Morgan State University is officially designated by the State of Maryland as **Maryland’s Preeminent Public Urban Research University**.

Morgan State University is a **Carnegie Foundation Doctoral Research University**.

Morgan State University is a **Center of Academic Excellence in Cyber Security** as designated by the National Security Agency (NSA) and the Department of Homeland Security.

**FIVE YEARS OF ACHIEVEMENT (2013–2017)**
Division of Research & Economic Development
Morgan State University
ON THE COVER: Dr. Kofi Nyarko is a Professor in the Department of Electrical and Computer Engineering and Director of the Engineering Visualization Research Laboratory (EVRL). Under his direction, EVRL has conducted research with more than $12M of funding from the Department of Defense, Department of Energy, Army Research Laboratory, NASA, Department of Homeland Security, and Purdue University’s Visual Analytics for Command, Control and Interoperability Environments (VACCINE).

MORGAN STATE UNIVERSITY aspires to preeminence in all things. This commitment is critical to research, where outcomes can affect scientific progress for years. Morgan’s Division of Research & Economic (D-RED) embraces and practices the University’s Core Values of Innovation, Excellence, Integrity, Respect, Diversity, and Leadership. Our Core Values guide our faculty, students, staff and research partners in all of their endeavors.

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Morgan State University’s research programs have inspired thought leaders, scientists, and students. Our research projects serve as a catalyst for economic growth in Baltimore and in the State of Maryland.
In 2017, Morgan State University celebrated its sesquicentennial — 150 years from its inception as the Centenary Biblical Institute, to its present status as a Carnegie-classified doctoral research university.

We see research as a vehicle not only to improve the lives of people and broaden the horizons of science, but also as an important tool that enhances education. Curiosity-driven and use-inspired student and faculty research stimulates innovation, enriches learning, and engages fully, leading to increased outcomes for student retention, graduation, and graduate school admissions.

True to our motto: Growing the Future, Leading the World, the last five years were no exception in Morgan's 'ascending trajectory.' In 2017 we saw the State Legislature officially designate Morgan State University as Maryland's Preeminent Public Urban Research University. With this designation, we affirm our commitment to research, particularly the overall research theme of urban sustainability and resiliency. We are dedicated to enhancing the lives of the people of Baltimore and to using research outcomes as an example for urban populations globally.

\[ \textit{Research is formalized curiosity. It is poking and prying with a purpose.} \quad \text{—Zora Neale Hurston} \]
Morgan research addresses a few of Maryland’s most critical challenges like the health of the Chesapeake Bay, protecting data from security threats, and opportunities for sustainable and resilient communities.
Patuxent Environmental & Aquatic Research Laboratory (PEARL)

PEARL is perched near the Patuxent River in St. Leonard, Maryland and has worked for many years to increase the public’s awareness of the ecological impact of modern life on the bay area and on its current and potential bounty. The PEARL mission is to help solve environmental challenges through research, education, and economic development.

Leadership
Dr. Scott Knoche serves as the Director of PEARL. His research interests, which include environmental and natural resource economics, mesh well with PEARL’s mission to inspire society to understand the need for healthy waterways. Dr. Knoche leads an interdisciplinary team that includes 12 staff members with expertise in shellfish aquaculture, oyster genomics, environmental education, blue crab population dynamics, and more. For these researchers — and future ones — the data they collect and share creates an important snapshot of Maryland’s treasured bay.

Research Programs

OYSTER AQUACULTURE PROGRAM
Oysters have been a staple on Maryland’s dinner tables for centuries. Overfishing, pollutants, disease, and land development have taken their toll on the ecological health of the bay, its tributaries, and its occupants to the dismay of farmers, restaurants, and residents. Acknowledging that healthy oyster beds are essential to future harvests, the state created a 10-Point Oyster Restoration Plan in 2010 that served as a catalyst to increase oyster aquaculture in the bay. Researchers at PEARL determined that a comprehensive view of the developing aquaculture industry was essential. So in addition to assisting with private hatchery development, PEARL also focuses on policy, regulation, economics, and marketing.

In 2017 PEARL hosted a National Science Foundation-funded workshop titled “Chesapeake Fisheries: From Oysters to Economics.” Attended by internationally-recognized scholars and researchers, the workshop focused on many of the issues PEARL works on year round: blue crab and oyster population levels, the economics of oyster reef restoration, and harvesting regulations.

