful private NASA contractors, will be building a space port in the city of Brownsville. These two factors will completely change the dynamics of the lower Rio Grande Valley (an area that covers two of the poorest counties in the USA) and position the CGWA to strengthen its research and educational activities at UTRGV to a new level. We discuss the future of these activities.

Funder Acknowledgement: The CGWA acknowledges partial financial support from the National Science Foundation, the National Aeronautics and Space Administration, and the USA Department of Defense.

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Poster Category: STEM Science and Mathematics Education

Institutional Change Through Faculty Advancement in Instruction and Mentoring--ICFAIM

Mehri Fadavi, Jackson State University

Institutional Change Through Faculty Advancement in Instruction and Mentoring (ICFAIM) is an implementation project at Jackson State University (JSU) that builds on two successful previous implementation projects, the Mississippi Academy for Science Teaching Project MAST and MAST-5, both of which provided professional development for K-12 science teachers from more than twenty districts in Mississippi over a period of 10 years. Funded by the National Science Foundation (NSF), ICFAIM's goal is to increase the retention of undergraduate students in the College of Science, Engineering and Technology (CSET) by helping its faculty members and graduate students improve their teaching and mentoring. This program focuses its initial efforts on the Department of Physics, Atmospheric Sciences and Geoscience (PASGS) by providing faculty professional development workshops in student-centered pedagogy and delivering professional development and mentoring. This program also works to support the department's efforts to revise the content of entry-level physics courses and their respective labs.

By improving the efficacy of faculty mentoring and developing a research methods course, ICFAIM will increase the number of research opportunities both on campus during the academic year and with partnering institutions year round; the program hopes that this will help increase undergraduate research participation. Specifically, ICFAIM's objectives are to: 1.) increase STEM faculty capacity for learner centered pedagogy, research mentoring, and build collaborative infrastructure; and 2.) increase enrollment, retention and graduation rate of students through curricular change, improved pedagogy and formal research experiences coupled with strong mentoring.

In the first year of this study, the purpose was to provide baseline and implementation data from ICFAIM's professional development program, to understand the contextual factors that facilitate or impede this process, to gather evidence of the effect of program workshops, and to gather evidence of the effect of program participation on participating faculty, and student outcomes. Rockman Et Al, the external evaluator employed a qualitative evaluation design with some quantitative components that triangulated several data sources. This design offered a dual focus of providing formative evaluation information describing implementation and highlighting areas for potential improvement, and yielding summative evidence of the short-term outcomes of the ICFAIM program.

Funder Acknowledgement: National Science Foundation-HBCU UP

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Poster Category: STEM Science and Mathematics Education

TIP Grant: Development and Enhancement of the Physics Laboratories at WSSU

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The major goal of this Targeted Infusion Project (TIP) grant is to enhance, develop, and modernize the Physics laboratories at Winston-Salem State University (WSSU), while integrating research and education. In particular, for the Modern Physics and Nonlinear Optics laboratories, we have developed a complete experimental set up for four-wave mixing in photonics crystal fiber and acquired fiber-optics coupled Raman spectroscopy systems from Kaiser Optical Systems and Horriba Scientific. For the Renewable Energy laboratory, we have acquired solar sets of Stirling engines as well as an ultra-broadband solar reflectometer. For the Biophysics laboratory, we have acquired computer-controlled Electrocardiogram sensors, a Diffusion-osmosis apparatus, and the Human-arm model. For the Computational Physics and Physical Chemistry laboratories, we have acquired a Gaussian software. And finally for the Introductory Physics laboratory, we have acquired computer-controlled force sensors and

enhanced experiments on Conservation of Energy, Conservation of Momentum, Ohm's Law, and Electromagnetic Induction. This TIP has directly impacted STEM students enrolled in the Introductory Physics, Modern Physics, Biophysics, and Renewable energy courses. The project has also impacted the research training of students in the areas of Nonlinear Optics, Computational Physics, and Computational Chemistry. Our research assistant students have disseminated their works by presenting posters at national, regional, and local conferences (ERN-2014, SERMACS 2013, and the 2013 WSSU's Research Day). Furthermore this TIP has assisted in sustaining students' retention and enrollment in the Physics Minor program at WSSU.

Funder Acknowledgement: This material is based upon work supported by the National Science Foundation under Grant Number 1238795 (HRD-HBCU-UP).

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Poster Category: STEM Science and Mathematics Education

Targeted Reinvigoration of Critical Key Aspects of the Undergraduate Physics Program in the Department of Physics and Astronomy at Howard University

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Specific critical aspects of the undergraduate program in the Department of Physics and Astronomy at Howard University have been reinvigorated via a targeted infusion approach. As a result of this effort, there is now an improved learning environment, which has been driven by four major activities: (1) Implementation of an Atmospheric Physics minor; (2) Conversion of the existing General Astronomy course into a hybrid on-line/laboratory class; (3) Upgrading of the Howard University Planetarium & Astronomical Observatory; and (4) Development of a Recruitment/Scholarship Program and Peer Support/Tutorial Program for Physics majors.

Funder Acknowledgement: Financial support from the National Science Foundation (Award No. HRD-1238383) is gratefully acknowledged.

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Poster Category: STEM Research

NSF-CREST: Advanced Center for Laser Science and Spectroscopy

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The CREST Advanced Center for Laser Science and Spectroscopy (ACLaSS) at Hampton University continues to enhance human resource development of minority students, and strengthen the research and education infrastructure. The goals of ACLaSS are to: 1) advance the research and education center with cutting edge laser sciences and spectroscopy; 2) develop and implement graduate and undergraduate educational modules; 3) provide extensive research and educational opportunities to graduate and undergraduate students; and 4) strengthen the pipeline of students pursuing advanced degrees in science and technology through outreach activities and summer workshops, and 5) provide educational opportunities in laser science and spectroscopy to high school teachers and students in grades K-12. The ACLaSS involves the participation of a diverse group of faculty and students from the Physics, Chemistry, and Atmospheric and Planetary Sciences Departments at Hampton University, as well as scientists at other national and international institutions, industries, and government agency laboratories.

Funder Acknowledgement: The research and education activities are supported by NSF HRD: 1137747.

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Poster Category: STEM Research

CREST Phase II: Computational Center at North Carolina Central University

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The goal of the Computational Center for Fundamental and Applied Science and Education (CCFASE) is to develop strong interdisciplinary, integrative research programs and research-based educational training that enhances the existing undergraduate and graduate curriculum at NCCU, thus expanding the University's ability to increase minority representation in the sciences. We are establishing sustainable, nationally recognized, computationally driven, complementary and closely interwoven research across four areas: (1) Development of novel nanomaterials and application of these materials in advanced optoelectronic devices; (2) Low-to-medium-energy nuclear and hypernuclear few-body physics; (3) Intelligent systems and robotics; and (4) Geophysical characterization of intraplate seismic zones.

The projects are internationally recognized and have the potential for large positive impacts in their respective scientific fields. Major results from these areas include: accurate calculations of the three-body scattering problem with charged particles, and the four-body problem when three particles are different; development of highly efficient and accurate computational codes for simulation of nanostructured materials; improving synergistic autonomous team capabilities of multiple robots and object

recognition software; and potential field and tomography studies. The computational structures developed in Phase II will position NCCU closer to the goal of establishing a National Center in Applied Computational Sciences. CCFASE has significantly enhanced the STEM research and education capacities at NCCU, and is now leading the transformation of NCCU from a teaching to a research intensive institution. The Phase II center is broadening the educational and research infrastructure to enable the expansion of PhD programs to all STEM disciplines at NCCU, thereby contributing to a more diverse, highly-skilled scientific workforce. CCFASE also supports the HBCU computational science network that enhances collaborations in science and education between minority institutions throughout the region, creating opportunities for student participation in advanced research and facilitating collaboration between HBCU researchers and external research institutions and industry. CREST is also integrating research into student education, improving matriculation, graduation and postgraduate study rates among African American and female STEM students.

Funder Acknowledgement: This work is supported by the NSF HRD-1345219 award.

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Poster Category: STEM Research

Accurate Quantum States for a 2D-dipole

Daniel Vrinceanu, Texas Southern University

Edge dislocations are crucial in understanding both mechanical and electrical transport in solids and are modeled as linear distributions of dipole moments. The calculation of the electronic spectrum for the two dimensional dipole, represented by the potential energy V(r, theta) = p cos(theta)/r has been the topic of several studies that show significant difficulties in obtaining accurate results. In this work we show that the source of these difficulties is a logarithmic contribution to the behavior of the wave function at the origin that was neglected by previous authors. By taking into account this non-analytic deviation of the solution of Schroedinger's equation superior results, with the expected rate of convergence, are obtained. This goal is accomplished by 'adapting' general algorithms for solving partial derivative differential equations to include the desired asymptotic behavior. We demonstrate this principle for the variational principle and finite difference methods.

