



# RESEARCH CAPABILITIES



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Detail from "The Faces of Science," Fort Interdisciplinary Research Center



**NORTH CAROLINA AGRICULTURAL AND TECHNICAL STATE UNIVERSITY**

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Joe B. Whitehead Jr., Ph.D., Provost

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<http://www.ncat.edu/research/overview/index.html>

# INTRODUCTION: RESEARCH AT N.C. A&T

Our land-grant heritage positions us well for today's great research challenges - nanotechnology and biotechnology ... energy and the environment ... and more.

Our work extends beyond our traditional disciplines of engineering and agriculture, into areas including biomedical research, leadership development, and the social and behavioral sciences.

In emerging and converging disciplines all across the spectrum of science and engineering ... health disparities, aerospace, and computational science, to name a few ... Aggie researchers are creating new knowledge, spurring economic activity, and improving the quality of life for our community and the world.

N.C. A&T faculty and students work in laboratories and in communities, on farms and in cities, on the campus, across the state and around the world. We partner among academic units and disciplines, with other universities, and with corporate and government researchers.

We invite you to learn more about how research at N.C. A&T drives education, community engagement and economic development.

[research.ncat.edu](http://research.ncat.edu)

[aggieresearch.wordpress.com](http://aggieresearch.wordpress.com)



**DIVISION OF RESEARCH AND ECONOMIC DEVELOPMENT**

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An expanded version of this brochure is at <http://www.ncat.edu/research/overview/index.html>.

# AEROSPACE & TRANSPORTATION SYSTEMS

Developing new systems, new materials, and new capabilities for missions on the seas, in the air, and beyond.

## FOCUS AREAS

- » Sensors & non-destructive evaluation
- » Computational fluid dynamics
- » Conventional and fuzzy logic controls and avionics
- » Human factors
- » Systems engineering
- » Small satellite systems

## REPRESENTATIVE PROJECTS

- » Supersonic injection, mixing and combustion for hydrocarbon-fueled scramjets
- » Thermal management for high heat flux components using spray cooling and surface enhancement techniques
- » Structural performance of affordable composites for stealthy naval ships
- » Ultra-lightweight microsystems mechanics
- » Integrated topology and multi-scale optimization of protective structures
- » Quantitative acoustic emission technique for monitoring hot spots in aging aircraft structures
- » Overcoming communication time-delays in spacecraft formation flying



## CENTER FOR AVIATION SAFETY

Funded by NASA, this center supports the agency's Fundamental Aeronautics and Aviation Safety programs. Research objectives center on:

- » Advanced composites and structures,
- » Integrated vehicle health management, and
- » Aeromechanics and propulsion.

The center works in partnership with NASA's Glenn and Langley research centers, major aerospace corporations, academic advisors, and small businesses.

The educational objective is to develop a high-quality aerospace engineering graduate program.

# BIOMEDICAL RESEARCH

Mechanical engineering, materials science, and life sciences come together to create and apply new medical knowledge.

## FOCUS AREAS

- » Alzheimer's disease
- » Health disparities
- » Nanomedicine
- » Drug-delivery systems
- » Mechanical scaffolding for tissues
- » Metabolomics
- » Proteogenomics
- » Biodegradable medical implants

## REPRESENTATIVE PROJECTS

- » Direct-write based micro and nano manufacturing fabrication of diverse applications, including functionally gradient materials, regenerative tissue scaffolds, and bio-chem sensors that lead to next-generation devices and systems
- » Merging quantitative proteomics with agricultural & environmental sciences
- » Bioactive food compounds with applications in prevention and management of diabetes
- » Wheat bran for colon cancer prevention: A targeted metabolomic approach



## NSF ENGINEERING RESEARCH CENTER FOR REVOLUTIONIZING METALLIC BIOMATERIALS

The ERC is conducting research in biomedical engineering and nanobio applications. Its goal is to generate revolutionary advances in cardiovascular, orthopedic and craniofacial medicine through technology for biocompatible and biodegradable implants for reconstruction and regeneration.