BLUE CRAB STUDY
The blue crab is a Maryland icon. The health and population levels of blue crabs are monitored annually, and even the most avid steamed crab-lover appreciates the need for sustainable harvest. PEARL’s annual George Abbe blue crab population survey began in 1968 and is the longest-running fisheries independent blue crab study in the state. Results from this long-term survey show that male blue crab size has decreased significantly since 1971. Because a healthy crab size is linked to more vigorous reproduction, the diminishing size highlights a problem that may affect future commercial harvests. PEARL’s long term involvement with the blue crab study helps to identify such problems and attract the necessary resources to research solutions.

Education and Outreach
Morgan is busy developing more researchers to carry on the vital work of PEARL. Morgan has a well-earned reputation for identifying and educating talented young people who gravitate towards science. PEARL’s internship and training programs are excellent examples of such development opportunities targeted to emerging scientists.
EXPERIENCING THE CHESAPEAKE BAY: PATHWAY FROM HIGH SCHOOL TO THE ENVIRONMENTAL SCIENCES

Morgan works to ensure a supportive and sustainable pathway from high school to university in the geoscience disciplines through an array of integrated activities. Students and teachers from a variety of high schools throughout Maryland will be engaged in inquiry-based field trips focused on environmental issues related to the Chesapeake Bay. An annual summer undergraduate intern program at PEARL provides mentored research experiences.

PLANKTON AND NUTRIENT STUDIES FOR THE CHESAPEAKE BAY (PLANS)

The PLANS program is designed to provide hands-on field and laboratory experiences for Maryland high school environmental science students. Students learn how to analyze water quality, nutrient dynamics, and phytoplankton blooms. The program is funded by the National Oceanic and Atmospheric Administration (NOAA).

POWER PLANT ENVIRONMENTAL TRAINING CENTER

In 2016, 152 students attended a new program designed by PEARL for prospective power plant employees (engineering and other STEM college students). The program provided a unique learning experience on the interrelationship between the operations of a nuclear power plant and the body of water that it uses to cool its power generation equipment.

This experience will provide STEM students with a better understanding of this dynamic environment and educate a more diverse power plant workforce. The program is grant-funded by the Nuclear Regulatory Commission’s Minority Serving Institutions Program.
The research process exposes students to a more engaging perspective than that of traditional textbook learning. By engaging in authentic, problem-centered learning experiences, the student develops the self-directed skills necessary for lifelong learning. Effective teaching happens when we help students learn how to learn — not what to think.

ASCEND Center for Biomedical Research

A lofty mission, committed faculty, curious students, health sciences, and innovation — it’s the recipe for a successful entrepreneurial development program in the sciences called ASCEND. As the name implies, Morgan’s ASCEND program encourages undergraduate students to rise to their talents and perform authentic research that involves making mistakes while pursuing the joy of discovery.

Leadership

Dr. Farin Kamangar, Director and Principal Investigator leads a team of researchers and educators who contribute their talents to ASCEND programs. Dr. Kamangar holds degrees in public health and biostatistics, a medical degree, and a PhD in epidemiology. He has published over 170 peer-reviewed articles in many top-tier journals. He has received several research awards, including the NIH Merit Award (group award) and the NCI Director’s Innovation Award.

Dr. Payam Sheikhattari, Co-Principal Investigator, holds a medical degree and an MPH in public health, and is an associate professor of behavioral health. Dr. Sheikhattari has expertise in community-based participatory research and leads the MSU Prevention Sciences Research Center (PSRC). He serves as the principal investigator of CEASE, a PSRC NIH-funded project aimed at reducing health disparities in tobacco use among residents of low income urban communities.

Research Programs

STUDENT RESEARCH CENTER (SRC)

The SRC is designed to be innovative, both in its use of space and in its philosophy. The Center is led by students and focuses on student researchers, each with different scientific interests and skills. Emerging researchers have the opportunity to individualize their projects, collaborate with faculty and near-peer mentors, and pursue multiple pathways for exploring their interests.

In the SRC’s first Health Research Concepts Competition (2017), nine student research concepts were funded.

SUMMER RESEARCH INSTITUTE (SRI)

Each year, a group of undergraduates spend eight weeks in a summer program designed for emerging researchers. SRI is an immersive introduction to health research led by co-directors Dr. Christine Hohmann and Dr. Avis Jackson. Students form teams, work with mentors, collaborate on a research question and prepare a proposal that adheres to the components of a viable research project. At the program’s conclusion, each team presents a preliminary research proposal to mentors, administrators, representatives from partner institutions, and family members.

COMMUNITY-BASED PARTICIPATORY RESEARCH PROGRAM

Many health problems, including obesity, diabetes, cancer, and cardiovascular problems disproportionately affect vulnerable and underserved populations. ASCEND’s Community-Based Participatory Research Program set out to address this situation by creating an infrastructure to connect academic and community partners. Morgan State research investigators and community members work together to create high quality and impactful research projects intended to improve the health and social welfare of neighborhoods.

