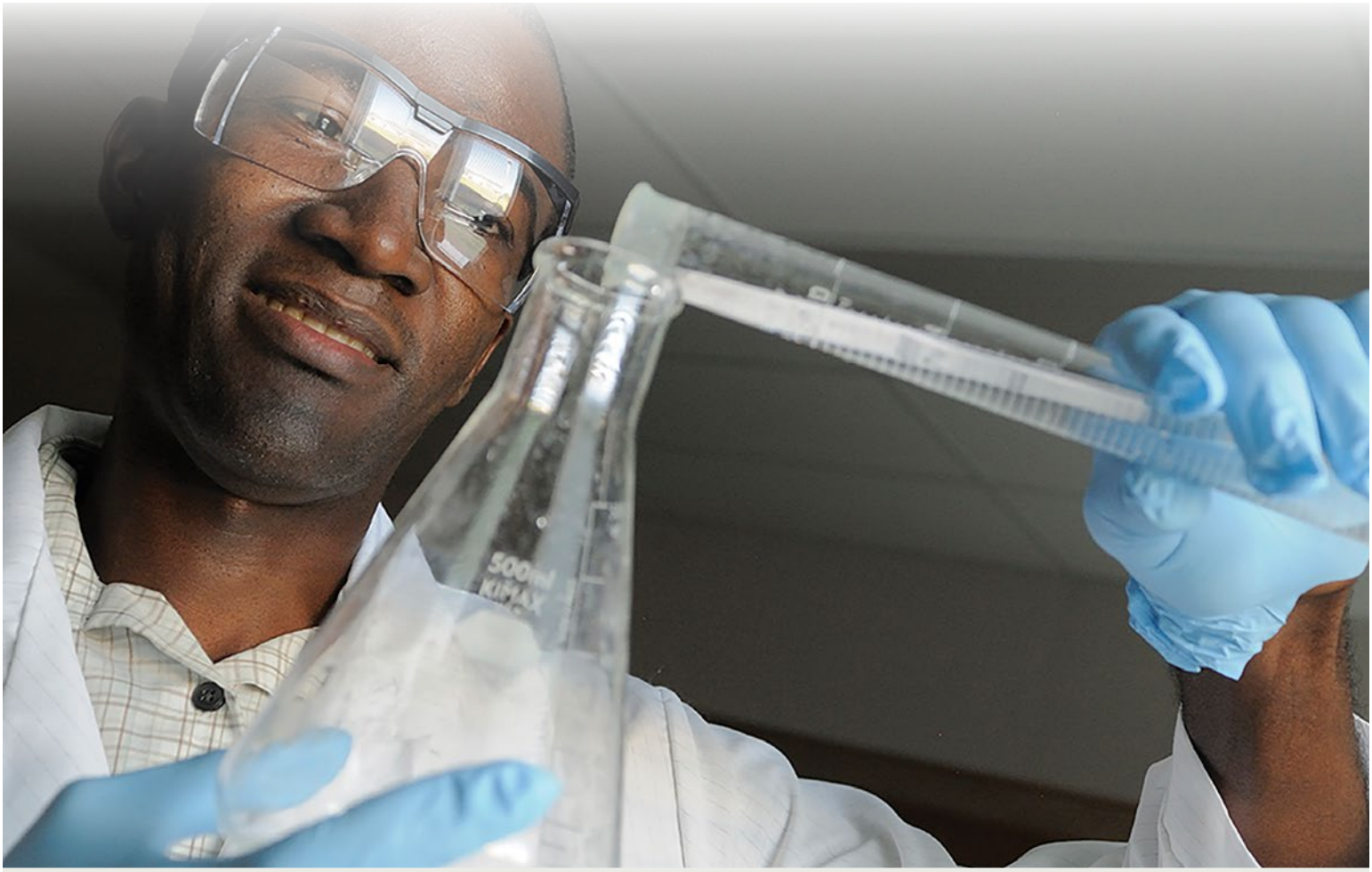
Association of Public & Land-grant Universities

Office of Access and Success

# Research Activity at the 1890 Universities



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## ABOUT THE ASSOCIATION OF PUBLIC AND LAND-GRANT UNIVERSITIES

The Association of Public and Land-grant Universities (APLU) is a research, policy, and advocacy organization dedicated to strengthening and advancing the work of public universities in the U.S., Canada, and Mexico. With a membership of 236 public research universities, land-grant institutions, state university systems, and affiliated organizations, APLU's agenda is built on the three pillars of increasing degree completion and academic success, advancing scientific research, and expanding engagement. The association's work is furthered by an active and effective advocacy arm that works with Congress and the administration as well as the media to advance federal policies that strengthen public universities and benefit the students they serve.

Annually, APLU member campuses enroll 4.7 million undergraduates and 1.2 million graduate students, award 1.2 million degrees, employ 1.4 million faculty and staff, and conduct $42.7 billion in university-based research. APLU's membership includes 208 campuses and 24 university systems, including 75 U.S. land-grant institutions. The association's membership includes 23 historically black colleges and universities (HBCUs), of which 21 are land-grant institutions (19 under the 1890 Morrill Act, two under the 1862 Morrill Act).

## ABOUT APLU'S OFFICE OF ACCESS AND SUCCESS

The Office of Access and Success (OAS) at the Association of Public and Land-grant Universities is dedicated to equity, access, and educational excellence for all Americans with a special focus on underserved students and minority-serving institutions. OAS provides comprehensive support for the Council of 1890 Universities and the Commission on Access, Diversity and Excellence (CADE). Many of the programmatic initiatives are purposed to advance degree completion and institutional capacity building efforts for the respective members. OAS engages in research and advocacy/policy, membership and coalition building, and meetings and convenings.

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# Foreword

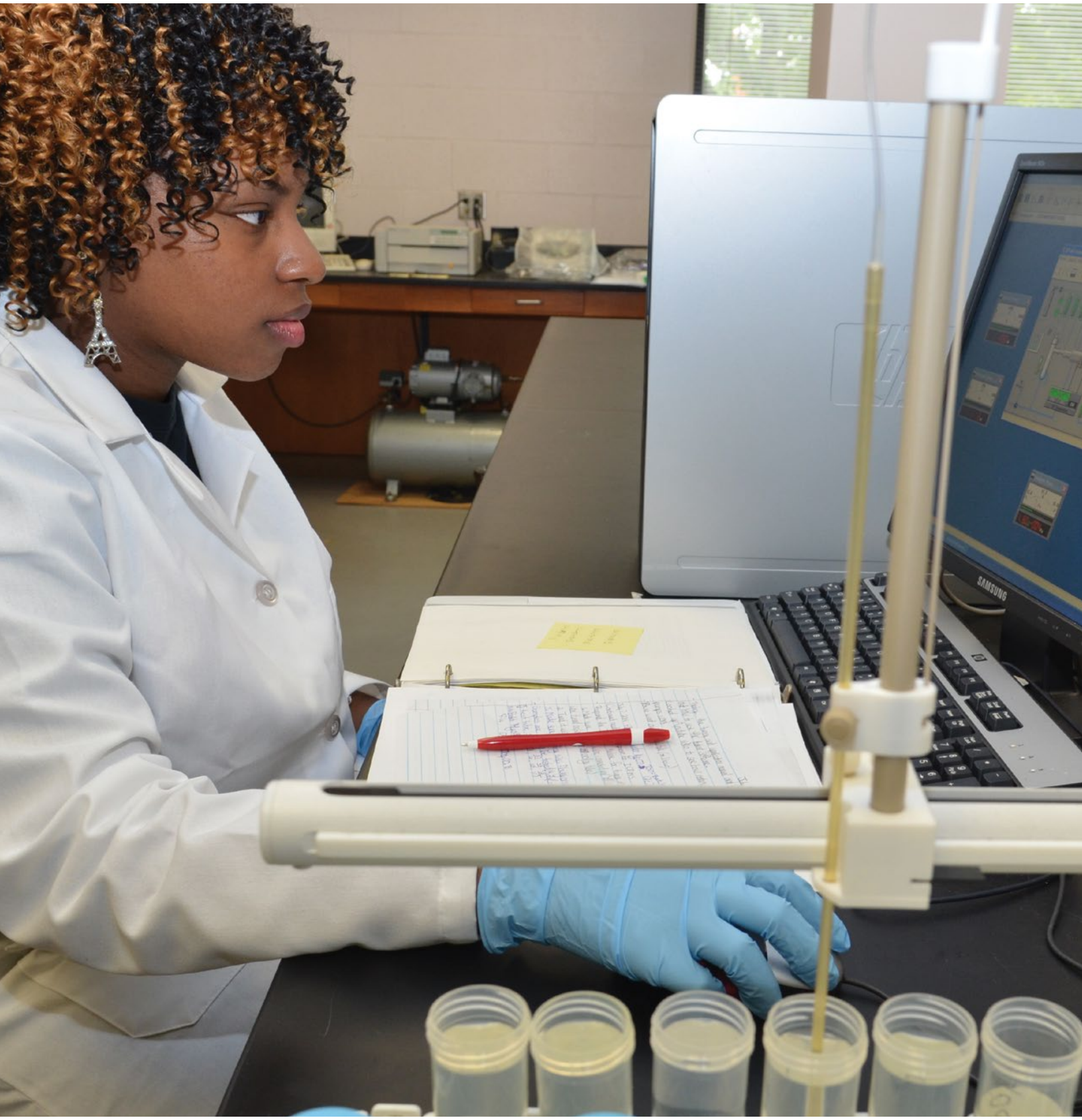
The report, *Research Activity at the 1890 Universities,* offers critical insight into the type of research ongoing at the 19 historically black land-grant universities. The five year period of 2012-2016 demonstrates notable research activity within primarily teaching-centered universities. Implications of research pursuits and productivity are important and the 1890 universities are engaging in research irrespective of the institutional type and infrastructural capacity they hold.