Funder Acknowledgement: CREST Center for Research on Complex Networks (HRD-1137732) and RISE project (HRD-1345173)

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Poster Category: STEM Science and Mathematics Education

TIP: Piloting a Physics Partnership

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Our HBCU-UP Targeted Infusion Project (TIP) has brought together the faculty and administrators of a four-year HBCU and a nearby two-year, Predominately Black Institution. Our project goal is “To form a successful physics partnership between South Carolina State University (SCSU) and Orangeburg-Calhoun Technical College (OCtech) that will strengthen both programs and serve as a model of best practices for developing a STEM collaboration.” We are accomplishing this through the sharing of resources and a variety of activities. We report on our successes and challenges at the midpoint of a three year project funded by the National Science Foundation.

The OCtech faculty has conducted training for SCSU students and faculty in the use and application of LabVIEW software and alternative-energy projects. This has led to the introduction of these topics into SCSU courses. For the first time, a SCSU faculty member has taught a physics course at OCtech for their students. Invention Instruction activities have been developed for introductory physics courses and both institutions have increased the use of cyberlearning resources.

New courses and coursework have been developed at both institutions. We have completed one semester of teaching calculus-based physics using the so-called “flipped or scrambled instruction”. This method requires students to preview short videos on topics in mathematics and physics prior to a live lecture and problem solving session. More than 100 videos of length two to five minutes each have been developed for the two-semester physics sequence. This hybrid method of teaching has been generally well received by our students. Technical issues and significant adjustments in time commitment have challenged faculty and students alike. A member of the SCSU education faculty has conducted an assessment of our flipped instruction during the fall 2014 term using a variety of methods including pre- and post-testing, focus groups and individual student interviews. We discuss some very preliminary assessment results.

Funder Acknowledgement: Funding for this project has been provided by the National Science Foundation through award HRD-1332449.

Science and Mathematics Education

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Poster Category: STEM Science and Mathematics Education

Addressing the Double Bind by Preparing Critical Faculty for the Future at HBCUs

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This poster session provides outcome analyses about the 72 women who participated in the Preparing Critical Faculty for the Future (PCFF) Program. It also offers an analysis of and insight about the efforts to both improve outcomes for and increase the number of underrepresented students who pursue STEM careers at the 36 HBCUs where PCFF participants serve as faculty. It will preview the forthcoming monograph scheduled for public release after program concludes.PCFF sought to address the barriers that STEM women of color (SWOC) faculty face at HBCUs through offering participants a yearlong series of professional development activities designed to advance their academic leadership acumen and pedagogical skills.

PCFF Sought to Answer What are the reasons for the gap in SWOC faculty within the advanced ranks of faculty at HBCUs and across higher education sectors? What are the intervention models that can reduce this gap in academic leadership? What effect can mentoring, coaching and networking play in advancing SWOC faculty members' academic leadership competencies and pedagogical capabilities? How can the capabilities of these women in particular be leveraged to lead undergraduate STEM education transformation at HBCUs and beyond?

Providing knowledge and practical applications of cutting-edge, evidence-based teaching strategies to a critical group of faculty at HBCUs will increase the likelihood of increasing underrepresented students' success in STEM courses; Engaging SWOC faculty in leadership skill development, mentoring, and networking opportunities increases the likelihood of continued practice of those skills; Strengthening the capabilities of teams to share responsibility for improving undergraduate STEM education increases the likelihood of sustained efforts; Engaging institutions in a commitment to a strategic action plan will garner greater support and sustainability than individual faculty efforts. PCFF Intervention Strategies Included a two-day seminar interwoven in AAC&U conferences for two women from each participating HBCU; An intensive four-day seminar interwoven in AAC&U's integrative learning institute (initial SWOC faculty were joined by colleagues and senior administrators to create institution teams; nearly 180 individuals were involved in the campus projects); 17 one-hour webinars over the course of the three year program; Individual and project consultation with PCFF Advisory Board members, and team consultations with consultant faculty.

Funder Acknowledgement: Historically Black Colleges and Universities-Undergraduate Program (HBCU-UP) office.

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Poster Category: STEM Science and Mathematics Education

Establishing Reliability and Validity of a Self-Regulated Learning Measure for African American Students in STEM

Caesar Jackson, North Carolina Central University
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Many students entering STEM programs at North Carolina Central University (NCCU) come under-prepared for college STEM course taking. Research indicates that self-regulated learning may be a key enabler of student academic success and can be taught. However, little is known about self-regulated learning in an HBCU (historically black colleges and universities) context. This project seeks to investigate the effect of self-regulated learning training and development on student success in STEM. The Motivated Strategies for Learning Questionnaire (MSLQ) will assess students' usage of self-regulated learning (SRL) strategies. However, the MSLQ was developed on a student population substantially different than the student population at NCCU an HBCU. Numerous studies have been conducted utilizing the MSLQ, but none have been on a population consistent with that at NCCU. Therefore, we conducted a preliminary study to establish the reliability and validity of the MSLQ for our NCCU study population.

The MSLQ is a self-report measure with 81 items and 15 scales. Six motivation scales measure students' goals, value beliefs, test anxiety and beliefs about success in the course. Nine learning strategies scales measure student use of different cognitive and metacognitive strategies and resource management.

Participants for the preliminary study were STEM majors recruited from their STEM courses at NCCU. The ethnicities of the STEM undergraduate student body are 53% female and 34% male; 86% African American, 5% White, 1.5% Asian, 1% Hispanic, 0.5% American Indian, 1% Non Resident Alien, and 4.5% Other.

The courses targeted included College Algebra and Trigonometry, PreCalculus, Calculus; General Chemistry I; General Physics I and General Physics for Scientist and Engineers I. The courses are selected because they are required in STEM degree programs and because the rate of DWF grades in these courses could exceed 30%. The MSLQ was administered during class sessions before midterm of Fall Semester 2014. Participant

demographic information, course grades, and grade point averages are gathered at the end of the semester.

Descriptive statistics, the total correlation matrix, and Cronbach's Alpha for each scale to determine internal consistency and reliability were computed. Confirmatory Factor Analysis assessed construct validity. Predictive validity was determined by correlating scale scores on the MSLQ with final grades in the STEM courses.

Funder Acknowledgement: National Science Foundation HBCU-UP

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Poster Category: STEM Science and Mathematics Education

Graduation Academy - Transitioning STEM Students to Graduation and Graduate School

Larry Mattix, Norfolk State University, Norfolk, VA
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Despite gains in freshmen retention (now 77 percent) at Norfolk State University (NSU) and the number of STEM Graduates (57% increase, from 2001 to 2012), the increase in the six-year STEM graduation rate has been very modest and still hovers around 30 percent. The positive news for NSU is that the students who complete our STEM programs are very successful. They are frequently recognized through their presentations at national research competitions and post NSU students are earning graduate and professional degrees from some of the nation's premier institutions of higher education. In the past, we have focused on freshmen to sophomore retention with our previous NSF (STARS/STARS-Plus) grant. We have assumed the traditional model with the first year called freshmen, the second called sophomore, third called junior and fourth called senior. When the first STARS program started in 2001, the STEM freshman cohort retention rate was 68%. However, only 19% of the STEM freshmen cohort was categorized as sophomores by the second fall.

Therefore, the College of Science, Engineering, and Technology at NSU has established a new project, entitled: Graduation Academy: Transitioning STEM Students to Graduation and Graduate School. This new project focuses on the development of STEM majors at the sophomore, junior, and senior levels, building upon the great success of other STEM programs at NSU. The new project features the following: (1) A Graduation Academy (which focuses on moving the students toward graduation and then on to graduate school); (2) A new concept of a Sophomore Summer Bridge Program; (3) Departmental Junior Prep and Grad Societies for enhanced advising and mentoring of students at the sophomore, junior, and senior levels; (4) Transition weeks to lead juniors and seniors toward completion; (5) An existing Community College component (T-CUP) that focuses on juniors who transfer to NSU; (6) Scholarships and undergraduate research support; and (7) Faculty development to foster improvements in student performance in junior and senior courses. The new project encourages and supports the participation of students from underrepresented groups in scientific meetings and activities of professional societies. A cascading mentoring component between undergraduate students, graduate students, and faculty provides the interactions and community to help ensure successful outcomes.

