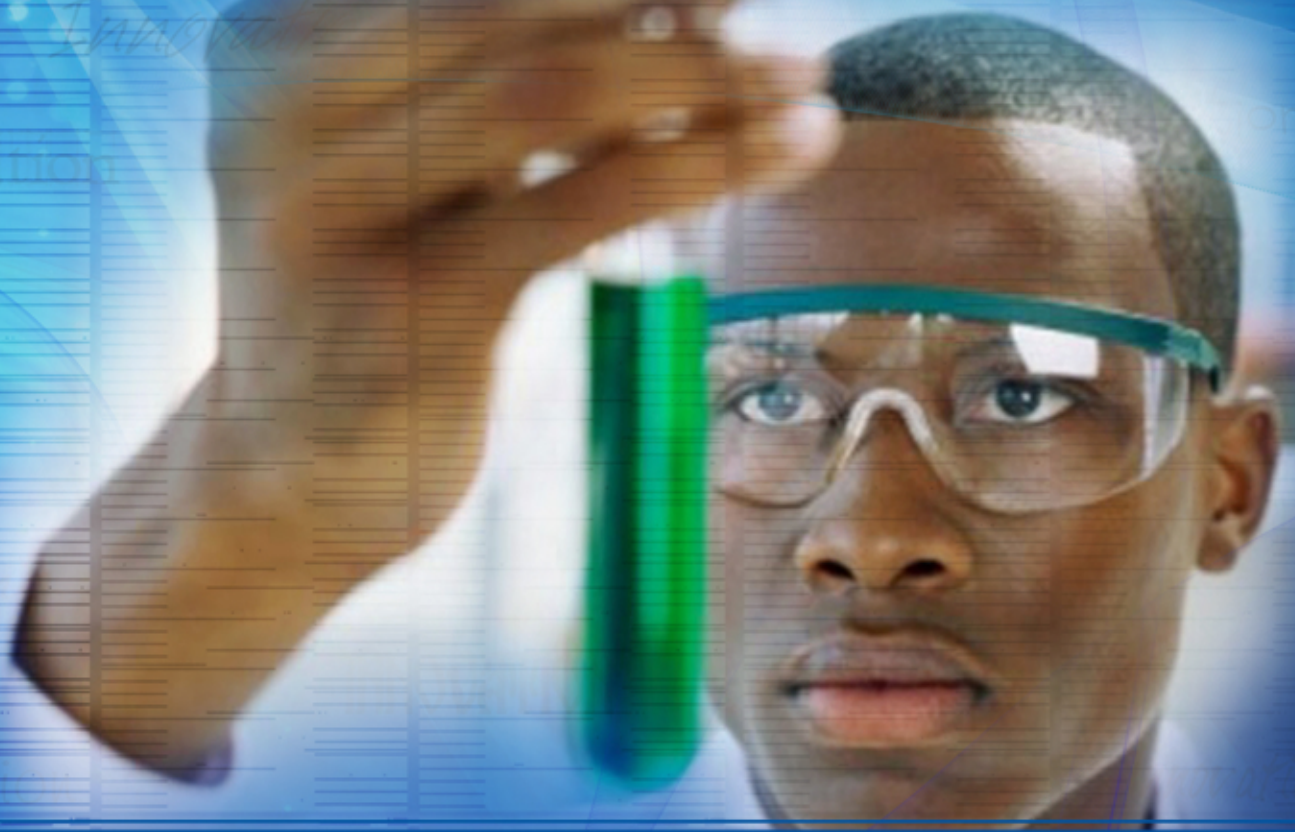


Division of Research and Sponsored Programs

RESEARCH HORIZONS



ANNUAL REPORT
FISCAL YEAR 2015

The College of Agriculture, Human and Natural Sciences at Tennessee State University dedicated the Agricultural Biotechnology Building on September 17, 2014. TSU President Glenda Glover, Dean Chandra Reddy, and Chancellor John Morgan of the Tennessee Board of Regents led the ribbon cutting ceremony with assistance from Commissioner of the Tennessee Department of Agriculture Julius Johnson, USDA Mid South Assistant Area Director Archie Tucker, and State Representatives Brenda Gilmore and Harold Love. The state-of-the-art facility supports research in animal science biotechnology, plant science biotechnology, and food biosciences.