Research focuses on biodegradable metals (magnesium alloys), biofunctional surface modification, sensors and controlled degradation, and controlled release. A&T is leading a consortium that includes the University of Pittsburgh, University of Cincinnati and Hannover Medical School in Germany.

## BIOTECHNOLOGY & BIOSCIENCES

Combine bioengineering and new paradigms in agriculture ... and you get a land-grant university for the 21st century.

### FOCUS AREAS

- » Bioengineering
- » Bioinformatics
- » Sustainable agriculture, conservation agriculture
- » Natural resources management

### REPRESENTATIVE PROJECTS

- » Evaluating the potential of winter legume and grass cover crops for carbon sequestration
- » Enhancing urban sustainability through the application of permaculture principles
- » Genetic transformation and use of applied plant biotechnology techniques for economic development, rescue of endangered species, and mass-propagation of rare species
- » Rapid multiplication of plant species with high economic value
- » Tissue culture techniques to produce bioactive compounds, plant-based medicines, and nutraceuticals
- » Genetic transformation for biofuel production and value-added crops



### NATUCULTURE: MIMICKING NATURE

Natuculture is a term originated by Dr. Manuel Reyes (above) for any human-made system that mimics nature in human-disturbed landscapes.

Reyes, professor of biological engineering, is applying the concept in Cambodia and the Philippines to make the unnatural

process of farming mimic the natural cycles of tropical rain forests.

The practice offers farmers in tropical climates the best chance at maintaining sustainable harvests. It reverses soil erosion and degradation and increases crop yield and profits.

## COMPUTER & COMPUTATIONAL SCIENCES

Applying the power of advanced computing to the life sciences, physical sciences, and to computer science itself.

### FOCUS AREAS

- » Big data
- » Social networking
- » Evolutionary biology of organic and inorganic systems
- » High-performance reconfigurable computing
- » Computational modeling in non-physical domains and in physical and engineering sciences
- » Data center operations and efficiency

### REPRESENTATIVE PROJECTS

- » Ph.D. program in computational science and engineering
- » Center for Autonomous Control and Information Technology
- » DataBridge: A sociometric system for long-tail science data collections
- » Social network analysis and simulation systems
- » A novel framework for community detection in large networks
- » Improving the availability, reliability, and cost efficiency of data centers
- » Remote and reconfigurable computing environment



### DATABRIDGE: A SOCIOMETRIC SYSTEM FOR LONG-TAIL SCIENCE DATA COLLECTIONS

DataBridge is an e-science collaboration environment tool to assist scientists in searching for relevant data sets and collaborators. Scientists are creating millions of data sets, describing an increasingly diverse matrix of social and physical phenomena; this data boom continually shrinks the chances of an individual, unaided scientist finding all

data relevant to a particular line of investigation. The DataBridge project is exploring a rich set of socio-metric tools and relevance algorithms and adapting them for defining different types of semantic bridges that link datasets and for semantically linking large numbers of diverse data into a socio-mapping network.