Grants of $20,000 are provided to help teams start, grow, and sustain their research endeavors. Ten projects have been funded that address a wide range of health issues, such as smoking cessation, nutrition, and literacy.

ASCEND SCHOLARS PROGRAM

ASCEND Scholars are a select cohort of students who conduct health-related research and study the principles of health research with guidance from Morgan faculty and other
For two years, the cohort studies theories of health behavior and examines the mandates of Healthy People 2020, the nation’s ten year plan for health promotion and disease prevention, to learn how they can foster solutions to persistent health problems.

The students are encouraged to explore the application of health research in a four-semester course called Prevention Science: Theory and Methods. Created by Dr. Jocelyn Turner-Musa, Chair of the Psychology Department and Director of ASCEND’s Student Training Core, and taught by Dr. Sherita Henry, the course is a one-stop shop for students to develop research skills as well as a professional science identity.

PILOT PROJECT RESEARCH PROGRAM

In order to help students develop critical research skills, faculty members must be on top of their own skills. Faculty are challenged to remain current and invested in their own research while devoting time and expertise to student development. It’s a balancing act that is helped considerably by ASCEND’s Pilot Project Research Program.

The core goal is to encourage and support faculty to begin or reinvigorate their own biomedical research programs. PPRP provides seed funding of $50,000 for promising projects led by Morgan faculty members. With $1,100,000 of funding supported by NIH, 22 pilot programs are now in progress. The Pilot Project Research Program addresses ASCEND’s goal of sustainability and offers Morgan State scientists the ability to advance their own research projects and serve as models and inspiration for their students.
Leadership
Dr. Daniel Laughlin serves as Associate Director and Principal Investigator of the USRA GESTAR and Morgan State University partnership. As a former GESTAR researcher himself, Dr. Laughlin served as program manager for NASA’s Learning Technologies, the Digital Media Learning Fellow at NASA Headquarters, and was a member of the White House National Science and Technology working group on digital game technology. With offices at both Morgan and Goddard, Dr. Laughlin bridges the gap between Morgan’s 26 GESTAR researchers and the campus community.

Research Programs
REDUCING STATIC
Dr. Priscilla N. Mohammed is an electrical engineer whose PhD research on Saturn supported the Cassini mission. Now with Morgan State University’s GESTAR program, she has been able to witness the space flight application of her earlier research. A dedicated collaborator, she recently paired with MSU graduate student Randeep Pannu to detect and minimize radio frequency interference of satellite observations of Earth.

Radio frequency interference (RFI) has a negative impact on satellite observations of the interactions of Earth’s oceans, land surfaces, ice, and atmosphere. Low level RFI is especially problematic since it could be mistaken for natural variability and ignored leading to corrupted measurements. Dr. Mohammed and, MSU doctoral student Randeep Pannu are collaborating on the development of a wideband digital detector subsystem and the implementation of RFI detection and removal techniques that improve on what currently exists for that purpose.

As part of the wideband RFI research, a reflectometry experiment was conducted in 2017 at the Harvest oil platform off the coast of California. The objective was to collect data for RFI detection and altimetry using direct and ocean reflected broadcast satellite signals from a commercial geostationary satellite. Ms. Pannu designed and built the radio frequency front end using experimental requirements. Ultimately, an improved wideband mitigation subsystem will enable more accurate measurements of the Earth and detect harmful RFIs.

CONNECTING TO THE FUTURE
Astrobiology is an exciting field. The study of the origin, evolution, and future of extraterrestrial life and life on Earth has generated public interest and motivated scientists for centuries. Dr. Benita Bell is looking to the future of astrobiology by focusing on some grassroots efforts now. Dr. Bell is the Co-Director of the Minority Institution Astrobiology Collaborative (MIAC).
MIAC is a virtual collaborative of faculty and students from Historically Black Colleges and Universities and other Minority Serving Institutions seeking to increase minority participation in astrobiology research and education. Dr. Bell represents both Morgan State University and NASA on the MIAC steering committee. Over the life of the GESTAR program more than 60 MSU students have worked as researchers at Goddard Space Flight Center facilities.

**MEASURING RAIN AND SNOW**

**Dr. Liang Liao** is another MSU GESTAR researcher who works collaboratively to increase our knowledge of the behavior of our planet. An Associate Research Scientist, his research interests include radio wave propagation, electric field scattering, and atmosphere radar and radiometer remote sensing on clouds and precipitation. While he has a PhD in meteorology and much of his work involves precipitation, Dr. Liao is more interested in studying snow and ice microphysics and their radiative properties than talking about the weather.