Long Term Goals:

- To increase the matriculation rate of students from sophomore to junior by the third fall
- To increase in the number of students maintaining eligibility for Federal Financial Aid
- To increase the success-rate of students beyond the freshmen year
- To improve the freshmen STEM retention rate to 85% and the six-year graduation rate to 50%
- To increase the number of transfer students completing STEM degrees
- To increase in the diversity of the workforce in STEM field

Project Objectives:

- To develop a STEM Graduation Academy to support sophomore, junior, and senior STEM majors toward graduation
- To improve faculty teaching and student learning in STEM, particularly for sophomore and junior
- To enhance the STARS Mentoring Center to support sophomore, junior, and senior STEM majors
- To build-upon the T-CUP model (supported by NSF) in Engineering and provide the same support to students transferring in as juniors
- To use a cascading mentoring model to enhance the success and maturity of both undergraduates and graduate students

Funder Acknowledgement: National Science Foundation

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Poster Category: STEM Science and Mathematics Education

The Impact of National Science Foundation Support on STEM Education

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Saint Augustine's University is a four year, liberal arts, Historically Black University that is affiliated with the Episcopal Church, is accredited by SACS, and is located in Raleigh, North Carolina. Founded in 1867, the University's mission is to sustain a learning

community in which students can prepare academically, socially and spiritually for leadership in a complex, diverse and rapidly changing world. As the need for a workforce in the STEM disciplines, particularly Science & Engineering increases, the overall numbers of American-born students who obtain degrees in these disciplines continues to decline, particularly among underrepresented groups. The primary goal of the grants awarded by NSF are to assist our efforts to increase the number of Saint Augustine's University STEM majors that graduate and are prepared for, apply to, are accepted, matriculate and succeed in graduate studies leading to graduate degrees in a broad range of STEM disciplines. We also anticipate that this will also vastly improve student preparation and success in gaining immediate entry/placement into the STEM workforce. The objectives and activities associated with the goals outlined in our NSF grants should help increase the number of this nation's African-American STEM professionals, by strengthening an institution Saint Augustine's University and School of Sciences, Mathematics & Engineering, that, even with modest resources, has historically succeeded with this population. In this poster, we describe/demonstrate the impact of increased exposure to STEM opportunities, undergraduate research internships, assistance in the form of scholarships, and faculty mentorship on increasing student interest in pursuing graduate school in STEM disciplines, and the likelihood of success in STEM research careers. Further, we demonstrate the importance of student peer tutoring and mentorship in the recruitment, retention, sustained participation, and graduation of students that pursue graduate school and STEM careers.

Funder Acknowledgement: NSF HBCU-UP TIP; NSF HBCU-UP Va-NC LSAMP; NSF HBCU-UP S-STEM; NSF HBCU-UP RIA

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Poster Category: STEM Science and Mathematics Education

Impact of a Science Methods Course on Preservice Elementary Teachers' Knowledge and Confidence

Leslie Y. Whiteman, Virginia State University
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The purpose of this mixed methods study was to measure the impact of an elementary science methods course on preservice teachers' knowledge and confidence of teaching with inquiry and problem-based instructional strategies. As part of the study, an integrated lecture/laboratory elementary science methods course engaged participants with hands-on activities designed to increase their pedagogical content knowledge, including theory, planning and implementation, of inquiry and problem-based learning. Changes in preservice teacher's knowledge and confidence were measured before and after completing the course activities using a pilot survey titled Science Pedagogical Content Knowledge & Confidence (PCKC) Survey. Qualitative data was also collected concurrently as part of the PCKC survey as well as during pre- and post-instruction focus groups. Results of the study indicated that preservice teachers' knowledge and confidence improved as a result of enrollment in the elementary science methods course. This study validates reform movements to incorporate scientific inquiry and problem-based learning into coursework.

Funder Acknowledgement: HBCU-UP solicitation NSF 12-519: Broadening Participation Research Grant.

Social, Behavioral, and Economic Sciences

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Poster Category: STEM Research

The Roles of Social Identities in the Achievement Motivation and Retention of Black Undergraduate Women in Computing Disciplines

Danyelle Brown, Howard University
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Educational psychologists have long been interested in the relationship between ability beliefs and achievement motivation, and have become increasingly focused on the interrelatedness of social identity and motivation variables. Psychological scholarship shows a growing trend in examining identity-related constructs among students in STEM fields yet has barely addressed the populations of racial-ethnic minority women in these contexts. The proposed study will use the expectancy-value theoretical framework to examine the relationships among racial identity and gender identity, identification with computing, identity interference beliefs, expectancy for success, subjective task value, and psychological cost associated with obtaining a computing degree among Black undergraduate women. A sample of approximately 200 Black undergraduate women in computing disciplines will be recruited from colleges and universities throughout the United States. Participants will respond to an internet survey with Likert-scale items to measure the identity and achievement motivation variables as well as open-ended questions to explore the way this population perceives their experiences in the computing context. A path analysis using the multiple regression method will be used to test the direct and indirect relationships among identity interference and achievement motivation in predicting retention intention. The qualitative data produced from the open-ended survey questions will be analyzed using the basic qualitative coding process and will be examined for convergence with the quantitative results. The findings of this study may contribute to our understanding of

how social identities relate to the achievement motivation of Black undergraduate women in computing, and assist efforts to increase their participation in this field.

Funder Acknowledgement: Walter and Theodora Daniel Educational Research Award; American Psychological Association Dissertation Research Award; NSF HBCU-UP.

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Poster Category: STEM Science and Mathematics Education

A Psychosocial Profile of African American STEM Majors at an HBCU

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M. Omar Faison, Virginia State University, Petersburg, VA

The underrepresentation of minority students in STEM fields is well documented, and there is an abundance of data showing that the college algebra-to-calculus course sequence is the primary gatekeeper for minority students seeking STEM majors and careers. In this study, we sought to identify psychosocial variables associated with success in a College Algebra course at Virginia State University (VSU).

In addition to expectancy-related, value-related, and affective factors which have often been studied as predictors of academic success, this study also considered assessment of cognitive skills, such as processing speed, working memory, and matrix reasoning. Math anxiety and attitudes about the study of mathematics were also assessed. Age, gender, student classification, and SES were included in the model as inactive covariates. A series of latent class models were estimated to identify the psychosocial profiles of students in the College Algebra course. The overall fit of the model improved substantially from the one-class model to the five-class model, but deteriorated with the six-class model suggesting that the 5-class model was the most appropriate solution for the data. Multinomial logistic regression revealed that relative to the reference group (which represents the ideal levels on these variables, Group 1 and Group 4 were less likely to achieve higher scores on the standardized math assessment or higher course grades in College Algebra (p's $< .05$). There is not much variation between Group 1 and Group 4 in processing speed, working memory, and matrix reasoning. However, there is greater variation between these profiles in math anxiety, attitudes about mathematics, and academic self-efficacy. This suggests that this sample of college students may be very similar in cognitive functioning (i.e., they function well enough to be admitted to college), but other psychosocial factors related to efficacy and anxiety, and their perception of math as not relevant to future goals, may hinder the achievement of some would-be STEM majors with similar levels of functioning. The implications of these results for designing effective interventions to retain African American STEM majors is discussed.

Funder Acknowledgement: This research was supported by grant No. HRD-1238757 from the National Science Foundation.

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Poster Category: STEM Research

The Howard University Center for Translational Psychological Science and STEM Workforce Development

Cynthia E. Winston, Howard University
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The proposed Howard University Center for Translational Psychological Science and STEM Workforce Development will be a research, training, and education center committed to expanding knowledge about human personality and the psychology of success. The center will translate theory and research on identity, motivation, personality traits, emotional intelligence, narrative personality, and the psychology of gender to design culturally relevant science education and STEM professional development models. Although these models will have broad application for the success of individuals and organizations, the center will have a targeted focus on women with STEM careers, secondary STEM teachers, African American girls, urban education, and HBCU contexts. The ultimate goal of the center will be to conduct psychological science research, offer professional development, and expand the presence of social science students, postdocs, and faculty at HBCUs and other institutions studying the psychological science of STEM workforce development. In so doing, the center will make high impact contributions to the development of new knowledge and institutional transformation, while simultaneously informing policy, program development, organizational design, and fulfilled living of people throughout the world. The proposed center has received institutional support from Howard University administrative leaders and is aligned with the Howard University mission, as well as the university's strategic direction to enhance its STEM research capabilities. With the support of the National Science Foundation HBCU-UP, the proposed center is in the advanced planning phase with defining projects and building collaborative partnerships with research scientists, educators, HBCUs, community colleges, industry, small business, government, and professional societies.

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Technology and Engineering

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Poster Category: STEM Research

Multimodal Imaging for Brain Research

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The primary barrier to identifying factors that modulate developmental plasticity of brain networks lies in the difficulty of studying a sufficient number of patients with atypical brain activations to guide prognostic indicators of outcome under so many variables (age, sex, type of pathology, location of the dysfunction with respect to eloquent cortex, timing, extent, and severity). The only realistic solution is to build a research platform for the cohesive study of the human brain, bringing in synergy several hospitals and academic institutions to instigate multi-site collaborative studies with a large number of patients in accordance to systematically administered standardized protocols. The main goal is to elicit new understanding on the functional mappings of the brain and the causality of key neurological disorders. Our approach was to build a multimodal neuroimaging structure using specialized software as well as unique hardware designs that bring in synergy different recording modalities not only in terms of time and space alignments, but also in exploiting the best in both temporal and spatial resolutions by combining unique strengths of the different recording modalities (EEG, MRI, fMRI, DTI, PET, and CT). This integrated approach informs clinicians and medical doctors on the best course of action to take on every patient who has 3D brain imaging as part of their clinical care.