# DEFENSE & NATIONAL SECURITY

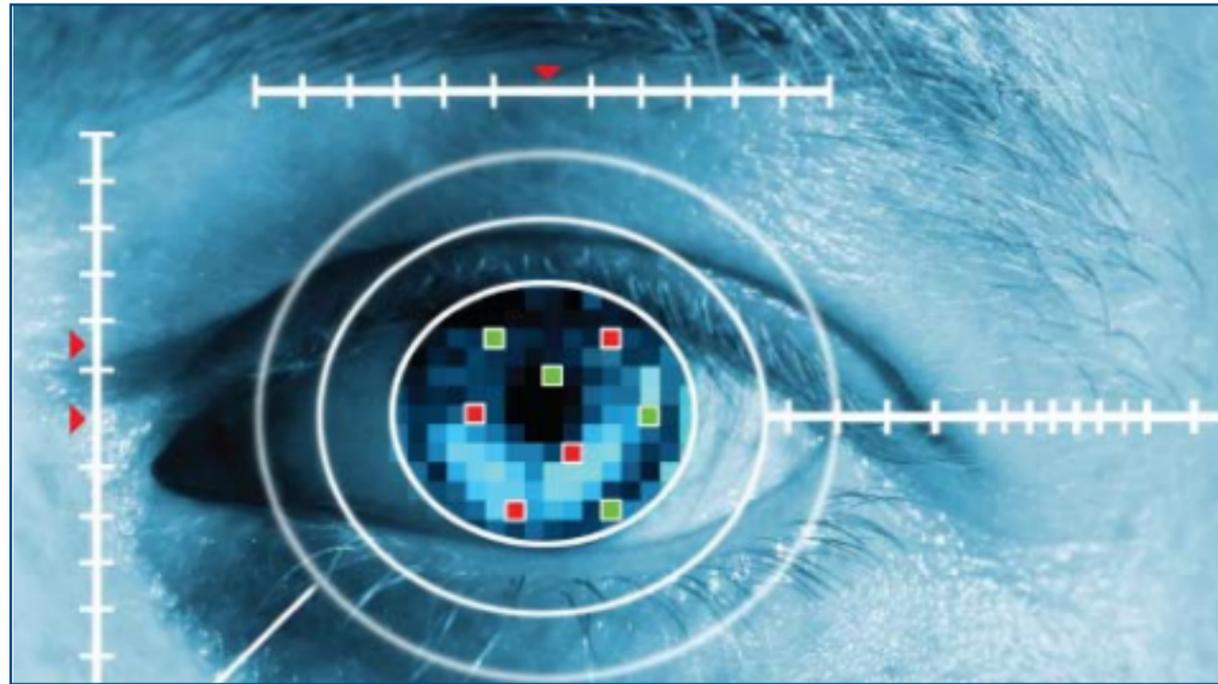
Countering real-world and virtual threats and vulnerabilities at the national level, the community level, and the individual level.

## FOCUS AREAS

- » Cybersecurity
- » Biometrics
- » Information assurance
- » Food security
- » Border security
- » Infrastructure protection
- » Autonomous agents
- » Modeling and simulation
- » Network survivability
- » Humanitarian logistics

## REPRESENTATIVE PROJECTS

- » Center for Advanced Studies in Identity Sciences
- » Center for Cyber Defense
- » Understanding network survivability under WMD attack
- » Immunological techniques for food security
- » Development of integrated food protection and defense education
- » Engineering efficient and equitable food distribution under uncertainty
- » Quantifying food-supply vulnerability



## CENTER FOR ADVANCED STUDIES IN IDENTITY SCIENCES

The center researches novel ways to solve the unconstrained biometrics problem centered on the face and head.

The focus is on techniques that exploit the tightly coupled face, periocular, and iris, and the fusion of facial attributes to improve recognition results and to enforce sanity checks on recognition.

A second focus area is protection and privacy associated with cyber and mobile identity: Can identity be discovered via social media mining? How does one protect against the discovery of their identity? What other elements can be discovered about someone, and how can this be protected?

# ENERGY & THE ENVIRONMENT

Basic and applied research in alternative energy and in sustainability ... in nature and in the built environment.

## FOCUS AREAS

- » Sustainable agriculture and natural resources management
- » Bioremediation and waste management
- » Energy efficiency, conservation and control
- » Advanced multi-scale computational algorithms
- » Climate change
- » Sustainable energy
- » Bioenergy and bioproducts
- » Hydrogen fuel and fuel cells
- » Solar power

## REPRESENTATIVE PROJECTS

- » NSF CREST Bioenergy Center
- » Center for Energy Research and Technology
- » Ph.D. program in Energy and Environmental Systems
- » Waste Management Institute
- » Interdisciplinary research in climate change and its social and economic impacts



## NSF CREST BIOENERGY CENTER

The Bioenergy Center conducts fundamental research toward the development of advanced thermochemical biomass conversion technology for the efficient, economic production of liquid transportation fuels and hydrogen.