Dr. Liao has worked with data collected by the Global Precipitation Measurement (GPM) satellite. The Dual-Frequency Precipitation Radar (DRP) instrument on GPM uses reflected radio waves to measure the rate of rainfall. To be useful, the DRP must accurately measure raindrop size and distribution. Dr. Liao’s work focuses on improving the measurement and data analysis tools to overcome historic limitations in rainfall and snowfall measurement.
Leadership

Dr. Kevin Kornegay is on the front line of the battle to protect America’s security infrastructure. He knows how important it is to be a step ahead of those who work to compromise the integrity of the nation’s critical infrastructure. Dr. Kornegay is the director of CREAM and IoT Security Chaired professor in the Department of Electrical and Computer Engineering with degrees from UC Berkeley in electrical engineering and computer science. Dr. Kornegay’s research is cutting-edge and essential to CREAM and its mission to train Morgan State students to become the next generation of cybersecurity engineers.

Research Programs

EMBEDDED SYSTEMS AND THE IOT

The Internet of Things (IoT) is a scenario in which objects, animals or people are provided unique identifiers such as an Internet protocol (IP) address and the ability to transfer data over a network without requiring human-to-human or human-to-computer interaction. Almost anything can fit into that category as long as there is an assigned IP address and the means to transfer data over a network. The IoT has rapidly evolved from the convergence of wireless technologies, sensors, and the internet.

Most IoT devices can be classified as embedded systems (ES). ES use a combination of computer hardware and software to perform dedicated functions within a larger mechanical or electrical system. Examples of embedded systems include cell phones, personal digital assistants, gaming consoles, and global positioning systems. As the IoT continues its evolution, the number of things and the upstream data associated with them present security concerns.

Public trust in the nation’s ability to protect sensitive information has wavered as cybersecurity intrusions become more frequent. Currently, most available security products deal only with protecting software. But sophisticated hackers are now able to attack hardware devices. CREAM researchers are working to develop solutions that will help protect our nation’s infrastructure by preventing the compromise of hardware.

MULTI-LAYER SECURITY

Most current solutions address IoT security at higher layers of the open systems interconnection model such as the application, transport, network, or data link layers. But Dr. Kevin Kornegay believes there is a unique opportunity to address security issues much earlier at the lower or physical layer of the open systems interconnection. This would allow for a security perimeter to be formed at the outermost edge of the IoT ecosystem all the way up to the cloud level. Hence, CREAM’s research has focused on vulnerability assessment, countermeasures, authentication, and intrusion detection of IoT devices.

CREAM researchers intend to investigate cross layer approaches that tie upper level security techniques to the physical layer to provide multi-layer security. At the heart of embedded systems are computers that leak information through side-channels, hidden back doors that are exploited during a cyber-attack. Side-channel analysis (SCA) is a reverse engineering technique used to reveal the encryption key via noninvasive side-channel monitoring. SCA attacks have uncovered the encryption key of many commercial computer systems. Vigorous Center for Reverse Engineering and Assured Microelectronics (CREAM)

CREAM is turning Morgan State University students into skilled cybersecurity engineers who will help secure our nation’s critical infrastructure. Our research is driven by the premise that Internet of Things (IoT) devices pose grave threats to our nation’s cyber physical infrastructure. We aim to change that.

A dog wanders away from home but luckily has a biochip transponder that transmits his location so he can be found. A car equipped with ONSTAR is involved in an accident, and help is on the way within minutes. A heart patient working in his garden is unworried about the exertion. He has been fitted with a wireless heart implant. In the evolving terminology of the Internet of Things (IoT), the dog, car, and patient are defined as physical objects or “things” within the IoT.
countermeasures are necessary to ensure that embedded systems can withstand SCA attacks and sustain or recover critical functions. CREAM employs a series of sophisticated side-channel analysis and monitoring techniques.

Creating a Safer Future

Acknowledging that external threats will rapidly evolve in complexity, CREAM enlists talented undergraduates and doctoral students to be thought leaders and problem-solvers in the ongoing battle to protect the nation’s cyber physical security infrastructure. Ten doctoral students are in the cybersecurity engineering program now, along with four undergraduate researchers. They are gaining critical knowledge in embedded systems, reverse engineering, hardware assurance, IoT testbeds, and side-channel analysis.