This research theme lays the foundation for a consolidated hardware-software infrastructure with the requisite expertise to bring new understanding into brain dynamics both in its normal state, and under specific pathology conditions. Important tasks considered include space alignment (registration) of the recording modalities, generating patient-specific connectivity networks and gauging their variations over time, performing multivariate analysis and multidimensional classification on the different features collected from distinct brain regions that best characterize the neurological disorder, and identifying the contribution of the different factors that influence the functional organization of the brain and underlying pathologies with a focus on epilepsy and Alzheimer. Furthermore, this interdisciplinary emphasis promotes a distinctive future engineer/scientist with the ability to collaborate among experts in engineering, computing, the bio-sciences and medicine - a relationship that will accelerate new findings with the promise of high deliverables.

Funder Acknowledgement: This work is supported by the National Science Foundation under grants HRD-0833093 and CNS-0959985.

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Poster Category: STEM Research

Dislocation Structure of Cu/Nu (100) Semi-coherent Interface and its Role in a Lattice Dislocation Nucleation and Point Defect Annihilation

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The main objective of this HBCUUP-RIA award is to initiate the PI's research on the structure and properties of heterogeneous metallic interfaces in regards to their strengthening effect and ability to mitigate irradiation damage in materials whose structure is dominated by interfaces, e.g. nanoscale metallic laminates (NML). Depending on their specific structure, interfaces can act as potent barriers to dislocation propagation and as sinks for point defects. Using molecular dynamics simulations and dislocation theory, we studied the structure of Cu/Ni (100) semi-coherent interface in NML and its role in nucleating lattice dislocation under mechanical loading. We found that misfit dislocation pattern and their relative position from one interface to the neighboring one depends on layer thickness. This is ascribed to the interaction energy among misfit dislocations and the core dissociation of misfit dislocations, both of which are layer thickness dependent. We show the possible low energy different dislocation structures and how they influence the onset of plastic deformation and vacancy formation energy within the interface and in the vicinity of misfit dislocations and their intersections. A second objective of the award is to provide mentoring for undergraduate students to participate in the research tasks mentioned above. A total of six students were involved in this research through summer research experiences as well as during the academic year. Students are first assisted too develop the big picture understanding of the research then assigned easy yet fundamental problems to solve using molecular dynamics. Once solved, the students are guided to author and post related tutorials on a website used by the research community. Finally, actual research subtasks are assigned. So far, this effort has resulted in six tutorials, four presentations at local and regional undergraduate research symposia.

Funder Acknowledgement: NSF-HBCUUP-RIA, Award 1137587

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Poster Category: STEM Research

Development and Study of an Implicit Model for Rapid and Accurate Simulation of Hurricane Storm Surge

Muhammad Akbar, Tennessee State University

In this poster a parallel storm surge model based on hybrid finite element and finite volume techniques to solve hurricane induced storm surge flow problem is presented. As a hurricane approaches the coastline, a combination of meteorological and hydrological forces causes sea water to rise and rush inland, causing a storm surge. A hurricane landing in the Gulf Coast may cause a devastating storm surge due to its funnel-like topography. A quick and accurate prediction of a storm surge, its extent, and the possibility of breaching levees are crucial for disaster planning.

Storm surge models are used to predict these surges. Storm surge models solve shallow water equations to simulate the hurricane induced floods. The hurricane induced wind stress and pressure, bottom friction, Coriolis Effect, and tidal forcing conditions are used as inputs to this model. Almost all surge models use explicit solvers. An explicit solver finds solution at a new time step based on that at the previous step. The algorithm is easy to implement, but stability requirements heavily restrict the time step size - leading to a longer surge forecasting period. An implicit solver, on the other hand, finds the solution at a new time step using the information of the same step. This algorithm has its own challenges, but it can use larger time steps potentially minimizing simulation time.

The developed storm surge model is used to hindcast Hurricane Katrina (2005). The simulated Maximum Envelope of Water (MEOW) and High Water Marks (HWM) are compared with published data. The comparison is reasonably good. The results are used to compare parallel performance of the model to the sequential version of the model. The future research includes increasing the speed and accuracy of the developed storm surge model.

Funder Acknowledgement: National Science Foundation. This study was supported by a HBCU-UP Research Initiative Award grant from NSF to Muhammad Akbar.

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Poster Category: STEM Research

Near-edge X-ray Absorption Fine Structure Investigation of P-type doped CVD Graphene

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This project sought to explore the electronic structures of doped chemical vapor deposition (CVD) graphene. Single layer CVD graphene samples were doped with 0.5Å of gold, 1Å of silver and 1Å of titanium via thermal/e-beam evaporation. Compared to our pristine graphene sample, the titanium doped, gold doped and silver doped samples exhibited an increase in hall mobility of ~19%, a decrease of ~24% and a decrease of ~8% respectively. Near-edge X-ray Absorption Fine Structure (NEXAFS) Spectroscopy of the pristine graphene sample and the doped samples illustrated that there was a slight shift in the position of the π^* resonance peak in the doped samples when compared to that of the pristine graphene sample. Differences were also noticed in the interlayer states of all the samples.

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Poster Category: STEM Research

Implementation of Sustainability Concepts into Undergraduate Civil Engineering Courses

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This paper describes an intervention to enhance students' learning through involving students in brainstorming activities with regard to sustainability concepts and their implication and counter measures in transportation engineering followed by lecture and discussion. The paper discusses the process of incorporating the intervention into a transportation course as well as the impact of this intervention on students' learning outcomes. To evaluate and compare students' learning as a result of the intervention, the Laboratory for Innovative Technology and Engineering Education (LITEE) survey instrument (http://www.litee.org/site) was used.

The survey instrument includes five constructs to measure five different aspects of students' learning in the undergraduate transportation engineering: higher-order cognitive skills, self-efficacy, ease of learning subject matter, teamwork, and communication skills. The survey on pre-assessment and post-assessment of student learning outcomes was conducted to determine the effectiveness of the intervention on enhancing students' learning outcomes. The results show that the implementation of the intervention significantly improves higher order cognitive domain of learning, self-efficacy, team work, and communication skills. Involving students in brain storming activities related to sustainability concepts and their implication in

transportation could be used as an effective teaching and learning strategy by educators to facilitate students' learning.

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Poster Category: STEM Research

Developing NAE Grand Challenges Research Initiatives at Tennessee State University

S. Keith Hargrove, Tennessee State University
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The National Academy of Engineering (NAE) has identified fourteen (14) grand challenges whereby technology solutions will improve human quality of life around the world. This project describes a strategic academic effort to develop research capabilities in selected areas advocated by the NAE, and engage faculty and students to support an independent and self-sustaining research unit of the university. This project will describe current and future applied research projects, and existing funding resources to promote sustainability and strategic goals of the facility.

Funder Acknowledgement: National Science Foundation ARRA Funding; National Science Foundation HBCU-UP Targeted Infusion Program; Department of Homeland Security.

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Poster Category: STEM Research

Green Bridge Rating System

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While Leadership in Energy and Environmental Design (LEED) has established five rating systems for building projects focused on green building construction and design, interior design and construction, building design and operations, neighborhood development, and homes, there currently is no formal rating system that uniquely addresses construction and design for green bridges. Given the condition and deteriorated state of several of the nearly 600,000 bridges in the United States, there is a need to address this shortcoming with the development of a rating system that embraces concepts of LEED for green building design, yet specifically applies to bridges that are being newly constructed or in need of rehabilitation. The proposed rating system is based on eight major categories: 1) construction, 2) transportation, 3) safety, 4) water efficiency, 5) energy and atmosphere, 6) air quality, 7) sustainability and land use, and 8) regional priority with associated points to determine the level of LEED certification. One of the expected outcomes of this study is the development of a new generation of high-performance green bridges that utilize innovative, sustainable materials and construction methodologies that meet various prerequisites and credits to be classified as bronze, silver, gold or platinum LEED certified bridges. This paper also presents evaluations of various bridge case studies to show the applicability of the green bridge rating system to new and rehabilitation bridge projects, and how the rating system can be used to increase its sustainability and efficiency.