The center is working to make biomass a more viable source of renewable energy by developing basic science and technology that will make energy conversions more efficient and affordable.

Research thrust areas are 1) gasification of biomass, 2) developing specific catalytic materials and processes for clean biofuels and hydrogen production applications, and 3) fuel processing and reforming technologies for hydrogen production and separation as H<sub>2</sub> fuel with applications in proton exchange membrane fuel cells.

The center's work includes a cross-cutting economic assessment focusing on the relative profitability of the technologies.

# FOOD SCIENCE

Unlocking the potential for safer and healthier food and for food components that can help prevent disease.

## FOCUS AREAS

- » Global food security and hunger
- » Metabolomics
- » Food processing
- » Food safety
- » Food science and nutrition
- » Functional foods
- » International agricultural trade
- » Animal science

## REPRESENTATIVE PROJECTS

- » Center for Excellence in Post-Harvest Technologies
- » Bioactive food compounds for prevention and management of diabetes
- » Ginger extract: Bioavailability and lung cancer preventive effect
- » Carnosic acid enriched rosemary extract and its active components reduce weight gain and type 2 diabetes
- » Controlling viral foodborne disease
- » Grape pomace as a potential functional food ingredient for obesity prevention and weight control.



## CENTER FOR EXCELLENCE IN POST-HARVEST TECHNOLOGIES

The center's research adds value to agricultural commodities by finding new ways to make food safer, extend shelf life and preserve health promoting nutrients.

It is located at the North Carolina Research Campus (NCRC) in Kannapolis

and is working with academic partners there to expand into diverse areas such as nutrigenomics and metabolomics.

A&T is one of eight universities with facilities at the campus, a \$1 billion, 350-acre biotechnology research park.

# HUMAN HEALTH, NUTRITION & WELLNESS

Strengthening the ability of science and society to improve health, well-being and quality of life for all people.

## FOCUS AREAS

- » Counseling
- » Health disparities
- » Childhood obesity
- » Health and education Interventions
- » Health disciplines
- » Health promotion and disease prevention
- » Human performance
- » Substance use

## REPRESENTATIVE PROJECTS

- » Center for Behavioral Health & Wellness
- » Center for Outreach in Aging and Community Health
- » Ph.D. program in rehabilitation counseling
- » Genetic epidemiology of Alzheimer's disease
- » Six sigma in public health clinics: Improving health outcomes
- » Access to comprehensive health care in Guilford County
- » Creating healthy communities through improved access to fresh produce



## CENTER FOR BEHAVIORAL HEALTH & WELLNESS

The center provides community-focused, evidence-based, and culturally competent services through the integration of best-practice research, training, and technical assistance.

The multidisciplinary team's research focuses on participatory applied research in partnership with community agencies.

### Research and program evaluation

- Longitudinal research
- Community-based needs assessments
- Database creation and analysis
- Survey development
- Evaluation consultation and logic modeling
- Program evaluation

## LEADERSHIP & COMMUNITY DEVELOPMENT

Faculty and students putting research into practice on city streets, country roads and in communities ready to create their future.

### FOCUS AREAS

- » Business development
- » Economic development
- » Economic empowerment
- » Housing and infrastructure
- » Leadership development
- » Leadership for young African American men

### REPRESENTATIVE PROJECTS

- » Ph.D. program in leadership studies
- » Community Empowerment Network of North Carolina
- » Community empowerment and sustainable workforce development initiative
- » Urban Education Institute (annual conference)
- » Enhancing land stewardship by socially disadvantaged beginning farmers and ranchers
- » Sustainable energy and economic development of rural communities: The green alternative



## COMMUNITY EMPOWERMENT NETWORK OF NORTH CAROLINA

Twelve pastors in Eastern North Carolina joined together to create the network in 2005. Located in seven counties across the region, they worked to advance their communities through economic development, education, and reduction of African Americans' health disparities.