As the number of devices continue to proliferate, so too will the number of threats from adversaries. But the researchers and students in CREAM will not let down their guard. They will be a step ahead and prepared for a future that requires vigilance and knowledge.
Morgan faculty research spans all academic disciplines, from child welfare to cybersecurity, from music composition to sustainable development. Making a difference is a mantra faculty live by.
Lorece Edwards is an energetic woman guided by and on purpose. She serves as Director of the Center for Sexual Health Advancement and Prevention Education (SHAPE) and Associate Professor in the Department of Behavioral Health Sciences, School of Community Health and Policy. Dr. Edwards’ research is as purposeful as she is and focuses on improving lives, especially those of youth, emerging adults, women, and sexual minorities who often face deleterious situations.

Her most important recent and rewarding research has focused on the health and well-being of youth and emerging adults, especially risk-perceptions, sexual health, and underage alcohol and substance use. The outcomes of her research indicate that youth and emerging adults face several challenges (past and present) including adverse childhood experiences which are significant risk factors for risk-taking behaviors and substance use.

This research into the health of youth, and emerging adults was the driving force behind three projects: Get SMART, Get SMART with iChat and the Get SMART West Baltimore Drug Free Community Coalition. The development of a Get SMART Enterprise is constantly growing. Get SMART with iChat focuses on sexual health, alcohol, and substance use/abuse among sexual minorities. The Get SMART West Baltimore Drug Free Community coalition addresses underage alcohol and substance use.

Dr. Edwards hopes to build an environment that produces results by using a systems perspective combined with restorative practices. Looking at this work from a life-course perspective will help young people make better informed decisions around health risk and substance use. “The unique niche is a public health framework and collaborating with the Morgan Community Mile, by which we will not only take Morgan to the community but bring the community to Morgan.” In her work, Dr. Edwards calls for a Public Health of Consequences which is a powerful reminder that our main objective should be to positively affect the health of urban populations.

My research makes a real difference to the community. It’s a good feeling to know that you are contributing to the discovery or the development of something that can make a change for the better in people’s lives.
Andrew Farkas lives by the motto: Keep Moving Forward. As the Director of the National Transportation Center and professor of transportation studies at Morgan State University and a former transportation and engineering economist for the U.S. Department of Agriculture, Dr. Farkas has studied the most efficient, equitable, and cost effective ways to move people and goods from here to there. His own journey from federal employee to faculty member and researcher reveals his commitment to transportation issues and his desire to share his passion with new generations of students.

In the 1980’s, looking for more personal satisfaction with his job, Dr. Farkas was helped with his transition by Dr. Moges Ayele, then department head of transportation studies at Morgan State, who provided encouragement, job openings, and research grant opportunities. Now, as the director of the department himself, Dr. Farkas manages a federally funded university transportation center and all of its research, education, and technology transfer programs.

His recent research is focused on the purchasing and commuting behaviors of electric vehicle owners. In 2013, nearly 2,500 electric vehicles were registered in Maryland, and that number is expected to continue growing. Dr. Farkas and his research team from Morgan State surveyed owners of electric, hybrid, and internal combustion engine vehicles to determine the factors that contributed to electric vehicle ownership. Survey results showed that most electric vehicle owners are older, affluent, white males who are more environmentally focused.

Electric vehicles offer many benefits for both owners and the environment, including reductions in emissions, fuel cost, noise, and reliance on fossil fuels. But the researchers acknowledged that market penetration is a challenge due to the high cost of electric vehicles, battery charge time, and availability of recharging stations.

That’s why this research is important. Knowing who buys and drives electric vehicles now will help influence more equitable access to electric vehicles in the future. The data will also help Maryland with planning for necessary infrastructure changes to accommodate electric vehicles.

Andrew Farkas

DIRECTOR: Morgan State University National Center for Transportation Management, Research and Development

PROFESSOR: Transportation Studies

EDUCATION: PhD Geography, University of Georgia; MA Economics, University of Georgia; A.B. Economics, Georgia Southern College

RESEARCH: Purchasing and Commuting Behaviors of Electric Vehicle Owners
Active learning is a way of life for Catherine Martin-Dunlop, Director of the Center for Excellence in Teaching and Learning, Division of Academic Affairs at Morgan State. Between yoga, kayaking, scuba-diving, and reading several books at a time, she devotes her energy to inventing creative ways to improve and assess how teachers teach and students learn.

Dr. Martin-Dunlop’s busy life reflects those of the students at Morgan State and helps her empathize with their challenges, especially those who are first generation college students as she was. She recognizes that more engaging learning environments would help provide focus to students who juggle part-time jobs, families, and school work.

Her recent research expands on an active learning tool she has successfully used with her own students for decades, that of concept mapping (pictured on pages 16–17). Concept mapping is a visual method for students to organize and expand their knowledge of a subject. A graphic representation might begin with a main concept or idea at the top of a page with arrows that branch out to connect other sub-topics with the main idea.