What we come to particularly appreciate from the report is the diversity of the 1890 universities and the types of research explored on the various campuses. The 1890 universities are not monolithic although they have shared values as land-grant institutions of higher education. Some of the vast differences in the research activity of the 1890 universities show how they offer something unique to the communities and constituencies they serve.

For those who might have been unaware of the research endeavors of these 19 historically black land-grant universities, the value-added report is a resource guide that shines a light and clarifies areas of expertise and exploration existing within their unique contexts. The Classification of Instructional Programs (CIP) provides a structured, legitimate approach to communicate and disseminate the STEM research activity of these 19 historically black land grant universities.

I am so pleased to have this informative report, *Research Activity at the 1890 Universities*, published during my tenure as Interim Vice President in the Office of Access and Success at the Association of Public and Land-grant Universities. Both individually and collectively, the 1890 universities have a powerful story to tell about the research they conduct on behalf of the nation. It's a story necessary for the public to know. For future questions about the report, you may contact Dr. Jared Avery, Associate Director via email at javery@aplu.org.

RoSusan D. Bartee, Ph.D.
*Interim Vice President, Office of Access and Success*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# Executive Summary

The executive summary of the report, *Research Activity at the 1890 Universities*, provides exploratory analyses of the research activity occurring at 1890 universities within the last five years (2012-2016). Key emerging findings are highlighted below as a synthesized response to the following report questions: 1) What are the recent and current research activities of the 1890 Universities in science, technology, engineering, and mathematics (STEM)? 2) Based on the Classification of Instructional Programs (CIP), to what extent are there similarities and differences in the research activity at 1890 universities? Using campus-generated data and CIP categories (*Agriculture, Agricultural Operations, and Related Sciences; Biological and Medical Sciences; Computer and Information Sciences and Support Services; Engineering, Aerospace, Aviation and Transportation; and, Mathematics and Statistics)*, qualitative analysis procedures examined the research activity occurring at the 1890 universities and the emerging similarities and differences. Highlights of the findings from the exploratory analyses are as follows:

## Agriculture, Agricultural Operations, and Related Sciences

- The 1890 campuses identified the most research activity underway in Agriculture, Agricultural Operations, and Related Sciences within the following subcategories: Agricultural Production Operations—*crop production (16 out of 19)*; Plant Sciences—*plant protection and integrated pest management (17 out of 19)*; and Soil Sciences—*social sciences and other (17 out of 19)*.

## Biological and Medical Sciences

- The 1890 campuses identified the most research activity underway in Biological and Medical Sciences within the following subcategories: Biomathematics, Bioinformatics, and Computational Biology—*bioinformatics (12 out of 19)*; Biotechnology—*medicinal crops (11 out of 19)*; and Ecology, Evolution, Systematics, and Population Biology—*ecology (14 out of 19)*.

## Computer and Information Sciences and Support Services

- The 1890 campuses identified the most research activity underway in Computer and Information Sciences and Support Services within the following subcategories: Computer/Information Technology Administration and Management—*computer and information systems security/information assurance (13 out of 19)*; Computer Programing/Programmer, General *(12 out of 19)*; and Computer Systems Networking and Telecommunications—*computer systems networking and telecommunications (10 out of 19)*.

## Engineering

- The 1890 campuses identified the most research activity underway in Engineering within the following subcategories: Agricultural Engineering *(18 out of 19)*; Aerospace, Aeronautical and Astronautical Engineering *(7 out of 19)*; and Civil Engineering—*water resources engineering (8 out of 19)*.

## Mathematics and Statistics

- The 1890 campuses identified the most research activity underway in Mathematics and Statistics within the following subcategories: Applied Mathematics—*computational mathematics (9 out of 19)*; and Applied Mathematics—*computational and applied mathematics (8 out of 19)*.

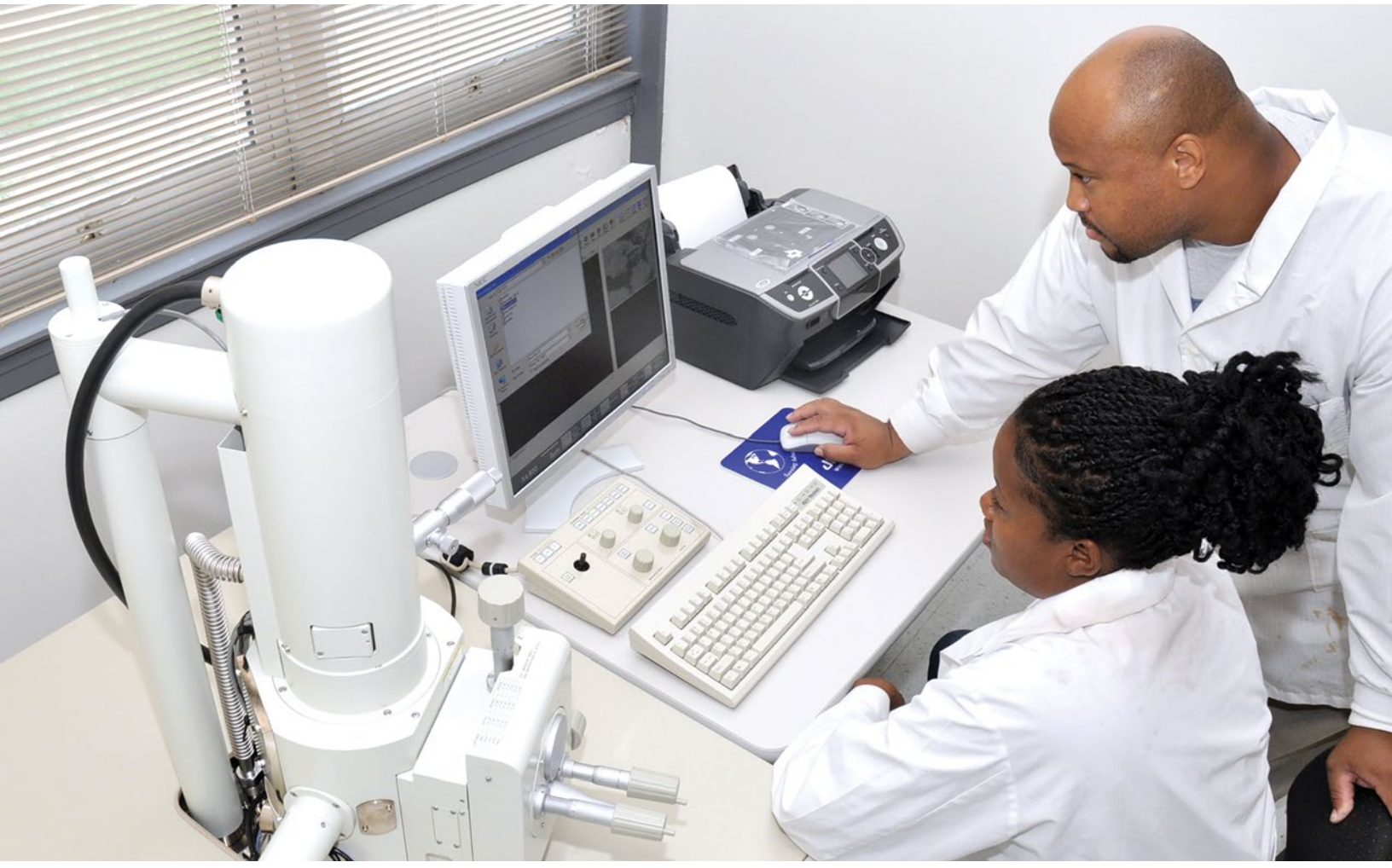
Tradition matters to the 1890 universities, particularly with regard to geographical location, research expertise, community demands, resource allocation, and related areas of interest. Several CIP and specific research concentration areas highlighted in the report illustrate inquiry shared by both the larger, more research-focused 1890 institutions and their smaller, more teaching-focused counterparts.

Report findings have particular importance in the ability of the 1890 universities to foster partnerships that could aid in the expansion of scientific understanding and funding opportunities. Report findings are also relevant to understanding more clearly the robustness of the type of research activities occurring at the 1890 universities compared to the STEM research activities that are not as robust. Given the identified limitations in the report, the ability to capture emerging areas of research at 1890 universities as well as the inability to fully capture research in the CIP may not be reflected in this report.