In 2007, they began a partnership with Dr. Forrest Toms of the Department of Leadership Studies. He initially helped develop a community development and

capacity building program.

Now, he and his Ph.D. students have been joined by the School of Technology and colleges of Engineering and of Arts and Sciences. A&T researchers now are delivering a distance- learning program, technology training, technical assistance, and other services.

As a result, the network has been able to launch new programs, including job creation and STEM training. And to grow to 50 churches in 16 counties.

## NANOTECHNOLOGY & MULTI-SCALE MATERIALS

The workings, wonders, and endless surprises of matter at a level beyond reach, and imagining, a generation ago.

### FOCUS AREAS

- » Nano-, bio-, electronic, composite, polymeric, smart, and metallic materials
- » Materials characterization and testing
- » Modeling and simulation
- » Nano and composite manufacturing
- » Advanced and smart materials
- » Biomaterials and regenerative engineering
- » Nanoengineered materials
- » Nanoscience and nanoengineering cross-cutting applications

### REPRESENTATIVE PROGRAMS

- » Joint School of Nanoscience and Nanoengineering
- » Ph.D. program in nanoengineering
- » NSF Engineering Research Center for Revolutionizing Metallic Biomaterials
- » High performance computing and enabling technologies for nano- and bio-systems and interfaces
- » Cell-based toxicity assay-on-chip for next-generation CMOS technology



## JOINT SCHOOL OF NANOSCIENCE & NANOENGINEERING

What's a greater feat: Unlocking the mysteries of nanotechnology or getting two very different universities to work together to create a scientific landmark? It's an academic question, because N.C. A&T and UNC Greensboro are doing both with ground-breaking results.

The Joint School offers A&T's two advanced degrees in nanoengineering

and UNCG's two in nanoscience. And it offers engineers and scientists common ground, literally and figuratively, to work together on such advanced research as nanomedical applications, material science requirements, and fabrication processes.

For a selected list of equipment in use at the Joint School, see Page 14.

# SOCIAL & BEHAVIORAL SCIENCES

Brain and behavior, ethics, language and culture, economics, education: Understanding ourselves and each other.

## FOCUS AREAS

- » Cognitive science
- » Cultural studies
- » Ethics
- » Interactive research in the arts
- » Rehabilitation counseling
- » Social systems
- » Socio-economic, cultural, and political disparities
- » Teaching tools and practices

## REPRESENTATIVE PROJECTS

- » Rehabilitation counseling Ph.D. program
- » Academy of Teaching and Learning
- » Culturally responsive instruction: Lesson design and delivery - A national dialogue
- » Workforce development and addiction counseling
- » Racial identity themes in television situation comedies
- » Changing societal attitudes toward water scarcity
- » Civic, community and political engagement among emerging adults



## REHABILITATION COUNSELING PH.D.

The doctoral counseling program is increasing the number of rehabilitation counselor educators by preparing culturally competent students to work as counselor educators, researchers, clinicians, and supervisors in academia. The curriculum includes rehabilitation

counseling and behavioral addictions, vocational evaluation and work adjustment, marriage and family, counseling, crisis management and conflict resolution, rehabilitation psychology and behavioral medicine.

# TRANSPORTATION & LOGISTICS

An interdisciplinary approach to mastering time and distance to meet human needs and business demands.