Dr. Martin-Dunlop’s research study, funded by the National Science Foundation, employs concept mapping as an active learning strategy to help undergraduate students master biology at a deeper level. She believes that a more comprehensive grasp of the subject matter can positively influence students’ metacognitive skills and academic self-efficacy as well as impact the pass and retention rates of STEM students, especially those in underrepresented populations.

While Dr. Martin-Dunlop specializes in science learning environments, she is quick to note that her work in assessing active learning environments can be applied to any subject area.

Morgan State is an exciting place to be right now. It is a unique institution in many ways. Morgan offers the only master’s and doctoral degree in Science Education in Maryland. It’s a great program that keeps me engaged with our talented graduate students.
Eric Conway is well known as a preeminent choral master and pianist. As director and chief accompanist for the Morgan State University Choir, his impressive talents have contributed to the creation of a world-class choir and made him a sought-after music collaborator in the global arts world. However, he may not be as well-known for his other significant role at Morgan State — that of Chairperson of the Fine and Performing Arts Department. Here, he orchestrates an academic department composed of musicians and artists who practice their avocation and engage in research, projects, and performances that advance the arts.

**Marquita Lister**, soprano and Morgan State Lecturer of Voice focused on preserving the musical heritage of the Negro spiritual in her collaborative project, *The African American Art Song and Arranged Negro Spiritual for a New Generation*. Honors include Emmy and Grammy nominations.

**James Lee**, composer and Professor of Music Theory, is conducting research on the music of ancient Israel, which will culminate in his new work, *Miqdash (Sanctuary)*, composed for orchestra with a version for piano. Dr. Lee’s compositions have premiered across the country.

**Stephanie Bruning**, pianist, Associate Professor of Music, and Coordinator of Keyboard Studies, was awarded the 2017 Global Music Awards Gold Medal for an Album, *The Indian Character Piece: Native-American Influenced Piano Works from the Early 20th Century*.


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E **ric Conway is well known as a preeminent choral master and pianist. As director and chief accompanist for the Morgan State University Choir, his impressive talents have contributed to the creation of a world-class choir and made him a sought after music collaborator in the global arts world. However, he may not be as well-known for his other significant role at Morgan State — that of Chairperson of the Fine and Performing Arts Department. Here, he orchestrates an academic department composed of musicians and artists who practice their avocation and engage in research, projects, and performances that advance the arts.**

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I try to live by Aristotle’s sage words: *We are what we repeatedly do. Excellence, then, is not an act but a habit. It inspires me to give my best performance as a musician and guides me to lead the Fine and Performing Arts Department to be the best it can be.*
Global citizen is a good way to describe Dr. Umaru Bah, Associate Professor, Fulbright Scholar, and passionate advocate of the uses of information/data for social entrepreneurship, civic engagement, and sustainable development. He is founder and chief coordinator of Morgan Open Data, an initiative to encourage and support interdisciplinary collaboration on action-oriented applications of data in the public domain. In this capacity, he leverages his expertise in social media applications and analytics along with his multilingual skills to collaborate productively with people locally and globally. One of several successful outcomes of such engagement is the official designation of Morgan State University as an institutional partner for sustainable development in Africa and the African diaspora at the second biennial Africa Open Data Conference held in Accra, Ghana in 2017.

Dr. Bah is also an enthusiast of Big Data, a term that refers to voluminous datasets which, with the aid of complex algorithms and artificial intelligence, are mined and analyzed to identify both human and non-human trends, patterns, insights, and behaviors. Open data is a critical component of Big Data. Globally accessible and often used in conjunction with online open platforms and open source codes, open data now plays a central role in the design of services and solutions for social entrepreneurship, community empowerment, and sustainable development. Open data applications cover a wide range of fields and disciplines including health, education, journalism, agriculture, nutrition, transportation, gender equality, and social justice.

Dr. Bah believes that Morgan’s seminal engagement as an HBCU in the open data movement is critical for future beneficial domestic and global partnerships. Plans are underway to engage with various stakeholders in data for development (D4D) initiatives to further internationalize the MSU campus and localize its global partners.
If a journey of a thousand miles begins with one step, Sandra Chipungu made that step with the support of many mentors. Dr. Chipungu is grateful to at least seven academic professionals who recognized her caring spirit and believed in her talents. Their thoughtfulness and frank advice made the kind of difference to her that she wants to make for others as a teacher and researcher.

Dr. Chipungu’s most important research has focused on child welfare. She is especially proud of Morgan’s role in the Title IVE Public Child Welfare Training contract. Morgan is part of the IVE Consortium, which over the past ten years has provided over $4M in tuition benefits for graduate students in exchange for their work in child welfare upon graduation. Title IVE Education for Public Child Welfare Program is a federal reimbursement program that helps reduce the costs of foster care for eligible children.