Thus, the report offers a unique opportunity to engage the discussion at the 1890 universities and the contributions of their communities toward the advancement of STEM. The capacity for which we are able to continue the discussion regarding the research activity of the 1890 university provides a clearer understanding of the important research contributions these 19 universities make toward advancing STEM research.

# General Overview

Carl Sagan, former astronomer, astrophysicist, author, and communicator, once stated, "Somewhere, something incredible is waiting to be known." Sagan's achievements as a researcher and as an advocate of scientific inquiry and critical thinking popularized a diverse range of scientific subjects to casual observers and engaged learners, alike. The efforts of Sagan as a scientist inspired a generation of students to reason beyond the norm in search of truth and understanding. Through the scientific method, the pursuit of truth and reason proved important for Sagan as he pushed future learners to do the same through their own academic interests to position themselves for enhanced knowledge acquisition and social impact.



Much like the intellectual curiosity and social engagement pursued by Sagan, research inquiry and innovation are embedded within the tradition of land-grant universities. The original mission of the land-grant universities and the passage of the *Morrill Act of 1862* espouse teaching in agriculture and technical areas to ensure the delivery of practical, relevant education. More specifically, the *Morrill Act of 1890* expanded access to African Americans where the diversity of ideas, interests, and individuals served as an important mechanism for generating inclusivity and opportunity. What remains an individualized, yet commonly-shared, pursuit of the land-grant universities is the engagement with research activity. Research activity is the conduit to understanding and articulating more clearly scientific origins and linkages for academic disciplines and social endeavors. Particularly, for the historically black land-grant universities, such outcomes are evidenced by over 130 advances in the areas of invention, processes, patents, licenses, and in intellectual property. Despite recorded inequities in funding and resources, Lee and Keys (2013) indicate historically black land-grant universities as producers of "innovative research and state-of-the-art practices in agriculture and STEM disciplines that are geared toward improving life in rural and high-risk communities" (p. 2).

Thus, the report, *Research Activity at the 1890 Universities*, explores research activity, within the last five years of 2012 through 2016, at the 1890 historically land-grant universities, with particular observation given toward similarities and differences in the research disciplines of STEM. The campus-reported institutional data is generated through the following questions:

1. What are the recent and current research activities of the 1890 universities in science, technology, engineering, mathematics (STEM)?
2. Based on the Classification of Instructional Programs (CIP), to what extent are there similarities and differences in research activity?

These exploratory questions provide an important framework for ascertaining important insights about the types of research activity at the 1890 land-grant universities and their implications as national priorities. The report also expands understanding of the diversified types of research occurring at the 1890 universities and the implications for national and international scientific communities. While much remains unclear regarding the degree to which the institutions collectively research and disseminate knowledge as a body of historically black land-grant universities, this report is particularly noteworthy as a means to understand the breadth and variability of research endeavors taking place on the individualized campuses of 1890 universities. As a resource directory, HBCU and non-HBCU presidents and chancellors, academic deans, policymakers, and funding agencies will be more informed about the research activity and intellectual contributions of the historically black land-grant universities to academic and social enterprises.

# 1890 Universities and STEM Research Activity

This section summarizes the program offering in accordance with the Classification of Instructional Programs (CIP) and the respective subcategories and specializations. Using the CIP, the tables below particularly disaggregate the type of STEM research underway at the 1890 universities.

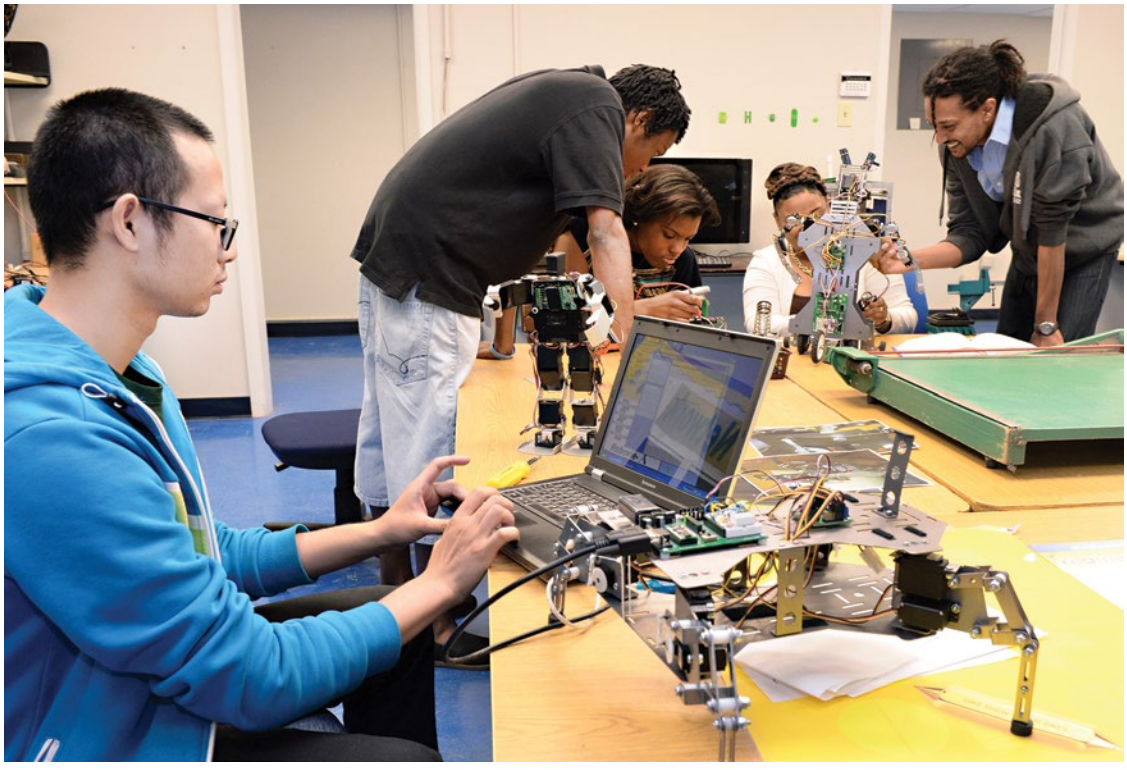
## Agriculture, Agricultural Operations, and Related Sciences

Research programs categorized under this CIP of Agriculture, Agricultural Operations, and Related Sciences prepare individuals to apply scientific knowledge, methods, and techniques to the management and performance of agricultural operations. Following below are disaggregated findings from the analyses of the research activity ongoing within the 9 sub-categories and specializations of the CIP of Agriculture, Agricultural Operations, and Related Sciences:

- ***Agricultural Production Operations (Crop Production).*** Research on the effects of chemical pesticides and diseases among small fruit (e.g., strawberries, blueberries, and blackberries) is conducted at 16 out of 19 universities. This represents a considerable portion of the 1890 universities, where the research activity of agricultural production operations in crop science is currently the focus.
- ***Agricultural Production Operations (Aquaculture).*** Aquaculture, represented by fish breeding and fish disease control, is an important research area by 9 out of the 19 institutions. Much of the research activity is concentrated to institutions land-locked of natural waterways.
- ***Animal Sciences (Agricultural Animal Breeding).*** Techniques that enhance animal breeding through the utilization of in-vitro fertilization and cloning research, is among the other areas of notable research inquiry conducted at 9 out of 19 universities. Increased demands for meat worldwide, as well as concerns about food safety, spur research in this area.
- ***Animal Sciences (Dairy Chemistry).*** Dairy chemistry, consisting of the production of goat milk, cheese, ice cream, and butter, is an area of research emphasized by 6 out of the 19 universities.
- ***Animal Sciences (Livestock Management—food and animal safety).*** Similar to studies in plant sciences, CIP analyses reveal commonalities in food safety research among animal livestock (13 out of 19 universities). Researchers at the 1890 universities concentrate much of their attention on the study of dangerous foodborne pathogens and parasites such as bacterial

*E. coli* and roundworms/tapeworms as a general area of public health needs. Much of this work aligns with the treatment and handling of animal meat after slaughter.

- ***Animal Sciences (Livestock Management—meat science).*** The analysis indicates commonalities in animal meat research, particularly in reference to goats, sheep, cows, and poultry. It is particularly notable for 14 out of the 19 campuses.
- ***Plant Sciences (Agricultural and Horticultural Plant Breeding).*** Agriculture biotechnology (e.g., genetic engineering, tissue engineering, etc.) emerges as a prevalent area of study among 11 of the 19 1890 land-grant universities. The utilization of methods that enhance the quality and nutrition of exported crops, such as corn and soybeans, demonstrate the most extensive research areas among the campuses in agricultural biotechnology. A significant portion of the 1890 universities increased yield of alternative crops by adding value in agro products and nano products.
- ***Plant Sciences (Plant Protection and Integrated Pest Management).*** Insect Pest Management, particularly in the plant sciences, is conducted at 17 of the 19 universities. This represents nearly all of the 1890 universities where plant science, with a unique focus on plant protection and integrated pest management, is a key research activity
- ***Soil Sciences (Soil Sciences, Other).*** Soil sciences and air quality (17 out of 19 universities) is a top research area in the agricultural sciences. It is occurring at nearly all of the 1890 universities campuses.