## FOCUS AREAS

- » Disaster relief
- » Global transportation
- » Manufacturing logistics
- » Resource scheduling
- » Supply chain strategy
- » Warehousing and distribution
- » Planning for disasters affecting transportation systems

## REPRESENTATIVE PROJECTS

- » Transportation Institute
- » Maritime domain awareness and coastal/port security
- » A supply chain management view of the humanitarian relief chain
- » Engineering efficient and equitable food distribution under uncertainty
- » Interactive simulation model for evaluating the impact of port disruptions
- » Quantifying vulnerability in food supply
- » Small Business Transportation Resource Center
- » Economic contributions of N.C. ports



## TRANSPORTATION INSTITUTE

The institute is an interdisciplinary research, training, and technology transfer unit that draws faculty, staff, and students from the School of Business and Economics, the College of Arts and Sciences, the College of Engineering, and units throughout the University.

The Transportation Institute serves as

a national, regional, and local clearing-house for transportation education, research and outreach; offering seminars, workshops, lectures, publications, and other information for public and private transportation practitioners, decision-makers and the general public.

## SELECTED FACILITIES & EQUIPMENT

### JOINT SCHOOL OF NANOSCIENCE AND NANOENGINEERING

Highlights of available equipment

#### Microscopy:

- » Carl Zeiss Orion Plus helium-ion
- » Agilent 5600 LS Atomic Force
- » Carl Zeiss Auriga-BU FIB FESEM
- » Carl Zeiss Axio Imager Z2m
- » Carl Zeiss Axio Observer A1
- » Carl Zeiss Axio Observer Z1, Spinning Disc Confocal
- » Carl Zeiss Libra 120 Plus TEM
- » Hitachi S-4800-I FESEM with Backscattered Detector & EDX
- » South Bay Technologies PC2000 Plasma Cleaner

#### Magnetic resonance imagery:

- » Siemens Magnetom Trio MRI 3T

#### Clean room equipped for:

- » Photolithography
- » Dry etching
- » Thermal processing
- » Wet processing
- » Chemical vapor deposition
- » Physical vapor deposition
- » Metrology
- » Post-processing
- » Biolithography
- » Sample preparation

For a more complete list, see: <http://www.ncat.edu/research/overview/index.html>

- » Labs for analytical chemistry, biophysics, material testing, nanobiology, nanochemistry, & nano fabrication

### ENGINEERING RESEARCH CENTER

Highlights of available equipment

- » GE Nanotomography Imaging System
- » Hitachi SU8000 Electron Microscope
- » Hitachi H-600 Electron Microscope
- » Integrated Nano-Bio Manufacturing Laboratory
- » Pulsed laser deposition facility
- » Fuel cell processing laboratory
- » Coatings synthesis laboratory
- » Bio/polymer laboratory
- » Composite processing laboratory
- » Materials processing laboratory
- » Computation and visualization lab
- » Nanoindentation facility
- » Mechanical testing high-temperature testing facility
- » Structural health monitoring research laboratory

### CHEMISTRY DEPARTMENT LABS

- » NMR: Varian VNMR NMR 300 MHZ spectrometer

- » Mass spectrometry: Varian and HP GC
- » X-ray: SMART X2S Automated X-ray Diffractometer
- » Genetic analysis: 3100 Applied Bioscience Genetic Analyzer (DNA Sequencer)
- » Sample purification and analysis: HPLC, IR, and UV-visible spectrophotometers; Mattson 20/20 Galaxy FTIR; gas chromatographs; high-speed centrifuges; electrochemical set-ups; impedance analyzer
- » Econotherm oven
- » Muffle furnaces (Barnstead, Thermoline 1300, and four-stage programmable muffle furnace)
- » Tube furnaces (Thermcraft Inc. and Lindberg Blue M)
- » Contact Angle System OCA, Future Digital Scientific Corporation

### RESEARCH FARM

- » 492-acre research farm produces crops and seven species of farm animals, used for research and education, testing and demonstration of new crops and farming practices.

### REID GREENHOUSE

- » 4,000 square-foot state-of-the-art greenhouse, with rolling benches, automated shade cloth and computerized environmental controls.