In another study, Dr. Chipungu researched the placement of foster children with relatives and with nonrelatives. The study found that relatives who were caregivers needed more services for their foster children but received less, and they were less likely to ask for assistance. This outcome, among others, helped shape state and federal policies to be more child-centered and provide more services for eligible caregivers.

Foster children face many challenges on the road to adulthood, so it’s good to have Dr. Chipungu along as a traveling companion. Each step she takes is fueled by her passion to make a difference for children and families.

**Sandra Chipungu**

**DEPARTMENT CHAIR:** PhD Department, School of Social Work

**EDUCATION:** PhD, University of Michigan School of Social Work; MSW, University of Michigan School of Social Work; BA, Sociology and Social Work, Morgan State University

**RESEARCH:** Principal Investigator, Title IVE Education for Public Child Welfare Program; Dr. Iva G. Jones Medallion Mantle Awardee 2014–2015

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Today’s generations of students want to be challenged, to be taught by faculty members who are prepared, and who have high standards. They are fortunate to be at Morgan, where committed faculty engage students at the highest levels.
Morgan sponsored research accomplishments include patents, licenses, and business start-ups. But most importantly, Morgan’s research outcomes have improved people’s lives.
Morgan State University takes enormous pride in the accomplishments of its researchers, like those of Dr. Taqi Timazi (pictured on pages 22-23). His Immigrant Muslim Youth Project explores acculturation, adaptation, and behavioral and mental health risk factors for Muslim youth. Dr. Timazi also examined the psychological and behavioral health of African American youth in public housing. His research integrates family support, discrimination, religion, and other socioecological factors.

**Division of Research & Economic Development (D-RED)**

D-RED has enthusiastically welcomed every opportunity that has come its way. Established in 2013, the division manages programs and facilities such as GESTAR, ASCEND, CREAM, PEARL, and the University’s Office of Technology Transfer. Over the past five years, D-RED has overseen more than $154M in awarded contracts and grants.

**D-RED Accomplishments and Highlights (2013–2017)**

**METEOROLOGY WORKSHOP FUNDED BY NATIONAL SCIENCE FOUNDATION (NSF)**

Weather is more than idle chit-chat at the NSF-sponsored Workshop on Sensitivity Analysis and Data Assimilation in Meteorology. GESTAR scientists Dr. Ronald Errico and Dr. Nikki Privé received a $10,000 grant from the NSF to enable students to attend the 2018 conference in Portugal.

**NUCLEAR REGULATORY COMMISSION (NRC) VISITS POWER PLANT ENVIRONMENTAL TRAINING CENTER**

The MSU PEARL Power Plant Environmental Training Center teaches STEM students at Minority Serving Institutions (MSIs) about the effects of nuclear power plants on the environment. The training center is funded by the Nuclear Regulatory Commission, Civil Rights and Diversity Directorate. NRC personnel visited the training center to discuss EEO requirements, metrics, and future funding opportunities.

**CRIME, VIOLENCE, AND GANG PREVENTION RESEARCH: EPIDEMIOLOGICAL CRIMINOLOGY**

Morgan brings a unique perspective to address crime, violence, gangs, and terrorism and the overlapping disparities between crime and health. An interdisciplinary team has developed and employed a new and emerging practices, theory, paradigm, and discipline entitled Epidemiological Criminology, in which law reviews, scientific papers, graduate theses, and dissertations have been authored, nationally and globally.

**CENTER FOR GUN ANALYSIS AND NEIGHBORHOOD GANG STUDIES (C-GANGS)**

An interdisciplinary team at Morgan has created the C-GANGS, to study the impact that illegal guns and gangs have on the health, crime, and violence in Baltimore.

**MSU TRAVELS TO ANTARCTICA**

Morgan became the first HBCU to visit Antarctica when Dr. Victor McCrary, Vice President for Research & Economic Development and a member of the National Science Board, joined colleagues from the National Science Foundation (NSF) for a site review visit of NSF’s McMurdo Station.

**AWARDS FOR INNOVATION AND RESEARCH**

Dr. Hyokyung Lee, MSU GESTAR assistant research scientist received an Outstanding Performance-Science Software Development award from NASA Goddard Space Flight Center Atmospheric Lab for GPM/DPR (Global Precipitation Mission/Dual-Frequency Precipitation Radar) Software Development at the 2017 awards ceremony.