## TABLE 1.1

### RESEARCH ACTIVITY OF THE 1890 UNIVERSITIES IN AGRICULTURE, AGRICULTURAL OPERATIONS, AND RELATED SCIENCES

| | AGRICULTURAL PRODUCTION OPERATIONS Crop Production | AGRICULTURAL PRODUCTION OPERATIONS Aquaculture | ANIMAL SCIENCES Agricultural Animal Breeding | ANIMAL SCIENCES Dairy Chemistry | ANIMAL SCIENCES Livestock Management—food and animal safety | ANIMAL SCIENCES Livestock Management—meat research | PLANT SCIENCES Agricultural and Horticultural Plant Breeding | PLANT SCIENCES Plant Protection and Integrated Pest Management | SOIL SCIENCES Soil Sciences, Other |
|---|---|---|---|---|---|---|---|---|---|
| **R2: DOCTORAL UNIVERSITIES: HIGHER RESEARCH ACTIVITY** | | | | | | | | | |
| Florida A&M University | X | | | | X | | X | X | X |
| North Carolina A&T State University | X | | | X | X | X | X | X | X |
| **R3: DOCTORAL UNIVERSITIES: MODERATE RESEARCH ACTIVITY** | | | | | | | | | |
| Prairie View A&M University | X | | | X | | X | | X | X |
| Tennessee State University | X | | X | | X | X | X | X | X |
| University of Maryland Eastern Shore | X | X | | X | X | X | | X | X |
| **M1: MASTER'S COLLEGES AND UNIVERSITIES – LARGER PROGRAMS** | | | | | | | | | |
| Alabama A&M University | X | | | | X | X | X | X | X |
| Southern University and A & M College | X | | | | X | X | | X | X |
| **M2: MASTER'S COLLEGES AND UNIVERSITIES – MEDIUM PROGRAMS** | | | | | | | | | |
| Alcorn State University | | X | X | | | X | | X | X |
| Delaware State University | X | X | | | | X | X | X | X |
| Langston University | X | | X | X | X | X | X | X | X |
| South Carolina State University | X | | | | X | | | X | |
| Virginia State University | X | X | | | X | X | | X | X |
| **M3: MASTER'S COLLEGES AND UNIVERSITIES – SMALLER PROGRAMS** | | | | | | | | | |
| Fort Valley State University | X | X | X | X | X | X | X | X | X |
| Lincoln University | X | X | X | | X | X | X | X | X |
| Tuskegee University | X | | X | X | | X | X | X | X |
| **BACCALAUREATE COLLEGES: DIVERSE FIELDS** | | | | | | | | | |
| Kentucky State University | X | X | X | | X | X | X | X | X |
| Central State University | | | | | | | | | X |
| University of Arkansas at Pine Bluff | X | X | X | | X | | | X | |
| **BACCALAUREATE COLLEGES: ARTS & SCIENCES FOCUS** | | | | | | | | | |
| West Virginia State University | | X | X | | | | X | | X |

## Biological and Medical Sciences

Research programs identified under the CIP of Biological Sciences and Medical Sciences prepare individuals for research and professional careers as biologists and biomedical scientists. Following below are disaggregated findings from the analyses of the ongoing research activity within the nine 9 sub-categories and respective specializations of the CIP of Biological and Medical Sciences:

- ***Biomathematics, Bioinformatics, and Computational Biology (Bioinformatics).*** Computer technology and mathematics is interwoven into much of the emergent areas of research in biological and medical sciences. For example, bioinformatics, defined as the application of computer technology for the management of biological and medical information, cross-cut many of the 1890 universities from an interdisciplinary standpoint (12 out of 19 campuses).
- ***Biotechnology (Genetic Engineering).*** Genetics and genetic engineering are areas of study at four out of 19 campuses.
- ***Biotechnology (Medicinal Crops).*** Medicinal crops research, as identified in the medical sciences, is conducted at 11 out of 19 universities. The extraction of various chemical compounds through both liquid and solid forms to determine their effect on the human body summarizes a common approach used by many of the campuses.
- ***Cell/Cellular Biology and Anatomical Sciences (Cell/Cellular and Molecular Biology).*** Research in the areas of molecular, cellular biology, biochemistry, and nano-medicine is represented by nine out of 19 institutions.
- ***Ecology, Evolution, Systematics, and Population Biology (Ecology).*** Climate change research supports much of the focus around ecology. For instance, researchers at 14 of the 19 campuses study the effects of greenhouse gases on regional ecosystems, food production, and natural water systems.
- ***Microbiological Sciences and Immunology (Microbiology and Immunology).*** Research teams at four out of 19 1890 campuses study a host of infectious diseases such as HIV/AIDS. Microbiological and immunology studies specifically include the study of viral and bacterial infections (e.g., encephalitis and keratitis) and other forms of mycobacterial infections.
- ***Neurobiology and Neurosciences (Neuroscience).*** Research examining brain and neurological disorders (i.e., Alzheimer's disease) is conducted by five out of the 19 institutions.
- ***Physiology, Pathology and Related Sciences (Oncology and Cancer Biology).*** Conducted by seven out of the 19 of the universities, cancer research is an important area of research inquiry, which includes treatment options for breast, kidney, pancreatic, and prostate cancer.
- ***Physiology, Pathology and Related Sciences (Physiology, General).*** In keeping pace with research in this area, studies investigating prevalent hereditary and chronic diseases conditions (i.e., sickle-cell anemia, diabetes, and obesity) affecting the African American community highlight the common areas explored by 8 out of the 19 institutions.

## TABLE 1.2

### RESEARCH ACTIVITY OF THE 1890 UNIVERSITIES IN BIOLOGICAL AND MEDICAL SCIENCES

| | BIOMATHEMATICS, BIOINFORMATICS, AND COMPUTATIONAL BIOLOGY Bioinformatics | BIOTECHNOLOGY Genetic Engineering | BIOTECHNOLOGY Medicinal Crops | CELL/CELLULAR BIOLOGY AND ANATOMICAL SCIENCES Cell/Cellular and Molecular Biology | ECOLOGY, EVOLUTION, SYSTEMATICS, AND POPULATION BIOLOGY Ecology | MICROBIOLOGICAL SCIENCES AND IMMUNOLOGY Microbiology and Immunology | NEUROBIOLOGY AND NEUROSCIENCES Neuroscience | PHYSIOLOGY, PATHOLOGY AND RELATED SCIENCES Oncology and Cancer Biology | PHYSIOLOGY, PATHOLOGY AND RELATED SCIENCES Physiology, General |
|---|---|---|---|---|---|---|---|---|---|
| **R2: DOCTORAL UNIVERSITIES: HIGHER RESEARCH ACTIVITY** | | | | | | | | | |
| Florida A&M University | | | X | X | X | X | X | X | X |
| North Carolina A&T State University | X | | X | X | X | | X | | X |
| **R3: DOCTORAL UNIVERSITIES: MODERATE RESEARCH ACTIVITY** | | | | | | | | | |
| Prairie View A&M University | X | | X | | | | | | |
| Tennessee State University | X | | X | X | X | X | | X | X |
| University of Maryland Eastern Shore | | | | | X | X | X | X | |
| **M1: MASTER'S COLLEGES AND UNIVERSITIES – LARGER PROGRAMS** | | | | | | | | | |
| Alabama A&M University | X | X | X | X | X | | X | X | |
| Southern University and A & M College | X | | X | | X | | | | X |
| **M2: MASTER'S COLLEGES AND UNIVERSITIES – MEDIUM PROGRAMS** | | | | | | | | | |
| Alcorn State University | | | | | | | | | |
| Delaware State University | X | | | | X | | X | X | X |
| Langston University | X | | | | X | | | | |
| South Carolina State University | | | | | | | | | X |
| Virginia State University | X | | | | | | | | |
| **M3: MASTER'S COLLEGES AND UNIVERSITIES – SMALLER PROGRAMS** | | | | | | | | | |
| Fort Valley State University | | X | X | X | X | | | | X |
| Lincoln University | X | | X | X | X | | | | |
| Tuskegee University | X | X | X | X | X | X | | X | X |
| **BACCALAUREATE COLLEGES: DIVERSE FIELDS** | | | | | | | | | |
| Kentucky State University | X | | X | X | X | | | | |
| Central State University | | | X | X | X | | | | |
| University of Arkansas at Pine Bluff | | | | | | | | | |
| **BACCALAUREATE COLLEGES: ARTS & SCIENCES FOCUS** | | | | | | | | | |
| West Virginia State University | X | X | | | X | | | X | |

## Computer and Information Sciences and Support Services

Research programs categorized under this CIP of Computer and Information Sciences and Support Services prepare individuals for various occupations in information technology and computer operations fields. Following below are disaggregated findings from the analyses of the research activity ongoing within the four sub-categories and respective specializations of the CIP of Computer and Information Sciences:

- ***Computer and Information Sciences, General (Artificial Intelligence).*** Advanced robotics and remote sensing is part of the research agenda at 9 out of 19 1890 campuses, with particular developments in self-automated helicopters, cars, and drones. This represents a notable number of 1890 universities conducting research in this area.
- ***Computer/Information Technology Administration and Management (Computer and Information Systems Security/Information Assurance).*** Cybersecurity and information systems security research is conducted by 13 of the 19 institutions. This is mirrored in studies particularly addressing defense and national security concerns in addition to mobile and smartphone security.
- ***Computer Programming/Programmer, General.*** Software development/engineering research is conducted by 12 out of the 19 universities. This represents a sizeable portion of research activity in this area being pursued at the 1890 universities.
- ***Computer Systems Networking and Telecommunications (Computer Systems Networking and Telecommunications).*** Cloud computing is an area of research for 10 out of 19 1890 universities. This represents half of the1890 universities conducting research activity within this sub-category

## TABLE 1.3

### RESEARCH ACTIVITY OF THE 1890 UNIVERSITIES IN COMPUTER AND INFORMATION SCIENCES AND SUPPORT SERVICES

| | COMPUTER AND INFORMATION SCIENCES, GENERAL Artificial Intelligence | COMPUTER/INFORMATION TECHNOLOGY ADMINISTRATION AND MANAGEMENT Computer and Information Systems Security/Information Assurance | COMPUTER PROGRAMMING Computer Programming/ Programmer, General | COMPUTER SYSTEMS NETWORKING AND TELECOMMUNICATIONS Computer Systems Networking and Telecommunications |
|---|---|---|---|---|
| **R2: DOCTORAL UNIVERSITIES: HIGHER RESEARCH ACTIVITY** | | | | |
| Florida A&M University | | X | X | X |
| North Carolina A&T State University | X | X | X | X |
| **R3: DOCTORAL UNIVERSITIES: MODERATE RESEARCH ACTIVITY** | | | | |
| Prairie View A&M University | | | X | |
| Tennessee State University | X | X | X | X |
| University of Maryland Eastern Shore | X | X | X | |
| **M1: MASTER'S COLLEGES AND UNIVERSITIES – LARGER PROGRAMS** | | | | |
| Alabama A&M University | X | X | X | X |
| Southern University and A & M College | X | | X | X |
| **M2: MASTER'S COLLEGES AND UNIVERSITIES – MEDIUM PROGRAMS** | | | | |
| Alcorn State University | | | X | X |
| Delaware State University | X | X | | |
| Langston University | | X | X | X |
| South Carolina State University | | X | | |
| Virginia State University | X | | X | |
| **M3: MASTER'S COLLEGES AND UNIVERSITIES – SMALLER PROGRAMS** | | | | |
| Fort Valley State University | | X | | X |
| Lincoln University | | X | X | |
| Tuskegee University | X | X | | X |
| **BACCALAUREATE COLLEGES: DIVERSE FIELDS** | | | | |
| Kentucky State University | | X | | X |
| Central State University | X | | X | |
| University of Arkansas at Pine Bluff | | X | | |
| **BACCALAUREATE COLLEGES: ARTS & SCIENCES FOCUS** | | | | |
| West Virginia State University | | | | |

## Engineering

Research programs categorized under this CIP of Engineering prepare individuals to apply mathematical and scientific principles to the solution of practical problems. Following below are disaggregated findings from the analyses of the research activity ongoing within the six sub-categories and respective specializations of the CIP of Engineering:

- ***Aerospace, Aeronautical and Astronautical Engineering.*** Aerospace, aviation and transportation are reported areas of research for seven out of 19 universities. Specifically, research in the areas of hydro-carbon fuel combustion and strategies that mitigate extreme aircraft thermal conditions are particularly prevalent. Aviation and transportation research is widely interrelated with a variety of specialty areas such as aircraft safety, aerial imaging, and air propulsion.
- ***Agricultural Engineering.*** The development of sustainable biofuels/bioenergy is most notable among 18 out of the 19 universities. This inquiry centers largely on the production and utilization of liquid fuels from organic matter, which could be used for common day transportation needs (e.g., cars, buses, etc.). The most common types of biofuels being researched at the 1890 universities include ethanol and biodiesel.
- ***Biomedical/Medical Engineering.*** Research that involves mechanical scaffolding for tissue engineering is reported at seven out of 19 universities. Much of the research in tissue engineering and biotechnology focus on ways to help medical patients live more comfortably and longer with certain anatomical conditions (e.g., heart value conditions).
- ***Civil Engineering (Transportation and Highway Engineering).*** Civil and environmental research activities are represented among six of the 19 universities. Moreover, studies funded by federal government agencies to improve issues such as highway safety for targeted populations (e.g., elderly citizens) demonstrate the increased attention given to the improvement of the nation's infrastructure needs. Cutting edge studies designed to improve the efficiency of transportation (i.e., interstate highways, city roads, etc.) is the primary area of focus for one of the universities included in this analysis.
- ***Civil Engineering (Water Resources Engineering).*** At eight of the 19 universities, water resources/hydraulics in populated cities/towns highlight research being conducted in the area of civil engineering.
- ***Manufacturing Engineering (Manufacturing Engineering).*** Manufacturing research is represented among three of the 19 universities. Analysis of the findings reveal a fair amount of overlap in the development of aeromechanic and propulsion components by the 1890 institutions.

## TABLE 1.4

### RESEARCH ACTIVITY OF THE 1890 UNIVERSITIES IN ENGINEERING, AEROSPACE, AVIATION AND TRANSPORTATION

| | AEROSPACE, AERONAUTICAL AND ASTRONAUTICAL ENGINEERING | AGRICULTURAL ENGINEERING | BIOMEDICAL/MEDICAL ENGINEERING | CIVIL ENGINEERING Transportation and Highway Engineering | CIVIL ENGINEERING Water Resources Engineering | MANUFACTURING ENGINEERING Manufacturing Engineering |
|---|---|---|---|---|---|---|
| **R2: DOCTORAL UNIVERSITIES: HIGHER RESEARCH ACTIVITY** | | | | | | |
| Florida A&M University | | | X | X | X | |
| North Carolina A&T State University | X | X | X | X | | |
| **R3: DOCTORAL UNIVERSITIES: MODERATE RESEARCH ACTIVITY** | | | | | | |
| Prairie View A&M University | | X | | | X | |
| Tennessee State University | X | X | X | X | | X |
| University of Maryland Eastern Shore | X | X | | | X | |
| **M1: MASTER'S COLLEGES AND UNIVERSITIES – LARGER PROGRAMS** | | | | | | |
| Alabama A&M University | | X | X | X | X | |
| Southern University and A & M College | | X | | | | |
| **M2: MASTER'S COLLEGES AND UNIVERSITIES – MEDIUM PROGRAMS** | | | | | | |
| Alcorn State University | | X | | | X | |
| Delaware State University | | X | X | | X | |
| Langston University | X | X | | | | |
| South Carolina State University | X | X | | X | | |
| Virginia State University | | X | | | | |
| **M3: MASTER'S COLLEGES AND UNIVERSITIES – SMALLER PROGRAMS** | | | | | | |
| Fort Valley State University | X | X | X | | | X |
| Lincoln University | | X | X | | | |
| Tuskegee University | X | X | | | X | |
| **BACCALAUREATE COLLEGES: DIVERSE FIELDS** | | | | | | |
| Kentucky State University | | X | | | X | |
| Central State University | | X | | X | | X |
| University of Arkansas at Pine Bluff | | X | | | | |
| **BACCALAUREATE COLLEGES: ARTS & SCIENCES FOCUS** | | | | | | |
| West Virginia State University | | X | | | | |

## Mathematics and Statistics

Research programs categorized under the CIP of Mathematics and Statistics focus on the systematic study of logical symbolic language and its applications. Following below are disaggregated findings from the analyses of the research activity ongoing within the two sub-categories and respective specializations of the CIP of Mathematics and Statistics:

- ***Applied Mathematics (Computational Mathematics).*** Algorithm design and analysis research is conducted by nine out of the 19 universities.
- ***Applied Mathematics (Computational and Applied Mathematics).*** Differential equations research is represented by eight out of the 19 institutions.[1]