Agricultural Biotechnology Building

Research Centers and Institutes at Tennessee State University

- Center of Excellence in Information Systems and Engineering Management
- Center of Excellence for Learning Sciences
- Center for Advancing Faculty Excellence
- Center of Excellence for Battlefield Sensor Fusion
- Cooperative Extension Program
- Massie Chair of Excellence
- Nanoscience and Biotechnology Core Facility
- Center for Prevention Research
- Center for Aging: Research and Education Services (CARES)
- Entrepreneurship and Economic Development Center
- Otis L. Floyd Nursery Research Center
- Institute of Agricultural and Environmental Research
- TSU Interdisciplinary Graduate Engineering Research (TIGER) Institute
 - Advanced Visualization and Computing
 - Bioinformatics
 - Cybersecurity
 - Mechatronics
 - Nano-materials
 - Renewable Energy Systems

Research Areas of Interest at Tennessee State University

- Advanced Control Systems
- Advancement of Human Capital and Leadership
- Agricultural Sciences – Animal, Agricultural Economics, Plant, and Soil
- Automated Astronomy
- Bio-Security
- Biotechnology
- Breast Cancer
- Climate Change, Weather, and the Environment
- Community Engagement, Enhancement, and Economic Revitalization
- Cybersecurity, Cyber Physical Systems, Bioinformatics, and Interoperability
- Data Science and Analytics
- Digital Storytelling
- Early Childhood Education
- Energy and Alternative Fuels, and Device Storage
- Environmental Sciences
- Food Safety and Security
- Human Health, Nutrition, Obesity, Disease Pathology, and Cultural Disparities
- Leadership Development
- Mechatronics
- Nanotechnology
- Neuroscience
- Personalized Learning Systems
- Public Policy and Urban Affairs
- Speech Pathology and Communication Disorders
- STEM Education and STEM Workforce Development
- Supply Chain Operations Research



Dr. Lesia Crumpton-Young
Chief Research Officer and Associate Vice-President of
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William Boadi, Ph.D. (left), associate professor in the Department of Chemistry and principal investigator leads student researchers in his laboratory as they conduct research on a USDA-NIFA funded project, Effects of Plant Flavonoids: Quercetin, Genistein and Kaempferol on Oxidative Damage in Obesity



Brenda S. McAdory, Ph.D., associate professor in the Department of Biological Sciences, and a cell and neurobiologist leads a neuroscience research laboratory inclusive of innovative research training for biology students.



Dr. Ahmad Aziz (right), associate professor of Agricultural and Environmental Sciences and principal investigator, carries on an experiment with graduate assistant Abdul Mujeed Yakubu, in his laboratory for research on bio-energy, biofuel, and natural resources.

College of Agriculture, Human and Natural Sciences

Department of Agricultural and Environmental Sciences

Department of Family and Consumer Sciences

The faculty in Agricultural and Environmental Sciences, and Family and Consumer Sciences are engaged in conducting research and generating scientific knowledge in various areas, including childhood obesity prevention, climate change, food safety, global food security, and sustainable bioenergy.

Department of Biological Sciences

Research expertise of faculty in the Department of Biological Sciences lies in the broad area of cell and molecular biology. Faculty research activities involve studies of plant extracts and their effect on cancer cell growth and function, the role of D₃ receptors in neuronal development, collagen assembly and trafficking, the role of the spectraplak protein, MACF1, in maintenance of brain tumors, the use of microorganisms as bioinsecticides and as producers of antimicrobial and anticancer compounds, inflammation cytokines in cancer biology, genome variation in poultry and studies of global change ecology.

Department of Chemistry

The faculty in the Department of Chemistry are engaged in conducting research activities specific to cancer, environmental science, nano-science, atmospheric chemistry, synthesis of molecules with biomedical interest, and polymer science.

College of Business

The faculty in the College of Business are engaged in conducting applied, disciplined-based and pedagogical research in areas of accounting, business management, economics, finance, and information systems and technology.

College of Education

The College of Education faculty are engaged in research that examines disparities in education student learning and persistence. Faculty with the experimental psychology program are engaged in basic psychological science research in the areas of cognitive psychology, neuroscience, behavioral psychology, and child development.