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Poster Category: STEM Research

Center of Excellence in Nanobiomaterials Derived from Biorenewable and Waste Resources

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Center of Excellence in Nanobiomaterials Derived from Biorenewable and Waste Resources was established at Tuskegee University (TU) with the funding from NSF for a period of five years starting October 2011. Collaborators from within the USA include Auburn University (AU), Cornell University (CU), the University of Alabama at Birmingham (UAB), and several industry and national laboratories. International collaboration is built upon the existing relationships with researchers from Brazil and India. The research focus areas of the proposed center include: (a) synthesis of plant based nanofibers through electrospinning and forcespinning™ methods; (b) production of bacterial cellulose fibers from soy waste products; (c) synthesis of nanoparticles from biodegradable sources such as egg shells and their use as nano-fillers in advanced composites; (d) synthesis of biopolymers; (e) development and characterization of advanced green nanocomposites using these materials with natural fibers; and (f) product design, prototyping and commercial feasibility studies. These efforts are being carried out through three sub projects: 1) Synthesis and characterization of nanobiomaterials, 2) Synthesis and characterization of biopolymers and nanobiocomposites, and 3) Processing, performance evaluation and technology transition of green nanobiocomposites to products. The materials developed will provide an alternative to the current generation of high performance 'advanced' composites materials which use thermoset polymers and man-made fibers like glass, carbon and Kevlar®. Further, these polymers are derived from petroleum, an expensive and scarce commodity, and composites are not biodegradable.

Funder Acknowledgement: National Science Foundation

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Poster Category: STEM Research

UNM Center for Water and the Environment: An NSF CREST Center

Kerry J. Howe, University of New Mexico

This poster will describe a new CREST Center that was awarded in 2014 to the University of New Mexico, called the Center for Water and the Environment. Few resources are as important to human health and welfare as water. A reliable source of water is critical to society; indeed, water is necessary for life itself. The Center for Water and the Environment is investigating technological solutions to problems with water and the environment, with a focus on water problems in arid environments and in times of drought, including those associated with deteriorating watersheds, climate change, water needs for energy development, and technologies to address these challenges. These issues are critical to the Southwestern U.S. but also have global importance. The research component is organized around four topics: watershed processes, water treatment technologies, water/energy interactions, and research integration. This Center will generate significant new knowledge about the management and treatment of water in arid and semi-arid environments. It will have regional and global consequences as climate change and population growth cause a decrease in water supplies. The poster will give an overview of the research activities planned and in progress in these areas.

Specific programs for recruiting, retention, and graduation of minorities are an integral feature of the Center. Innovative programs in this Center will include construction of a water technology demonstration trailer with hands-on water activities for K-12 students, a dual-credit high school course, a summer field class, and a water competition. These activities will create a pipeline of new STEM professionals to address the water problems of the future. UNM has significant populations of Hispanic and Native American students. This center seeks to attract minorities into STEM careers because young people from the Hispanic and Native American cultures of the desert southwest instinctively understand the vulnerability of the water and its importance. These aspects of the Center will also be described in the poster.

Funder Acknowledgement: National Science Foundation

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Poster Category: STEM Research

Reforming and Processing of Biofuels for Fuel Cells

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The goal of our NSF CREST Bioenergy Center is to use biomass as a renewable energy source through developing the basic science and technology that will bring efficiency in energy conversions and affordable costs. Fuel processing and reforming technologies for hydrogen production and separation as H2-fuel with applications in the proton exchange membrane fuel cell (PEMFC) technology is one of the three research Thrust areas of Bioenergy.

Owing to their high efficiency and zero emissions, there has been growing interest in PEMFCs for stand-alone power sources. However, the development of low-cost cell components and a source of reliable high purity H2-fuel free of CO and sulfur compounds; still pose a serious technological barrier for PEMFCs down-to-earth applications. Thrust III research projects are briefly narrated here with status update.

Develop CO-tolerant high surface area, low Pt-loading noble/transition metal electrocatalysts for PEMFC electrodes: One of the first objectives of this project is to use the high surface area ordered mesoporous carbon supports instead of conventional carbon black to obtain novel electrocatalysts with low Pt loading. We have successfully been able to synthesize high surface area OMC and modified-OMC using SBA-15 and Ni-SBA-15, respectively, as a hard template with sucrose as source of carbon. Pt-OMC and Pt-modified OMC electrocatalysts are characterized and tested for PEMFC performance.

Develop low humidity, high temperature proton conducting membranes for PEMFC: In this work we have been working on the synthesis of phosphoric acid doped PBI membranes (PBI/PA) which can potentially be used at higher PEMFC operating temperature. Detailed fuel cell performance tests were conducted using membrane electrode assembly (MEA) prepared using PBI/PA and Pt/C at different operating conditions, such as pressures, temperatures, and H2/O2 gas compositions.

Develop an H2-selective Pd-alloy composite membrane on microporous supports and demonstrate its application as a membrane reactor-separator for reforming reactions as fuel-processor: In the first part of this project, we are working on the fabrication process optimization of dense Pd-Ag composite membranes on microporous stainless steel substrate (MPSS) by a novel surfactant induced electroless plating (SIEP) process. A cationic surfactant, dodecyl trimethyl ammonium bromide (DTAB) was used in Pd and Ag baths for the improved deposition of metals on MPSS substrates. Fabricated membranes are characterized and tested for thermal and mechanical stability, structural integrity and H2-permselectivity. The performance of the SIEP process developed Pd-Ag membrane will be compared with the membranes fabricated using conventional electroless plating method. Some of the results of these projects will be highlighted in this poster presentation.

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Poster Category: STEM Research

An Assessment of Three Strategies for Supply Chain Disruption Mitigation: Pre-Positioning Inventory, Backup Suppliers, Supplier Protection

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We evaluate strategies for disruption mitigation in a supply chain by incorporating two types of risk in the supply chain: supply risk and environmental risk. We examine three supply disruption mitigation strategies: 1) pre-positioning inventory, 2) backup suppliers, and 3) supplier protection. We evaluate three different supply risk mitigation strategies with respect to environmental risk.

Utilizing the concept of a decision tree, we develop a two-stage mixed-integer programming model as a general model with no disruption management strategy. We then extend this general model to incorporate each of the three different supply risk mitigation strategies, and evaluate the impact of the mitigation strategies on the expected supply chain cost and risk. We show how implementation of disruption mitigation strategies, along with the contingency plans, can help firms mitigate supply chain disruptions.

The findings suggest that all three disruption mitigation strategies reduce costs and risks, compared to the general model with no disruption management strategy. Of the three disruption mitigation strategies, we find that supplier protection is best for cost-driven firms, pre-positioning inventory best suits risk-averse firms, and firms that take a balanced approach between costs and risks should implement a backup supplier strategy. Finally, we show that egionalizing a supply chain is an effective way to mitigate the negative impacts of disruption on the supply chain.

Funder Acknowledgement: National Science Foundation

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Poster Category: STEM Research

The Research and Educational Activities of the Center for Energy and Environmental Sustainability at Prairie View A&M University

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Center for Energy and Environmental Sustainability (CEES), a NSF CREST Center at Prairie View A&M University was established in October of 2010. The centers research is focused in three broad areas of energy: 1) Biofuels, 2) Wind Energy, and 3) Energy and the Environment. The overarching goal of the Center is to build a nationally recognized energy research program at PVAMU in energy engineering.

As part of our educational outreach, CEES worked with the college of engineering and the university and established energy engineering minor and is currently in the process of getting approvals for an energy engineering concentration in the existing Master of Science in Engineering Program.

The biofuels research at CEES involves both thermochemical and biochemical processes for converting plant based biomass into biofuels. Two biofuel reactors consisting of a high yield batch reactor and a fluidized bed reactor have been designed and are being. TGA decomposition kinetics, based on a multistage decomposition model, has been completed for several biomasses. A recyclable acidic ionic liquid catalyst system that can act as the hydrolysis catalyst is developed. The major tasks in the wind energy area are (i) aerodynamic force evaluation for various wind speed cases with constant blade rotating speed. (ii) Fluid structure interaction (FSI) on the blades where studied with aerodynamic loads being applied to the blade structure with the help of an interface which relates the FSI interaction. (iii) Aerodynamic noise characterization of NREL Phase VI wind blade was simulated, and then the optimized blade shape was studied to obtain reduced noise level without minimizing the loss of power generating efficiency.

The research in the energy and environment area's focus is on three fundamental components: (i) sustainable nuclear energy (ii) photochemical modeling of ozone in the Houston-Galveston-Brazoria (HGB) area and (ii) the life cycle assessment of different energy technologies. The results from the photochemical model, CAMx predicated ozone exceedances and are primarily governed by volatile organic compounds during the mornings and NOx during the afternoons. Life cycle assessment (LCA) of different blends of bio-ethanol fuel were examined in combination with the emissions in transportation sector using the Greenhouse gases, Regulated Emissions, and Energy use in Transportation (GREET) model.