**TABLE 1.5**
**RESEARCH ACTIVITY OF THE 1890 UNIVERSITIES IN MATHEMATICS**

| | APPLIED MATHEMATICS Computational Mathematics | APPLIED MATHEMATICS Computational and Applied Mathematics |
|---|---|---|
| **R2: DOCTORAL UNIVERSITIES: HIGHER RESEARCH ACTIVITY** | | |
| Florida A&M University | X | |
| North Carolina A&T State University | | X |
| **R3: DOCTORAL UNIVERSITIES: MODERATE RESEARCH ACTIVITY** | | |
| Prairie View A&M University | X | X |
| Tennessee State University | | |
| University of Maryland Eastern Shore | X | |
| **M1: MASTER'S COLLEGES AND UNIVERSITIES – LARGER PROGRAMS** | | |
| Alabama A&M University | X | |
| Southern University and A & M College | | |
| **M2: MASTER'S COLLEGES AND UNIVERSITIES – MEDIUM PROGRAMS** | | |
| Alcorn State University | X | |
| Delaware State University | X | X |
| Langston University | | |
| South Carolina State University | X | X |
| Virginia State University | | |
| **M3: MASTER'S COLLEGES AND UNIVERSITIES - SMALLER PROGRAMS** | | |
| Fort Valley State University | X | X |
| Lincoln University | | X |
| Tuskegee University | | X |
| **BACCALAUREATE COLLEGES: DIVERSE FIELDS** | | |
| Kentucky State University | | |
| Central State University | X | X |
| University of Arkansas at Pine Bluff | | |
| **BACCALAUREATE COLLEGES: ARTS & SCIENCES FOCUS** | | |
| West Virginia State University | | |

1 Research in mathematics overlaps considerable with the computer science and technology disciplines.

# Research Activity Discussion for the 1890 Universities

The research activity of the 1890 universities remains diverse in the exploration of STEM fields. Such diversity of research activity shows that the 1890 universities are not monolithic and have uniqueness that reflect their geographical location, research expertise, community demands, resource allocation, and related areas of interest. What remains a shared endeavor, however, is the need to pursue research activity in STEM to demonstrate their intellectual curiosity and institutional commitment to social impact. Thus, given the recurring CIP as identified in Tables 1.1–1.5, the research activity generates some key areas of consideration with regards to the 1890 universities as identified below.

## Tradition Matters in Research Activity

Represented through the current STEM research, the land-grant tradition remains vibrant and relevant among the 1890 historically black universities. Observations from this study reveal research in the areas of plant and animal science, which connects with the original role of land-grant institutions in the study of agriculture and natural resources. Faculty in agriculture from the 1890 universities, joined by their undergraduate and graduate student research staff, have engaged in research toward improving and understanding solutions about relevant national issues (i.e. food safety in plant harvesting, food safety in animal meat production). For instance, data from the Centers for Disease Control and Prevention (CDC) indicate foodborne disease outbreaks remain problematic due to their ability to cause severe illness and other health related issues. In response to these reports and in alignment with their mission, some of the 1890 universities have focused their efforts toward developing new food safety strategies and technologies. Research conducted by the1890 campuses further focus on eliminating the threat of microbial pathogens and parasites in poultry and beef. Research endeavors undertaken by the 1890 universities also contribute to understanding about the development of safer and more consumer-friendly foods.

Further, the research subject areas that follow the tradition of the land-grant institutions focus on re-engineering approaches used in the past to fill needs of the present. While George Washington Carver's work on peanuts is widely known, modern genetic research at many 1890 institutions is leading to advances in small fruit (e.g., strawberries, blackberries, etc.) and meat production. For instance, findings from the data reveal advances in genetic crop production as a result of re-

search conducted at 1890 universities. Techniques focused in altering the heritable make-up of a given organism—whether plants or animals—to improve the quality of crops or livestock with desired traits proved particularly noteworthy. Genetic recombination approaches studied by the 1890 universities focused on many of the most common small fruits and animal meats everyday consumers enjoy the most.

Moreover, crop production has been improved by the research of the 1890 universities by examining the materials needed for healthy and bountiful growth. Assessing the quality of both the air and soil means more productivity and profitability for the nation's agriculture industry and better crops for consumption. While extremely important for farmers during America's pre-industrial periods when the economy relied heavily on crop production, the study of air and soil quality for the 1890 universities remains extremely important due to factors such as population growth; air, water, and land pollution; and climate change. Research funded by the U.S. Department of Agriculture at the 1890 universities focuses on understanding these conditions and how food nutrition could be affected by soil quality degradation. Soil scientists and other 1890 university researchers are developing tools to measure and monitor soil quality and ways to prevent or mitigate degradation. Such strategic approaches integrate the use of biochar to correct soil acidity and increase soil nitrogen. In this way, the 1890 universities' research traditions in agriculture remain strong.

## Trends Move the Research Activity

Current societal trends are factors for generating momentum with research activity. Climate change and declining natural resources are affecting human survival and economic activity. These areas have been used as a source of research inquiry at the 1890 universities as they have been proactive in establishing a firm research agenda in these environment and ecosystem-focused areas. The 1890 universities that are located closer to coastal areas are examining ways to reduce greenhouse gas emissions using microorganisms and discovering alternative forms of energy through biofuels. Moreover, some 1890 universities are pursuing innovative research in Urban Forest Ecosystem studies. Their research analyses have particular importance due to the connection with water resource management, air quality improvement, and ecosystem restoration. The 1890 universities have also responded to growing environmental dangers by studying pollution and urban & rural ecosystems (e.g., wetlands, forest lands, agro-forestry, urban-wildland interface, etc.). Increasing the call for conservation and protection has served to benefit the surrounding communities of the 1890 universities and the broader constituents.

Disease and sickness represents a significant threat to continued human growth and prosperity. Accordingly, the 1890 universities have responded in a deliberate and relevant manner. For example, uncovering the secrets of the human body at the cellular level has helped 1890 university researchers discover new treatment options for various conditions and diseases (i.e., diabetes, sickle-cell anemia, and cancer). Through molecular biology, cellular biology, and biochemistry,

research scientists from the 1890 universities are providing a more clear understanding of the basic composition of the human cell. How abnormalities affect the way in which the human body properly responds to external stimuli become evident in this scope of work. Cross-disciplinary work in nano-medicine has improved and the benefits of this work can be seen in more advanced treatment options for ailing. Many of the 1890 universities have coalesced around the practicalities of research to better understand human health and the implications for social outcomes.

Innovation and invention in technology supports many areas of the broader American society. Specifically, at the 1890 universities, bioinformatics have extended the reach of biomedical science by helping researchers aid in the development of methods and tools used to better understand genetics. Cybersecurity and information system security, robotics and remote sensing, and software development/engineering have also supported other sectors of society—most notably in defense and security. The drive for this support comes in large part to address increased cyberattacks by hostile groups – often described by many military strategists as a new, virtual battlefield. Such actions have prompted the considerable investments by the federal government and the private

sector. Accordingly, in 2015, it was announced that the Department of Energy would provide grant opportunities over the next five years to support cybersecurity education. The grant funding is a considerable investment in the nation's cyber infrastructure and benefits a number of the 1890 universities. Technology assumes national importance and the 1890 universities are part of concerted efforts to enhance the effectiveness and efficiency of security both inside and outside of the country.

## Teamwork Melds the Research Activity

The diversity of research activity encourages a need for expanded collaboration in order to coalesce the talents of researchers and access to resource within the 1890 university community. Scientific discoveries in agriculture plant and animal sciences among the larger, more research-focused 1890 universities compare favorably to their smaller, more teaching-focused counterparts. For instance, uncovering strategies to assist small farmers in rural areas and an emerging number of urban farmers in cities demonstrates the mutuality of the 1890 institutions despite differences in size and focus. In many ways, this could prove noteworthy as the 1890 universities address issues germane to their respective communities and communities different from their own. The ability to intellectually cross-pollinate between different individual and institutional contexts can aid in the development of bolder, more robust and research-fundable ideas. With the diversity of 1890 universities located in cities (9), suburbs (2) and towns (8), as defined by the Integrated Postsecondary Education Data System (IPEDS), broader opportunities for data sharing among researchers could occur with more deliberate intentions. Furthermore, it can be safe to assume that expanded partnerships between the different 1890 university types could help better align the earlier traditions of agricultural and technical colleges to more effectively respond to current issues. Such collaborative, collective approaches could have a greater impact on research activities and the productivity of graduates who further impact academic and social landscapes.

# Concluding Statements

The 1890 universities continue to hold a unique position in their respective communities and the broader country. Due to the sociohistorical context that led to their founding as well as their historical designation as land-grants, the 1890 universities have established themselves as well-regarded centers of teaching, research, and service. The universities not only serve people of color, but serve the broader national interests by contributing to the movement of understanding and knowledge as a means to better the human condition. Emerging evidence within Tables 1.1–1.5 shows the similarities and differences involving the research activity occurring at these 19 universities. As such, the research activity of the 1890 universities remains critically important to advance the inquiry and innovation of issues affecting our communities and country at large. More importantly, this report serves as a resource directory to generate increased discipline-focused collaboration both internally and externally to the historically black, land-grant body of universities. By capitalizing upon the traditions of yesterday and the trends of today espoused in the research activity of the 1890 universities, the broader institution of higher education will continue upon the position embraced by Carl Sagan, "somewhere, something incredible is waiting to be known."

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APPENDIX A

# Research Methods

## Research Design

Through qualitative analysis, Dr. Avery explored the ways in which the academic programs, mission statements, and press releases included within relevant research publications (i.e., printed reports, brochures, newsletters, and websites) communicated the engagement of the 1890 universities in basic or applied research. Self-reported data were critical in understanding the type of research activity conducted. The initial data collection and analysis process occurred from 2012 through 2014 and the report findings were confirmed between 2015 through 2016. Verification of the report findings from 1890 research directors, research and development officers, and agricultural research and extension personnel aided in the trustworthiness of the report. For the purposes of this investigation, the identified focus is to understand the shared and unshared research activities of the historically black, land-grant universities.