## SELECTED FACILITIES & EQUIPMENT

### FOOD AND NUTRITION LAB

- » Visible spectroscopy
- » Supercritical CO<sub>2</sub> fluid extraction
- » Automatic titration system
- » Waters High Performance Chromatography
- » UV-Vis Spectrophotometer
- » Leco-Carbon-Nitrogen Analyzer
- » Soxtec Auto Fat Extraction System
- » Bench-top spectrophotometer for color measurement
- » Ozone generator
- » Eppendorf Real-Time PCR
- » Eppendorf Centrifuge
- » Millipore Water Purifying System

### ANALYTICAL SERVICES LAB

- » UV/VIS absorption spectrophotometry -- ion chromatography
- » Gas chromatography & mass spectrometry
- » NMR spectroscopy
- » Ion coupled plasma/atomic emission spectroscopy
- » High performance liquid chromatograph

### ADDITIONAL AG FACILITIES

- » Bioinformatics Lab
- » Plant Tissue Culture Biotechnology Lab
- » Food Research Lab
- » Plant Biotechnology Lab

### CENTER FOR COMPOSITE MATERIALS RESEARCH

- » Processing and Fabrication Lab
- » Low-temperature plasma machine
- » Custom-built electrospinning apparatus
- » Burn-through test facility
- » High-capacity servo hydraulic testing systems
- » Dynamic test facility for high strain rate testing and low-velocity impact testing
- » Digital Image Correlation System
- » High speed camera (up to 500,000 frames per second)

### AUTONOMOUS CONTROL LAB

- » DARwIn-OP humanoid robots
- » Adept Viter 6-Axis Robot arms
- » Pioneer 3-AT and 2-DX mobile robots

### COMPUTATIONAL SCIENCE AND ENGINEERING CLUSTER

- » 3 Sun 6000 chassis, total 1 TB memory
- » 26 dual-socket 6-core AMD blades
- » 1 8-socket 6-core AMD blade
- » Storage system, approximately 48 TB
- » Parallel application support using MPI and OpenMP distributed and shred memory programming models
- » Communication fabric: Infini-Band, supporting NFS over IB

### N.C. RESEARCH CAMPUS

- » The Center for Excellence in Post-Harvest Technologies is located at the North Carolina Research Campus, a 350-acre public-private research park in Kannapolis, North Carolina, focusing on human health, nutrition, and agriculture. A&T facilities include:
- » Biosafety level three lab
- » Liquid Chromatography/Mass Spectrophotometer (tandem mass capability w/ESI, APCI, PDA, & ELSD)
- » Gas Chromatography/ Mass Spectrophotometer (with NIST library)
- » Inductive Coupled Plasma Mass Spectrophotometer
- » High Pressure Liquid Chromatography with electro-chemical array detector

### OFF-CAMPUS FACILITIES

- N.C. A&T researchers have access to:
- » Cerro Tololo Inter-American Observatory, Chile, six 16-inch diameter fully automated optical telescopes
  - » Cherry Research Farm, Goldsboro, NC
  - » National Institute of Aerospace, Norfolk, VA
  - » Thomas Jefferson National Accelerator Facility, Newport News, VA
  - » Three College Observatory, Graham, NC
  - » Triangle Universities Nuclear Laboratory, Durham, NC

# UNDERGRADUATE RESEARCH

One of the best ways of teaching is research. One of the most powerful impacts of research is education.