Funder Acknowledgement: National Science Foundation

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Poster Category: STEM Research

NextGenC^3 Composites CREST Center

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The establishment of the National Science Foundation's NextGenC3, at Southern University (SU), a historically black college and university, in close collaboration with Louisiana State University (LSU) in September 2009 has provided us with the opportunity to be the leading composites center in the region. NextGenC3 conducts basic and applied research in advanced composite materials and provides innovation in the development of next generation composites. Since its inception, NextGenC3 has directly supported 91 students and has had an impact on over 200 students. Of the supported students, 59 are undergraduates, 32 are graduate masters, and 7 are doctorates. As of now, 34 have received their bachelor's degree, 18 have received their master's degree, and 6 have received their doctoral degree. NextGenC3 has also been instrumental in streamlining students and post-doctoral associates into the workforce. Undergraduates have secured positions with Honda, Enercon Services, The Conti Group, Weatherford, ABET, Piping Technology and Products, Brocade, NiSource, BNSF Railway, Dow Chemicals, and Shell. Post-docs have acquired positions in the industry with Nuvotronics, Ford Motor Company, and MED Institute.

Outreach efforts of the center include 11 seminars, 1 organized national STEM conference for undergraduates and graduate students (76 registered participants, 27 submitted abstracts, 16 oral presentations, 17 poster presentations) 1 co-organized campus-wide conference on sustainability, research experience for undergraduates (REU) program participation at University of Delaware, and alternative energy and sustainability research visits abroad to countries in China and Africa. The center has been active in K-12 activities as well including supporting, mentoring and advising high school and middle school students on various activities.

The center has held 3 professional training and development workshops and produced 31 publications. 1 patent has been filed, and another filing is in progress. Participants of the center have attended 23 national and international conferences with 25 published conference proceedings. Additionally, 1 course has been created as a direct outcome of the center, and 3 courses have been impacted.

The future of NextGenC3 is envisioned to continue workforce development of students and faculty and provide the best in education and research. The center will expand on advanced research and continue to be a beacon for the education of future scientists and engineers, which includes diverse, competitive, and well trained citizens, in the area of next generation composite materials and technology.

Funder Acknowledgement: National Science Foundation (NSF)

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Poster Category: STEM Research

Enhancement of the Co-precipitation Synthesis and Peptization Conditions to Increase the Heat Dissipation Rates of Iron Oxide Magnetic Nanoparticles

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Iron oxide magnetic nanoparticles for hyperthermia-based cancer treatment have been studied during the last decades due to their promising properties and proven positive effects they have to control the growth and proliferation of cancer cells. Magnetic Fluid Hyperthermia (MFH) uses thermal energy to cause a temperature increase in tumors which promotes damage to cancer cells. The heat is the result of exposing suspensions of magnetic nanoparticles to alternate magnetic fields. Under this approach, temperature increments between 43˚C and 47˚C can be locally achieved in small regions inside the organs affected by cancer, where the nanoparticles are accumulated. One of the limitations when using in vivo MFH is that a high dose of nanoparticles have to be injected to achieve a good temperature distribution, due to the low heat dissipation rates that nanoparticles traditionally have. Nanoparticles possessing this ability can promote faster heating, increasing the efficiency of the energy delivered and. At the same time, the application of high magnetic field intensities, which could be poorly tolerated by patients, can be avoided. The optimization of nanoparticle synthesis for MFH is not yet well established even when a good number of studies are available in the literature, mostly attempting to set optimal conditions to decrease the particle size. Recent studies have demonstrated that clusters of maghemite particles in flower-shape and chain-shape, along with cuboid nanoparticles, release a high amount of heat. However these ferromagnetic maghemite particles lose their susceptibility with time, and ferromagnetic materials have fast relaxation times thus reducing the amount of heat dissipated. Also, exchange-coupled nanoparticles using different metals have been published with high heat dissipation rates, but the use of toxic metals such as cobalt is not attractive for in vivo MFH. For this reason, this work focuses on nanoparticles synthesized by the co-precipitation method, studying the influence of temperature, iron concentration and sonication on the specific absorption rate (SAR). SAR is the parameter used to describe the heating power of magnetic nanoparticles. In this study, SAR values up to 1,048 W/gFe were obtained, which represent one of highest values reported for magnetite particles synthesized by a simple and cost-effective co-precipitation method, which was enhanced to produce outstanding and reproducible results. Also, our particles reached up to 719 W/gFe when placed in a solid matrix, demonstrating that they are capable to dissipate a high amount of energy even when they are restricted of move-

ment. This is of utmost importance in the complex biological environments typical of body organs and tissues, so these particles are excellent resources for in vivo experiments. The present study therefore, highlights for the first time the importance to improve the conditions of both co-precipitation and peptization of iron oxide magnetic nanoparticles, in order to increase the heat dissipation rates for MFH applications.

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Poster Category: STEM Research

Real Time Visualization of PEI Dynamics

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Co-Author(s): Quentinn Roby, Kimberley Curtis, Tasneem Abdus -Shakur, and Preethi Chandran, Howard University, DC

Polyethylenimine is a positively-charged polymer that is used to package DNA into nanometer sized particles for delivery into cells. The PEI charge comes from the protonation of tertiary amine groups on its backbone. Since about 50% of the amines are still protonable at physiological pH, the polymer can act like a buffering agent. This buffering property is critical for the success of PEI as a DNA carrier. The DNA/PEI particles are protected from degrading in the acidic environment of the cell-uptake vesicles and are eventually released into the cytoplasm. From a polymer biophysics point of view, PEI is a hydrophobic, semiflexible, weak-base polyelectrolyte; it remains in equilibrium with an aggregated phase and the free polymer dynamics is governed by competing intra- and inter-chain charge repulsion. Our goal was to examine the role of PEI polymer biophysics in its biologically-important function as a pH buffering agent. Using Dynamic Light Scattering, the change in the PEI backbone elongation and its aggregation state was visualized as a function of H+ addition to the backbone. The charge state at each backbone elongation was determined with Molecular Dynamics Simulations. Separate concentration regimes were examined for intra- and inter-chain charge repulsion. PEI buffering mechanism appears to be closely governed by the biophysical state of the PEI during the buffering event. Real-time tracking of the PEI state indicates that the free polymer has preferred charge states and the buffering mechanism includes periodic bursting of polymer aggregates to release additional monomers. The societial impact of the proposed project is that it will lead to the cytotoxic and stability characterization of PEI, an important gene delivery vehicle for the development of DNA-based vaccines.

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Poster Category: STEM Research

Integrated Geoscience Curriculum for Workforce Development for Oil and Gas Industry (IGC)

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Natural gas has become one of the most economical clean energy available in the United States. A shift in the energy consumption towards natural gas is happening due to its relatively lower price compared to other alternatives spurred by a rapid interest in tapping huge deposits of shale that can yield vast reserves of domestic natural gas and oil. The United States has capability to increase production of shale gas from 23 trillion cubic feet in 2011 to 33 trillion cubic feet in 2040. The goal of this project is to investigate how modern oil and natural gas technologies may be infused into uniquely integrated geosciences curricula at CSU through the infusion of established environmental principles, accepted engineering practices, and innovative separation processes. CSU has an integrated geosciences department which comprises of four baccalaureate programs in Water Resources Management, Environmental Engineering, Geology, and Geography.

The project aims to accomplish the following objectives: 1.) infusion of shale gas extraction into integrated geosciences curriculum within the department; 2.) collaborative engagement of faculty across these programs on innovative research on applying environmental engineering principles into shale gas production; and 3.) the development of a certification program in shale gas technology with the assistance from community colleges and universities in the region. Progress made on all three objectives will be discussed.

Funder Acknowledgement: National Science Foundation

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Poster Category: STEM Research

Numerically-Based Parametric Analysis of Plain-Fin and Tube Compact Heat Exchangers

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This study presents a comprehensive numerical analysis of the convective heat transfer on the external side of a compact fin-tube heat exchanger. The aim is to study the influence of key geometric parameters on both fluid flow and heat transfer processes in order to design more compact devices. The parameters are: fin spacing, tube diameter and tube alignment; i.e., in-line

or staggered, for a set of typical operating conditions. The parametric analysis is established on a six-tube baseline heat exchanger model, where air flows over the tubes and water flows at high speed inside them.The mathematical model of the convection process is comprised of the three-dimensional continuity, momentum and energy equations, in Cartesian coordinates. The model is solved under specific flow and temperature values using the finite element method. From computed velocity, pressure and temperature fields, the values of heat rate and pressure drop are then calculated for a range of flow rates in the laminar regime. Results from this investigation indicate that tube diameter and fin spacing play a role in the amount of heat being exchanged and that, for a given device, the length needed to exchange 90% of the energy that could be achieved by the baseline model, is confined to less than 1/2 its actual size, and to exchange 98% of the associated thermal energy, less than 2/3 of its size is necessary.