College of Engineering

The College of Engineering faculty are engaged in conducting research in signal/image processing, bioinformatics, sensor fusion, applied intelligent systems, unmanned vehicles, decision making processes, health monitoring (prognosis and diagnosis) of aircraft engines, wireless communication, robust control systems, cyber-security, renewable energy sources, virtual reality high performance computing, and chemical sensing detection systems.

College of Health Sciences

The faculty in the College of Health Sciences are engaged in research areas that encompass HIV prevention, health disparities, obesity, diabetes, Ebola, and speech pathology.

College of Liberal Arts

The faculty in the College of Liberal Arts are engaged in conducting research in fields that reflect studies in global perspectives on civil rights and justice issues; African American history, literature, and culture; studies in education in music, history, literature, and language; studies in global perspectives in art; and studies in criminal justice.

College of Public Service and Urban Affairs

The faculty in the College of Public Service and Urban Affairs has been engaged in areas of research that include: leadership, curriculum reform and learn-centered paradigm; intergovernmental relations, public finance, public policy, and economics of education; education policy, environmental policy, urban planning and policy, nonprofit management and community revitalization; state lottery; health policy; sociology and social work; and aging.

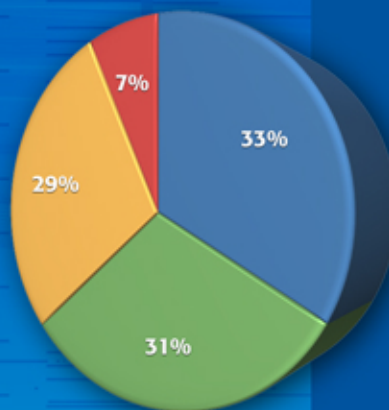
Fiscal Year 2015 Awards

AWARDS by Agency/Corporation/Foundation

- National Aeronautics and Space Administration (3)
- National Science Foundation (22)
- Private (14)
- State (16)
- U.S. Air Force (6)
- U.S. Department of Agriculture (41)
- U.S. Department of Commerce (1)
- U.S. Department of Defense (8)
- U.S. Department of Education (27)
- U.S. Department of Energy (5)
- U.S. Department of Health and Human Services
 - Health Resources and Services Administration (1)
 - National Institutes of Health (3)
 - Other (18)
- U.S. Department of Housing and Urban Development (1)
- U.S. Department of Transportation (3)
- U.S. Fish and Wildlife Service (1)
- U.S. Navy (2)
- Total (172)**

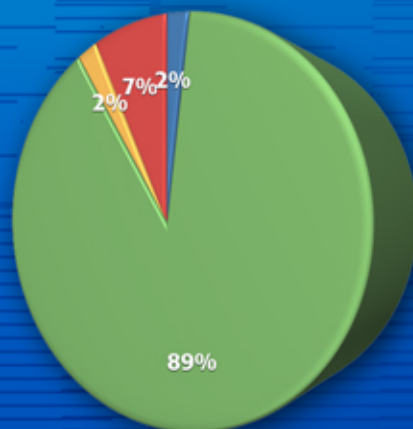
AWARDS by Project Type

- Research (81) \$16,824,372
- Instruction (49) \$16,196,205
- Service (40) \$14,823,018
- Construction (2) \$3,685,200
- Total (172) \$51,528,795**



AWARDS by Source

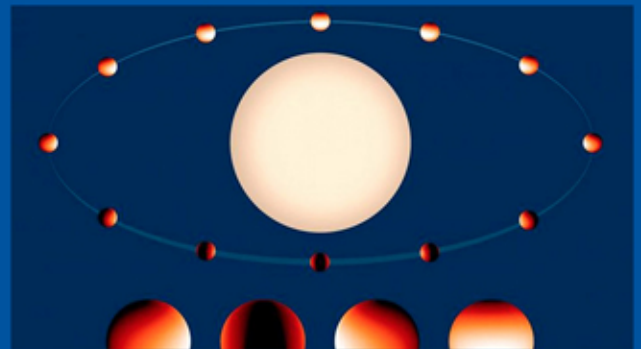
- State (16) \$1,271,914
- Federal (140) \$45,655,168
- Private (14) \$916,513
- Physical Plant/Construction (2) \$3,685,200
- Total (172) \$51,528,795**



USING HUBBLE SPACE TELESCOPE, TEAM INCLUDING TSU ASTRONOMERS DEVELOP MOST DETAILED EXOPLANET WEATHER MAP

When it comes to understanding the stars and galaxies, scientists at Tennessee State University continue to play key roles in major discoveries and breakthroughs.