## Trustworthiness

Trustworthiness of the study findings were established in two ways. First, triangulation was utilized to verify the themes identified by the investigator once the institution reported data was collected, coded and analyzed. Triangulation refers to the approach used to cross-reference data for verification of results from two or more sources (Creswell, 2009). The report findings were validated by individuals internal of the association and included in the verification process were the APLU's Office of Access and Success and other APLU personnel. Second, once this process was completed internally, the research report was disseminated to representatives from the 1890 institutions for a series of member checks between 2015 through 2016. This approach further ensured report validity and confirmed the report findings aligned with data submitted by the individual 1890 campuses. All of the 1890 universities participated in the member checking process.

## Analysis of the Data

The investigator utilized multiple approaches to analyze the data. First, requested research publications were thoroughly reviewed and examined for thematic patterns. Qualitative analysis was used to code and identify patterns in the research publications from the universities. Second, similarities and differences between the codes were observed and grouped into subthemes. Once

complete, each group of identified subthemes were organized and grouped by area of academic specialty. The themes were then organized by their general and specific two digit Classification of Instructional Program (CIP) code. This allowed the investigator to uncover the research tendencies of the 1890 universities in STEM discipline areas and how they were situated in the natural and applied sciences. The Carnegie Classification, a framework used to classify colleges and universities by size, research activity, and degree awards produced, allowed the investigator to further examine the research activities of the institutions by their respective peers (The Carnegie Classification of Institutions of Higher Education, 2016). Due to diversity of the universities that comprise the 1890 land-grant body, it is helpful to examine the institutions based on their inherent within group and between group differences.

## Limitations of the Research Report

The exploratory analyses depict an overview of the collective research activity occurring at the 1890 universities. Initial data collection occurred in 2012 through 2014 and were confirmed or updated in 2015 through 2016. Hence, the report may not be reflective of any additional progress made in the program delivery since the designated investigation period. Given that the data is campus-reported, the ability to capture emerging areas of research at 1890 universities may be limited and may not fully reflect what is occurring in the respective areas of STEM. The responses are not an indication of the quality or quantity of work and their contributions toward student learning occurring on 1890 university campuses. Limitations with the report also prohibit the ability to capture research that might not be as fully reflected in the CIP. Because some of the research areas might be more specialized to the 1890 universities, the research area responses may or may not be reflected in the proper CIP category.

## Direction of Future Studies

Given the combined limitations of this report on research activity, future studies could examine in more detail the depth of research and research capabilities (e.g., expenditures, faculty, and degree offerings) at the 1890 universities. This could take into account the role of graduate students, intellectual climate, facilities, and research funding as factors influencing the types of research activity conducted on 1890 campuses. Thus, by representing the aforementioned factors quantitatively, it could help to contextualize the operational range of the historically black land-grant universities.

Moreover, future studies could explore the research activity of the 1890s and their 1862 land-grant counterparts. Discovering commonalities in research for both land-grant types could be beneficial as a means to the enhancing of current and the building of new partnerships. This has particular relevance given the fact that two land-grant universities are situated in many of the states. Other considerations in future studies could establish preset CIP codes in survey designs making it more efficient for universities to self-categorize areas of research inquiry during data collection.

APPENDIX B

# Identified Themes and Classification of Instructional Programs (CIP)

## AGRICULTURE, AGRICULTURE OPERATIONS, AND RELATED SCIENCES

| IDENTIFIED THEME | CLASSIFICATION OF INSTRUCTIONAL PROGRAMS (CIP) | CLASSIFICATION OF INSTRUCTIONAL PROGRAMS (CIP) SUBAREA |
|---|---|---|
| Agriculture Biotechnology | Plant Sciences | Agricultural and Horticultural Plant Breeding |
| Animal Breeding | Animal Sciences | Agricultural Animal Breeding |
| Animal Meat Research | Animal Sciences | Livestock Management—meat science |
| Animal Meat Research | Animal Sciences | Livestock Management—food and animal safety |
| Aquaculture | Agricultural Production Operations | Aquaculture |
| Dairy Chemistry | Animal Sciences | Dairy Chemistry |
| Food Safety (Plants) | Agricultural Production Operations | Crop Production |
| Insect Pest Management | Plant Sciences | Plant Protection and Integrated Pest Management |
| Soil Sciences and Air Quality | Soil Sciences | Soil Sciences, Other |

## BIOLOGICAL AND MEDICAL SCIENCES

| IDENTIFIED THEME | CLASSIFICATION OF INSTRUCTIONAL PROGRAMS (CIP) | CLASSIFICATION OF INSTRUCTIONAL PROGRAMS (CIP) SUBAREA |
|---|---|---|
| Bioinformatics | Biomathematics, Bioinformatics, and Computational Biology | Bioinformatics |
| Brain and Neurological Disorders | Neurobiology and Neurosciences | Neuroscience |
| Cancer | Physiology, Pathology and Related Sciences | Oncology and Cancer Biology |
| Cellular Biology | Cell/Cellular Biology and Anatomical Sciences | Cell/Cellular and Molecular Biology |
| Climate Change | Ecology, Evolution, Systematics, and Population Biology | Ecology |
| Genetic Engineering | Biotechnology | Biotechnology |
| Infectious Diseases (Viral or Bacterial) | Microbiological Sciences and Immunology | Microbiology and Immunology |
| Hereditary and Chronic Conditions | Physiology, Pathology and Related Sciences | Physiology, General |
| Medicinal Crops | Biotechnology | Biotechnology |

## COMPUTER AND INFORMATION SCIENCES AND SUPPORT SERVICES

| IDENTIFIED THEME | CLASSIFICATION OF INSTRUCTIONAL PROGRAMS (CIP) | CLASSIFICATION OF INSTRUCTIONAL PROGRAMS (CIP) SUBAREA |
|---|---|---|
| Cloud Computing | Computer Systems Networking and Telecommunications | Computer Systems Networking and Telecommunications |
| Cybersecurity and Information Systems Security | Computer/Information Technology Administration and Management | Computer and Information Systems Security/Information Assurance |
| Robotics | Computer and Information Sciences, General | Artificial Intelligence |
| Software Design and Programming | Computer Programming | Computer Programming/Programmer, General |

## ENGINEERING

| IDENTIFIED THEME | CLASSIFICATION OF INSTRUCTIONAL PROGRAMS (CIP) | CLASSIFICATION OF INSTRUCTIONAL PROGRAMS (CIP) SUBAREA |
|---|---|---|
| Aerospace and Aviation | Aerospace, Aeronautical and Astronautical Engineering | Aerospace, Aeronautical and Astronautical/Space Engineering |
| Biofuels and Bioenergy | Agricultural Engineering | Agricultural Engineering |
| Cell and Tissue Engineering | Biomedical/Medical Engineering | Bioengineering and Biomedical Engineering |
| Civil and Environmental | Civil Engineering | Transportation and Highway Engineering |
| Manufacturing | Manufacturing Engineering | Manufacturing Engineering |
| Water | Civil Engineering | Water Resources Engineering |

## MATHEMATICS AND STATISTICS

| IDENTIFIED THEME | CLASSIFICATION OF INSTRUCTIONAL PROGRAMS (CIP) | CLASSIFICATION OF INSTRUCTIONAL PROGRAMS (CIP) SUBAREA |
|---|---|---|
| Algorithms | Applied Mathematics | Computational Mathematics |
| Differential Equations | Applied Mathematics | Computational and Applied Mathematics |

## Support Letters for the Research Activity at the 1890 Universities

APLU COUNCIL of 1890 UNIVERSITIES

Greetings HBCU Stakeholders!

The report, *Research Activity at the 1890 Universities*, presents vital information about the research activities within the community of historically black land-grant universities. The Council of 1890 Universities presidents are pleased with the information provided in the report, which highlights *inter-* and *intra-* research activity occurring at our institutions. The collective mission of 1890 Universities is to render high caliber teaching, research, and outreach to our constituents and communities. This report documents our capacity to engage research activity in carrying out this mission.

Beginning in 2012, attention has been focused on identifying similarities and differences in STEAM (science, technology, engineering, and mathematics) research activity at the 1890 Universities. The report provides critical insights about these select 19 land-grant institutions, their academic programs, and the contributions of research activity. The diversity of research activity also provides clear characterizations of university interests, infrastructure, research capacity, and faculty expertise.

Upholding a tradition of excellence and recognition of the unique value of academic research, the 1890 Universities are engaging in important knowledge-generating activities. This report, *Research Activity at the 1890 Universities*, highlights our significant research activities and provides a framework for expanded collaboration and enhanced project development among 1890 Universities and non-1890 universities as well.

I hope you enjoy reading this important report.