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Poster Category: STEM Research

Simulating the Approach-retract Phenomena of Atomic Force Microscopy (AFM) in a Virtual Environment with Haptic Interface

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The research presented in this poster aims at developing a virtual environment with haptic interface to simulate the Approach-retract (AR) phenomena during operation process of Atomic Force Microscope (AFM). In such a virtual environment, the users can examine and manipulate the nanoscale materials like they actually will do with a real AFM. The Atomic Force Microscope (AFM) is a very important and popular tool for imaging, measuring and manipulating nanoscale materials. However, the use of AFM is very costly and takes extreme amount of training. The preparation is very difficult and time-consuming. The AFM lacks real-time visual feedback. The virtual reality simulation is engaging and intuitive, which does not need any training. The simulation provides users a 3D view of the manipulation scene in real time. The integration of haptic interface in the simulation provides users the physical experience of understanding the nanoscale forces and objects. Various force models were developed to simulate the interaction between the AFM probe and different characteristics of samples. Surveys were conducted to evaluate the effectiveness of the simulation in increasing the users' understanding of nanoscale phenomenon.

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Poster Category: STEM Research

Hybrid Systems Modeling of Drug Effect on Tumor Growth

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It is widely accepted that effective mathematical modeling would allow quantitative thinking to the development of oncology drugs and would be beneficial to increase drug development productivity. In this study, a novel hybrid system model is proposed to study drug effect from the perspective of tumor growth dynamics, and we study the practical case of periodic drug intake. Specifically, the effects of the timing (when) and the dosage (quantity) of the drug is investigated. We tend to answer such questions: whether small frequent drug intake or large infrequent drug intake is better. We propose a new concept called drug efficacy region and derive it analytically. Simulations are performed using MATLAB/SIMULINK to validate our analytical results.

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Poster Category: STEM Research

Structure and Dynamics of Nanoparticle Suspensions and Gels

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The ability to understand and control matter on the nanoscale is critical to the development of a number of products such as scratch resistant transparent coatings, photonic crystals for optical filters and functional ceramic/polymer composites for biomedical implants to name a few. Of particular importance is to understand/characterize the microstructure and dynamics of nanoparticle gels that are used in the materials fabrication and how they influence the resultant macroscopic properties such as elastic modulus and flow curves. The proposed project is a systematic study of the dynamics of the colloidal suspensions and gels using scattering techniques (X-ray photon correlation spectroscopy XPCS and small angle X-ray scattering) at Argonne National Laboratory (ANL) with an aim of correlating measured dynamics to macroscopic properties as measured in a rheometer. Efforts will be made to use statistical mechanical theories

(naive mode coupling theory) to connect dynamics and macroscopic properties. The novel XPCS techniques developed to study the dynamics will result in benchmark experiments for rigorous testing of theories and phenomenological models. The microscopic understanding of the flow properties will give one a handle to tune these properties and help develop design rules for materials processing.

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Poster Category: STEM Research

Building Research Capacity in Cyber Security at Tennessee State University

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Recent cyber attacks on U.S. soil, has sparked an urgent need to protect information in cyber and cyber physical systems critical to commercial and government enterprises. Securing cyber space has been identified as one of the Grand Challenges of Engineering. Higher education will play a huge role in ensuring the development of security products and trained workforce to protect cyber and cyber physical systems from known and unknown cyberattacks. These efforts have resulted in developing technologies to protect critical infrastructure, such as, cloud computing and mobile devices from cyber threats, infusing undergraduate and graduate academic programs with cyber security concepts and training and developing a pipeline of trained workforce to be employable in cyber security related industries or to enroll in competitive graduate programs.

Ironically, despite the the increased workforce demand, minorities are still underrepresented within university training programs and in the work place. In this article, we describe the efforts undertaken by team of faculty and students to build a curriculum infused with numerous hand-on research opportunities for students which build the research capacity at Tennessee State University in cybersecurity and to build the next generation of researchers for Tennessee

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Poster Category: STEM Science and Mathematics Education

Southern University and The New Energy Workforce: Sustainable Materials, Energy, and Technology

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The major goal of the HBCU-UP ACE Implementation Project at Southern University and A&M College (SU) is to create a transformative connection between STEM disciplines, research and development, and international engagement using an interdisciplinary approach to promote innovation and creativity in the field of sustainability.

The major accomplishments are summarized into the following four categories:

1. Enhanced the Curriculum and Promoted Sustainability Teaching and Learning- A concentration in sustainability has been developed and is currently moving through the university approval process. The first course towards a bachelor's degree program in sustainability was approved through the University's academic affairs division, applicable curriculum committees, and by the University in May 2012. The first class was conducted each summer since 2012, in conjunction with the research study abroad experience at Guizhou University in Guiyang, China.
2. Broadened International Engagement in Education and Research- The Sustainable Research Experience (SRE) in China program was conducted during Summer since 2011.There were 21 students supported by the program in the 2012-13 academic year including summer 2013 - doubling the number of participants in the 2010-11 academic year. There are six faculty members, representing six university departments mentoring students as of the summer 2013 term. The program provided Southern University undergraduate students and their faculty mentors the opportunity to obtain a global perspective on sustainability research in the areas of sustainable materials, energy, technology, climate change, ecosystem and natural resources.
3. Advanced Internationalization -Southern University has developed a new partnership with the American Council on Education to participate in ACE's Internationalization Laboratory that jointly promotes the achievement of comprehensive internationalization, the first-ever HBCU invited to participate.
4. Contributed to STEM Workforce Development and Research Enhancement- In response to Louisiana's postsecondary education initiative entitled Workforce Investment for a Stronger Economy (WISE), SU has developed a plan (SU WISE) that links research productivity to workforce

development activities that target high-demand employment fields.

Measures proposed allow us to: 1) Recruit and retain a greater number of students into targeted fields; 2) Leverage educational technologies to support professional development of faculty and students; and (3) Review and align curricula with workforce needs. The SU WISE research productivity efforts include the development of a Center for Smart Composite Materials Modeling and Manufacturing and a Bioenergy Research and Development Platform to address the Clean Technology and Energy needs in Louisiana.

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Poster Category: STEM Science and Mathematics Education

Engaging Hispanic Youth in STEM via Clubs and Balloon Activities

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Since 2006, researchers at the University of Puerto Rico-Mayaguez (UPRM) have been organizing annual meetings of public school students to work on complex nanotechnology themes using educative models constructed with balloons. The participants are from intermediate and high schools in Western Puerto Rico who are also members of the Materials Science & Engineering Clubs established and sponsored by the UPRM Nanotechnology Center. The relevant topics are selected by researchers from the Center whose groups are in charge of designing the activities with the support of the Center's Education and Outreach Group (EOG). The number of participants, topping 500 in 2014, has consistently increased throughout the years as more clubs have formed in additional schools affiliated to the Center. Each Club is led by a teacher mentor who, most of the times, has also been trained at the Center via a Summer Camp. The theme selected each year is further developed in an instructional module that is tried first in a test bed by faculty and students from the Center. They prepare written instructions optimized through the test bed experience and share them with the teacher mentors.

Through the years, relevant and complex nanotechnology concepts have been explored through this interactive activity: nanoparticles synthesis for cancer therapy, nanofilters for environmental remediation, micro and nanofabrication of circuitry, crystalline defects, and nanoporous block copolymers, among others. The entire strategy hinges on the successful intervention in the public schools through the club structure, which is supported by the Center. These clubs have regular meetings under the supervision of the teacher mentor and are periodically visited by the Center's students and members of the EOG. In those visits interactive activities led by the Center personnel seek to engage the club members in critical thinking related to nanotechnology. The learning level is then assessed via classroom response systems that provide prompt feedback. As a whole the strategy has proven efficacious to increase young club members to improve their academic performance in order to seek admission in UPRM STEM programs.

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Poster Category: STEM Research

Biomass Gasification and Hot Syngas Cleaning for Production of High-Quality Syngas for Fischer-Tropsch Synthesis

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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 using the syngas. This research is thus to study an integrated biomass gasification and hot syngas cleaning process to produce high-quality syngas for the Fischer-Tropsch (F-T) synthesis of liquid fuels.

Four 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; and (4) study of Fe-based catalyst for the F-T synthesis of liquid fuels from biomass-derived syngas. Advanced experimental and mathematical modeling techniques are used to generate fundamental knowledge and tools necessary for the development of an integrated biomass gasification and hot syngas cleaning process. Specifically, experimental techniques including thermogravimetry, differential scanning calorimetry, Frontier micropyrolyzer, elemental analyzer, gas chromatograph, mass spectrometry and infrared spectrometry are used to uncover the physicochemical evolution of biomass particles during gasification. The evolution of the porous structure of biomass particles is analyzed using a B.E.T. surface area and pore analyzer. A CFD model with temperature-dependent physicochemical and structural properties is developed to analyze the behavior of multiple-phase, reactive gas-particle flow in a biomass fluidized bed gasi-

fier. Different nickel-based catalysts are investigated to catalytically remove tar and ammonia from the syngas. Biomass derived syngas usually has significant amount of CO2 and unadjusted H2/CO ratio. Fe-based F-T catalysts can effectively convert this kind of syngas into liquid fuels. The effect of promoting Fe-based F-T catalysts with various metals in hydrogenation of biomass-derived syngas is studied.