Recently, TSU astronomers Gregory Henry and Michael Williamson were part of a team of astronomers that announced they had made the most detailed map ever of the temperature distribution of an exoplanet's atmosphere and traced the amount of water vapor it contains.



In this artist's illustration, the Jupiter-sized planet WASP-43b, orbits its parent star in one of the closest orbits ever measured for an exoplanet of its size – with a year lasting just 19 hours. (Illustration courtesy of NASA, EAS, Z. Levey)



Gregory Henry

Work Rese

TSU DATA SCIENCES WORKSHOP DRAWS MORE THAN 100 EXPERTS FROM THE UNITED STATES AND CHINA



Dr. Ali Sekmen

Dr. Ali Sekmen, professor and chair of the Department of Computer Science at Tennessee State University (TSU) hosted the first annual workshop on data sciences in April 2015 that brought together more than 100 data science researchers from over 20 universities and institutions in the United States and China.

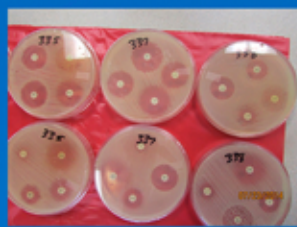
"High Dimensional Data Analysis" was a platform for experts from national institutions such as Harvard University, Johns Hopkins University, the University of Memphis, Tuskegee University, the University of Tennessee-Knoxville, Vanderbilt University, and China's Nanjing University of Information Science and Technology to gather at TSU.

TRACING FOODBORNE PATHOGENS AND EMPOWERING FARMERS TO ENHANCE CONSUMER FOOD SAFETY

Dr. Agnes Kilonzo-Nthenge, associate professor and food microbiologist in Family and Consumer Sciences at TSU and her team are pursuing interventions to minimize the transfer of pathogenic bacteria from farms to consumers by evaluating the profiles of bacteria (*Salmonella*, *Clostridium difficile*, *Escherichia coli*, *Enterococcus faecium*, and *Shigella*) from farm environments, retail produce, and meats in Middle Tennessee. Prevalence of antimicrobial resistance has also been determined in bacteria isolated from the food systems. As the multi-state, multi-institution collaborative research investigation (TSU and University of Maryland-Eastern Shore) continues, food safety consultants are preparing growers for food safety audits leading to Good Agricultural Practices (GAPs) certification.



Dr. Agnes Kilonzo-Nthenge



Antibiotic resistant bacteria are revealed from retail chicken.



Helen Liu (graduate student) analyzes bacteria from fresh produce.

World Class Research

ROBOTICALLY DISCOVERING EARTH'S NEAREST NEIGHBORS

TSU astrophysicists and a team of astronomers using ground-based telescopes in Arizona, California, and Hawaii recently discovered a planetary system orbiting a nearby star that is only 54 light-years away from our solar system. TSU has also been developing and operating robotic telescopes for over 20 years.



Tennessee State University's robotic telescopes in the mountains of southern Arizona prowl the night sky every clear night of the year studying Sun-like stars and searching for new planetary systems. (Moonlight image by Lou Boyd, Fairborn Obs.)

ADVANCEMENT OF CYBERSECURITY RESEARCH AT TENNESSEE STATE UNIVERSITY – A WORLD CLASS VENTURE FOR EXCELLENCE IN ACADEMICS AND RESEARCH

Dr. Sachin Shetty, associate professor in the Department of Electrical and Computer Engineering, leads the Cyber Defense and Security Visualization Laboratory and a team of faculty participating in creating the next generation of cybersecurity researchers.



Dr. Sachin Shetty (back row, far right) and students present the Cyber Defense and Security Visualization Laboratory during a tour of the TSU Interdisciplinary Graduate Engineering Research Institute (I.G.E.R. Institute).

Exploring, Creating, and Learning

BREAST CANCER VACCINE DEVELOPED BY TENNESSEE STATE UNIVERSITY RESEARCHER AND COLLEAGUES SHOWS PROMISE IN PRELIMINARY TRIAL

According to a study published in Clinical Cancer Research, Dr. Venkataswarup Tiriveedhi, assistant professor of Biological Sciences and his colleagues found that the experimental vaccine, Mammaglobin-A, was "overexpressed" in 40 to 80 percent of primary breast cancers.