Dr. Lawrence A. Peskin of the Department of History and Geography won a competitive Award for Faculty from the National Endowment for the Humanities. The $33,000 grant entitled “U.S. Consuls in the Mediterranean and Latin America and the American Trading Nation, 1785–1850” will support Peskin’s investigation of early American consuls and their networks in the Mediterranean and Latin America.
First Technology Transfer Agreement

Dr. Seong Lee is an acknowledged innovator. He has been honored as Innovator of the Year twice by the Daily Record. More recently, his creative technology talents have led to a milestone for Morgan State University — their first technology transfer agreement.

Dr. Lee serves as Professor and Laboratory Director in the Center for Advanced Energy Systems and Environmental Control Technologies (CAESECT) in Morgan’s Department of Industrial Engineering. He led a research staff and the technology development activities that resulted in the production of CykloBurn™, a technology that uses an environmentally friendly, ultra-clean mobile combustor to dispose of poultry waste. The technology represents a significant value proposition to individual poultry farmers by ridding them of the waste, creating electricity for operations, and providing heat for poultry houses.

In 2017, a new Maryland company, CykloBurn Technologies, LLC was formed by two Maryland entrepreneurs. The company has received a $150,000 investment from the TEDCO Maryland Innovation Initiative (MII) to commercialize Dr. Lee’s innovation and establish business and manufacturing operations in Baltimore City. Morgan State University, in partnership with the company, was awarded a $100,000 Maryland Industrial Partnerships (MIPS) Program Grant to further develop the CykloBurn™ Heating System for use in poultry houses. Dr. Lee’s research contributes to Maryland’s efforts to reduce harmful pollutants that impact the Chesapeake Bay and farmlands.

$154.5M total in awarded sponsor grants and contracts

$375.8M total potential award value for 664 pending research proposals

$143.8M in total expenditures

$75.1M in research expenditures

$24.3M National Institutes of Health/ASCEND Cooperative Agreement (over five years), renewable in 2019

$18.5M GESTAR contract with Universities Space Research Association (over five years), renewed in 2016

$4.2M from the Substance Abuse and Mental Health Services Administration (over five years)

$2M for the Center for Cybersecurity in the 2019 State Budget

$1.5M from U.S. Department of Homeland Security, S&T, University Programs, to establish the Visual Analytics for Science and Technology (VAST) Research Training Program (over six years)

$500,000 Johns Hopkins University Extreme Materials sub-agreement (2013–2018)

$500,000 for five Maryland Innovation Initiative awards to faculty through the Maryland Technology Development Corporation

$300,000 from Dominion Power Foundation for the PEARL crab study (over five years)

$150,000 from the Maryland Department of Commerce to restart PEARL Oyster Hatchery

Office of Technology Transfer accomplishments:
- 39 invention disclosures
- 6 utility patents filed
- 19 provisional patent applications filed
- 1 issued US patent
- 1 technology transfer license
- 1 start-up company formed

Major partnerships agreements signed:
- US Navy, NAVSEA Indian Head (2013)
- Drexel University (2013)
- New York Academy of Sciences (2013)
- US Drug Enforcement Administration (2014)
- US Army Corps of Engineers (2016)
- Maryland Department of Natural Resources (2017)

Designated Maryland’s Preeminent Public Urban, Research University in May 2017

Designated Center of Academic Excellence for cyber education by the National Security Agency in 2016


Rebranding and revitalization of the Estuarine Research Center to the Patuxent Environmental & Aquatic Research Laboratory with a 5-year strategic plan

Conflict of Interest in Research Policy developed and approved by the State Ethics Commission and MSU Board of Regents, more than 25 new procedures for research administration developed (2013–2017)

Morgan Community Mile has impacted the community by facilitating:
- 30 solar panels installed on homes of low-income Baltimore City residents (2016); community information campaign to reduce vehicle break-ins (2015)

Five STEM EXPO Events hosted jointly by the School of Education and Urban Studies and Senator Ben Cardin (2013–2017)

Government and local officials visits:
- Dr. John Holkren, Head, White House Office of Science & Technology Policy
- Dr. France Cordova, Director, National Science Foundation
- Dr. Corin Stone, Executive Director, NAVAIR Patuxent Naval Air Station
- Dr. Sylvia Trent-Adams, US Public Health Service, Commission Corps
- Dr. Stefanie Tompkins, Director, Defense Science Office, DARPA
- Dr. Ernest Moniz, Secretary of Energy
- Mr. Thomas Perez, Secretary of Labor
- Mr. Ron Daniels, President, Johns Hopkins University
- Archbishop William Lori, Archdiocese of Baltimore
Alone we can do so little, together we can do so much. — Helen Keller

Many thanks to our State and Federal stakeholders, and our supporters within industry, academia, and foundations for their support and advocacy of Morgan’s growing research enterprise.