Sincerely,

Juliette B. Bell

**Juliette B. Bell, Ph.D.**
*President,* University of Maryland Eastern Shore
*Chair*, Council of 1890 Universities

ARD

*Association of 1890 Research Directors, Incorporated*
*1890 Land-Grant Universities*
*Office of the Executive Director*

Dear HBCU and Non-HBCU Colleagues:

On behalf of the 1890 Land-grant University Research Directors, I am pleased to endorse the report, *Research Activity at the 1890 Universities,* and invite each of you to learn more about the collective research activities of the 19 historically black, land-grant universities. Scientific research and discovery have long been an important part of the land-grant tradition. As defined in the Classification of Instructional Programs (CIP), this report synthesizes the depth and breadth of research activity occurring on our campuses.

*Research Activity at the 1890 Universities* is comprised of compiled institutional-reported data demonstrating how these universities are involved in meeting 21st Century challenges through innovation. An example of collaborative and integrative research includes the 1890 universities' engagement to address recurring problems within rural and high-risk communities (i.e. food systems, nutrition and health, system hydraulics, and environmental pollution). *Research Activity at the 1890 Universities* also demonstrates a wide diversity of the research strengths, similar to the diversity and uniqueness of each of the campuses which are invaluable attributes.

*Research Activity at the 1890 Universities* further allows some insight into the scale of research activity and corresponding services that the 1890 universities are providing. As a national priority, STEM research is critical to the advancement of higher education and the larger society and the 1890 universities are contributing broadly to this comprehensive and essential educational component. As a resource directory, *Research Activity at the 1890 Universities*, assists in identifying the 1890 universities by the particular type of academic research in which they are engaged.

Thank you again for your interest in learning more about the current research activity at our 1890 universities. For HBCUs and non-HBCUs alike, the report showcases research activity areas of greatest strength and opportunity. This is indeed a very useful resource to have as we seek to advance and expand research activity at our historically black land-grant universities.

Sincerely,

Carolyn B. Brooks, Ph.D.
*Executive Director*, Association of 1890 Research Directors
1890 Land Grant Universities

Association of Public & Land-grant Universities

Dear Colleagues:

We are pleased to have this type of report, *Research Activity at the 1890 Universities*, released as an informational guide about the research activity occurring at our historically black land-grant universities. It is important to be informed more clearly about the types of research activity the 1890 universities are engaging both as a collective body and individual institution of higher education.

The 1890 universities are often generally thought of as teaching institutions and ones specializing in the delivery of sound content and pedagogy. Interestingly enough, I am amazed how often my colleagues discuss the1890 universities primarily in this regard. The report indicates how the 1890 universities are engaging in research activity of important national priority. Using the Classification of Instructional Programs (CIP), the report offers an informed glimpse into the Science, Technology, Engineering, and Mathematics (STEM) pursued on the campuses of the 1890 universities. As one who is interested in food and agricultural related matters, the CIP serves as critical lens for viewing the similarities and differences within research endeavors and to understand how STEM disciplines can be explored in multifaceted ways.

As land-grant institutions, the 1890 universities have a unique history for which speaks to the timeliness of this report. Having just celebrated the 125th commemorative anniversary, the 1890 universities provide access and opportunity for those who might not otherwise attend post-secondary institutions of higher education. Individuals who attend the 1890 universities gain valuable experiences to enhance their ability to be successful in society. Being aware of the types of research activity ongoing at the 1890 universities serves and should be used as a recruitment mechanism for potential students interested in STEM disciplines.

Again we are pleased to have this report, *Research Activity at the 1890 Universities*, generated at this time. The research activity as demonstrated through this report is important and shows the need for continued support toward their infrastructural capacity. The resourcefulness of these universities is enormous and we must do all we can to continue their historic and present mission to provide access and opportunity.

Ian L. Maw, Ph.D.
*Vice President for Food, Agriculture, and Natural Resources*

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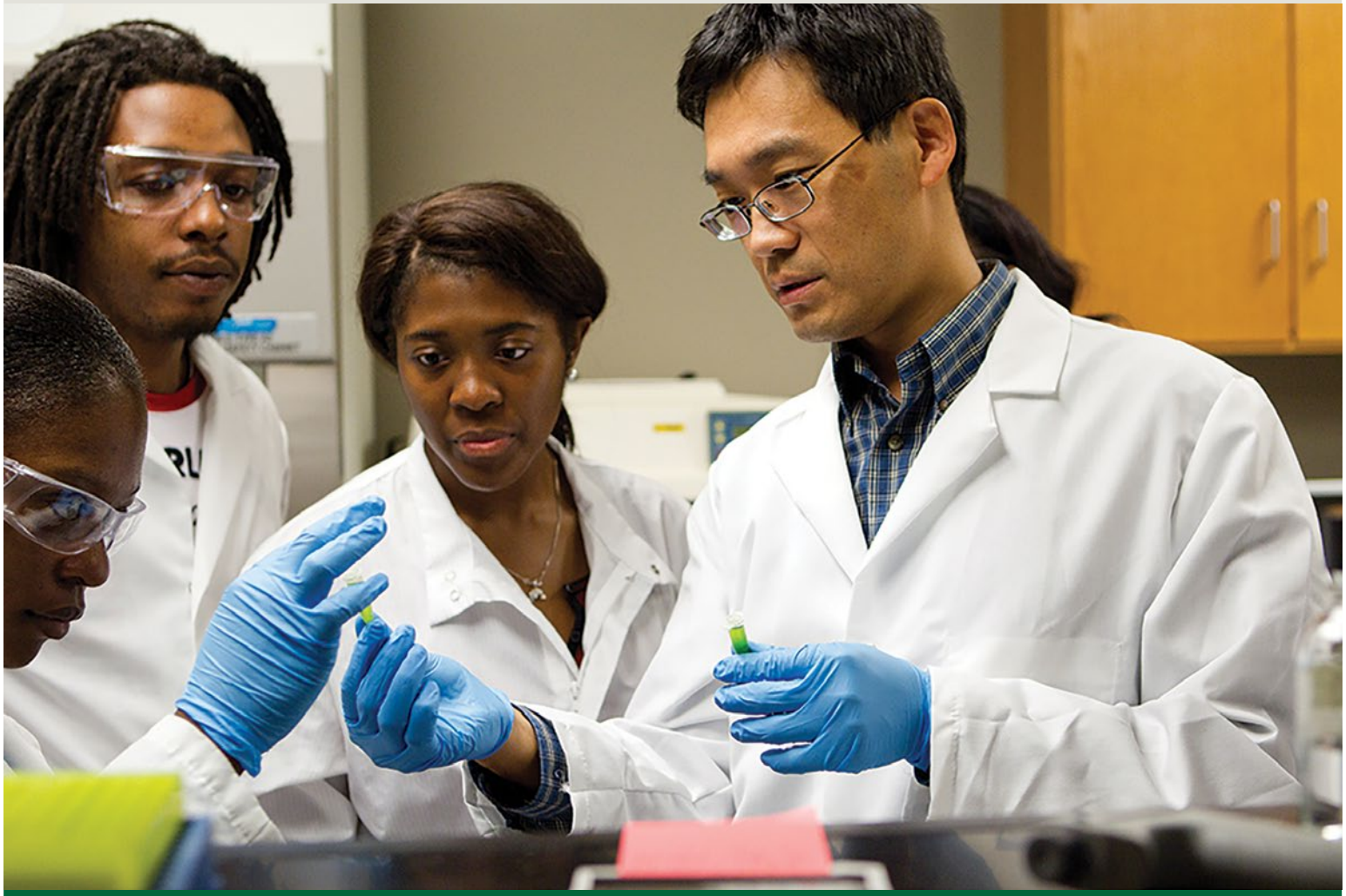
Jared C. Avery, Ph.D. is the Associate Director for Access and Success Initiatives with the Association of Public and Land-grant Universities (APLU). In this capacity, he provides comprehensive support around equity, access, and educational excellence for college student populations and minority-serving institutions. Dr. Avery manages collaborative partnerships and initiatives including the HBCU Innovation, Commercialization, and Entrepreneurship (ICE) Collaborative, the Minority Male STEM Initiative, and the 1890 University Teaching, Research and Innovation Awards.

Prior to joining APLU, Dr. Avery served as the coordinator of the Core to College Program with the Louisiana Board of Regents. Dr. Avery supported the ongoing alignment of efforts concerning college and career readiness standards and the implementation of the college and career readiness assessments in the state. He also oversaw special projects promoting college access and completion within the state agency.

Dr. Avery's research interests include accessibility and degree-completion; academic and leadership development initiatives; and minority serving institutions. Specifically, he has explored how academic and leadership development programs impact the performance and persistence of Black male students and studied the achievement of Black male collegians in the science, technology, engineering, and mathematics (STEM) disciplines. Most recently, Dr. Avery published articles and reports focused on the persistence of African-American male college students and the implementation of senior-year college readiness courses.

A Louisiana native, Dr. Avery is a three-time graduate of Louisiana State University, earning a bachelor's and master's degrees in psychology and education with an emphasis in higher education and student affairs as well as a Ph.D. in Educational Leadership and Research.



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