"The MAM-A DNA vaccine is safe, capable of eliciting MAM-A-specific CD8 T-cell responses, and preliminary evidence suggests improved progression free survival (PF)," the researchers concluded.

Dr. Tiriveedhi is also investigating the role of a high salt diet potentially leading to breast cancer disparities among various ethnicities.



Dr. Venkataswarup Tiriveedhi, a cancer and immunology specialist and assistant professor of Biological Sciences, works on a cancer mechanism in his laboratory in Harned Hall at Tennessee State University.

DEPARTMENT OF HOMELAND SECURITY SCIENTIFIC LEADERSHIP AWARD: AN INTEGRATED UNDERGRADUATE RESEARCH AND EDUCATION PROGRAM IN DATA ANALYTICS FOR SECURING CRITICAL INFRASTRUCTURE AT TSU

TSU professors received a large grant as part of the Department of Homeland Security Scientific Leadership Awards (DHS-SLA). The grant will focus on “cyber data analytics” to support DHS’s mission to secure cyberspace. Cyber data analytics can be used in the sciences to verify or disprove existing models or theories. Data analytics will help in improving situational awareness in the presence of cyber threats.

Dr. Martene Stanberry, assistant professor of Mathematics, and Dr. Sachin Shetty, assistant professor of Electrical and Computer Engineering, received the grant as part of the DHS Science and Technology (S&T) Scientific Leadership Award in 2014.



Dr. Sachin Shetty



Dr. Martene Stanberry

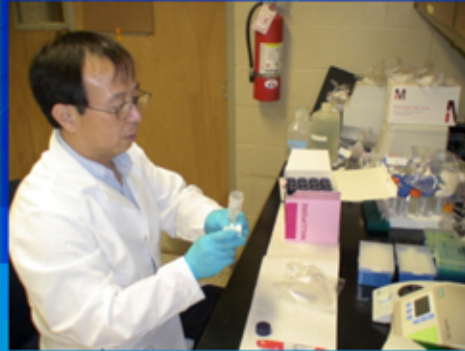
MULTI-STATE UNIVERSITY STUDY REVEALS UNSAFE HANDLING AND COOKING PRACTICES PLACE CONSUMERS AT RISK

A recent multistate observational study performed by Tennessee State University (TSU) and Kansas State University (KSU) in collaboration with RTI International revealed that many consumers are putting themselves at risk for foodborne illnesses when preparing poultry and eggs.



Dr. Sandria Godwin

This study is just one of many studies related to poultry and eggs being performed by researchers at Tennessee State University and their partner institutions. Dr. Sandria Godwin is a principal investigator and professor in Family and Consumer Sciences at TSU. Other TSU researchers on this project include Dr. Fur-Chi Chen, Dr. John Ricketts, Dr. Samuel Nahashon, and Dr. Agnes Kilonzo-Nthenge.



Dr. Fur-Chi Chen, a professor in Family and Consumer Sciences is assessing bacteria levels on poultry products.

Excellence is Our Habit

TSU AND VANDERBILT RECEIVE NEARLY \$1 MILLION TO INCREASE MINORITY STEM PH.D.s

Increasing the number of minority students who earn a Ph.D. in science, technology, engineering, and mathematics is the aim of a new “bridge-to-the-doctorate” program launched by a coalition of Tennessee universities and spearheaded by Tennessee State University and Vanderbilt University.



Dr. Lonnie Sharpe

The National Science Foundation recently awarded \$987,000 to TSU to initiate the new program as an expansion to the Tennessee Louis Stokes Alliance for Minority Participation (TLSAMP).

Dr. Lonnie Sharpe is the TSU Massie Chair of Excellence director and TLSAMP executive director.

TSU PROFESSOR LANDS HALF MILLION-DOLLAR USDA AWARD TO RESEARCH FOODBORNE ILLNESS PREVENTION

Dr. Ankit Patras, an assistant professor with the College of Agriculture, Human and Natural Sciences at Tennessee State University has received a \$500,000 USDA grant to research new ways of preventing foodborne illness and increase the safety of the food production industry.



Dr. Ankit Patras