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Poster Category: STEM Research

Enhance Computing Curricula with High Performance Computing Teaching and Research

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Today's scientists and engineers depend increasingly on information and tools made available through new advanced computing technologies, such as networks, large data analysis, and sophisticated simulation tools that assist in the understanding of natural phenomena. High Performance Computing (HPC) now plays a critical role in enabling such scientific and engineering inquiry. However, undergraduate students are still lacking of experience in how HPC functions, because our current computing curricula do not adequately cover HPC. To solve this problem, a team of faculty members of Prairie View A&M University work together to improve undergraduate computing education through enhanced courses and research opportunities. The goal is to incorporate HPC concepts and training across the computing curricula in multiple disciplines in order to motivate students' interests in computing and strengthen their computing problem-solving skills, thus to strengthen and diversify the future U.S. workforce.

This is a collaborating project with three participating departments: Electrical and Computer Engineering, Computer Science, and Engineering Technology. After the first project year, a diverse environment was established with HPC cluster and embedded HPC platforms. Both platforms supported students' research projects in parallel programming, embedded systems design, and data cloud. In the past year, the project was successfully introduced in undergraduate classes. New course materials integrating parallel and distributed computing concepts were developed and offered to undergraduate students. Class surveys were collected to guide future development. Based on the results, more courses will be renovated to accommodate HPC contents in the coming years. A project-based learning scheme will also be introduced to our new course design and implementation including subjects like Computer Vision and Machine Learning.

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Poster Category: STEM Science and Mathematics Education

Developing a Health Informatics Security and Privacy Program

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Health informatics is one of the nation's largest growing industries. To protect health information systems, it is extremely important for health informatics professionals to be well educated and trained in information assurance, and to understand the many concerns of security, privacy, integrity and reliability. To meet this demand, we are creating a new, interdisciplinary curriculum model of Bachelor of Science in Computer Science (BSCS) concentration in Health Informatics Security and Privacy (HISP) at North Carolina Agriculture and Technical State University (NC A&T). To establish this BSCS concentration in HISP, we developed a new course on health information systems in the Department of Computer Science, a new course on Mathematics for Health Informatics in the Department of Mathematics, and modified an existing course in the Department of Management to include topics on business practices relating to health information technology. We also developed three course modules on health informatics security and privacy and are integrating these course modules into the existing information assurance courses in the Department of Computer Science.

Currently the BSCS concentration in HISP has been approved by the university. The three new courses and course modules have been taught at least twice. We are advertising this program to computer science students, as well as advertising the new courses to students in related disciplines such as mathematics, management, information systems, nursing, biology, etc.

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Poster Category: STEM Research

Achieving Effective Learning Using Student-Generated Screencasts in Computer-Aided Design Education

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Screencast tutorials have been widely used in computer-aided design (CAD) education. Screencast tutorial is a digitally recorded playback of a computer screen output, which often contains audio narration, to visually present procedural information. However, in current CAD education, students learn about the CAD software by watching the screencasts made by the instructor. Students are mostly kept in a passive role in the learning process and did not participate in designing the screencasts.

This poster presents the preliminary work of a new way of using screencast tutorials in the CAD education. Students were asked to make screencasts on the homework problems and share with all other students in the freshman Mechanical Engineering Drawing class. In this work, the students were divided into two groups. In the control group, students received traditional teacher-centered instruction without designing their own screencast tutorials. In the experimental group, students designed their own screencast tutorials that provided them with the feelings of belonging and ownership to their learning tasks. The students' learning outcomes, including their CAD modeling skills, engineering attitude, and their life-long learning skills, are assessed.

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Poster Category: STEM Science and Mathematics Education

Teaching and Research Initiatives in Power Engineering Technology

Yongpeng Zhang, Prairie View A&M University

The existing centralized, producer controlled generation and uni-directional transmission and distribution network has been gradually shifted to distributed generation with significant integration of renewable energy and bi-directional power flow, leading to the so called 'smart grid'. The power grid evolvement is boosting related industries, and provides a great opportunity for United States to secure its leadership for future economic growth. However, the education of engineers, technicians, and educators themselves has not kept pace with the rising demand for both grid modernization and workforce replacement. But the revival of power engineering education cannot be the simple duplication of the previous curriculum. Traditional courses in power engineering technology, such as power system, power electronics, electric machines, etc, need to be revamped to deliver relevant information in light of current industrial practices. And complementary knowledge and skills including control theory, embedded system, communications, digital signal processing, etc, are needed to strengthen student knowledge and skills with communication and information technologies. The investigator teams is composed of three faculties in two department, and this presentation focuses on the teaching and research initiatives in Engineering Technology (ET).

As the new concentration on top of the existing degree plan, most power courses are selected as the technical electives instead of required courses. Also, most supplementary courses in communication and information technologies may not be required courses either. It means the students may not be able to receive the full spectrum exposure in this field. Therefore, each power course needs to be independently established to ensure the knowledge delivery of the concepts of emerging smart grid. One possible solution to strengthen student capability in communication and information technology is the senior design. For example, leveraged on the previous NSF projects, online teaching platform has been established. The courseware developed in the new power courses (power system, power electronics, motor and drive) have been or will be uploaded to the online server for future use. Through such a procedure, students gained valuable experience in both power software development and online server management. Another important component is graduate student involvement. Graduate students are a critical component to ensure the technical progress, and keep a close monitoring on the undergraduate laboratory. In addition, their research projects paved the way for the establishment of new platform and function as a pilot investigation for future teaching innovations.

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Poster Category: STEM Science and Mathematics Education

Teaching Community Approach to Prompting Effective Active Learning Through Implementing Self-Regulated Learning Assessment in Multiple STEM Courses

Wei Zheng, Jackson State University

Learners not only have to manage the motivation to sustain their learning efforts, but also need to strategically regulate their cognitive activities in order to effectively acquire knowledge. Educational research has provided understanding on effective Self-Regulated Learning (SRL) and revealed that optimal learning is strongly correlated to the extent to which the learner uses SRL. However, those findings have not been well known and utilized by the STEM faculty members to facilitate learning of their students, particularly those African American students who had poor preparation in their early schooling and may mostly need the SRL skills for comprehending complex STEM subjects.

This paper is intended to communicate a novel perspective for prompting STEM faculty to acquire SRL and other learning theories and prompting students to develop higher-order learning skills, and presents work-in-progress of implementation of a proposed framework in this perspective, which is the main implementation framework of a NSF-funded Target Infusion Project.

The objectives of implementing the presented framework to expand faculty's expertise in fostering students' active learning through their participation in a teaching community and interaction with learning scientists; and to facilitate students' SRL skill development in their STEM learning by implementing the SRL Assessment in diverse STEM courses. The SRL assessment is composed of various questions that prompt students to make plans, adopt learning strategies, reflect on their learning efforts, and make adjustments on their learning efforts. It is implemented through integration with series of course quizzes in repeated cyclic processes for fostering students' SRL skills. Through such guided learning processes, students can have the opportunity to learn, adopt, and practice different learning strategies, and track and assess more effectively their academic learning, make adjustment for improvement, leading to enhancement of their academic performance, as well as their self-confidence and self-regulation skill. The novelty of the presented framework lies in building a broad teaching community among STEM instructors and learning scientists, whose members can provide the peer support to acquire learning theories and design, implement, evaluate, and publish their effective teaching practice in implementing SRL Assessment through intellectual exchange based on their common interest and pursuit. This novelty enables STEM instructors to adapt or develop learning strategies that are particularly suitable for a specific STEM subject in their courses, and enables students to be prompted for learning, adopting, and evaluating various regulating strategies in context of learning subjects from multiple STEM courses simultaneously. The mixed-methods with quasi-experimental design are also developed to collect and analyze data for revealing the impacts of SRL assessment on African American students' learning in STEM fields.

This poster, firstly, reviews relevant literature on theoretical basis and effective instructional practice on cultivating SRL skill; secondly, provides detailed description of the proposed framework including teaching community activity plan and SRL assessment implementation procedures, as well as empirical experimental design and evaluation plan; thirdly, shares implementation experience and work-in-progress of building teaching community through face-to-face meetings and virtual communications, as well as other work-in-progress of data collection on students' learning dispositions; finally, discusses the limitation of presented results and future improvement and work on implementation of the presented framework.

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