## REPRESENTATIVE PROGRAMS

- » Collaborative Earth systems science research: Atmospheric modeling, sensing and societal impacts
- » Undergraduate Research Scholars Program (School of Agriculture and Environmental Sciences)
- » Innovation Challenge (annual competition for undergraduates)
- » North Carolina Louis Stokes Alliance for Minority Participation (faculty-mentored research in STEM fields and annual conference)
- » Minority Access to Research Careers Program (biomedical and behavioral sciences)
- » MBRS Research Initiative for Scientific Enhancement (research in biology, chemistry and psychology for students interested in graduate studies in biomedical sciences)
- » iBLEND (biomathematical research)
- » iCUBED (systems biology)
- » iGEM (synthetic biology)
- » Ronald E. McNair Research Symposium (annual event)



# GRADUATE DEGREE PROGRAMS

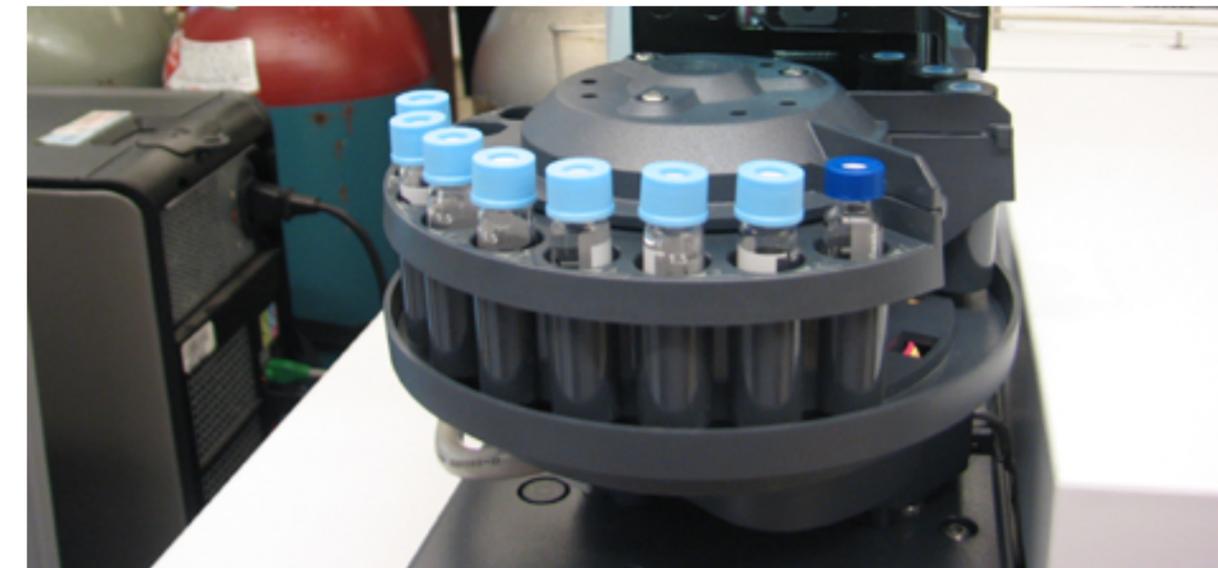
The next generation of researchers and leaders in engineering and science is working in our labs today.

## PH.D. PROGRAMS

- » Computational Science and Engineering
- » Computer Science
- » Electrical Engineering
- » Energy and Environmental Systems  
*Concentrations:*  
*Atmospheric Sciences*  
*Sustainable Bioproducts*  
*Energy and Environmental Science and Economics*
- » Industrial and Systems Engineering
- » Leadership Studies
- » Technology Management (Joint with Indiana State University)
- » Mechanical Engineering
- » Nanoengineering
- » Rehabilitation Counseling & Rehabilitation Counselor Education

## MASTER'S PROGRAMS

- » MA English & African American Literature
- » MAEd Elementary Education
- » MAEd Reading Education
- » MAT Master of Arts in Teaching
- » MS Adult Education



- |  |   |
|--|---|
| <ul style="list-style-type: none"> <li>» MS Agricultural Education</li> <li>» MS Agriculture &amp; Environmental Systems</li> <li>» MS Applied Mathematics</li> <li>» MS Bioengineering</li> <li>» MS Biology</li> <li>» MS Chemical Engineering</li> <li>» MS Chemistry</li> <li>» MS Civil Engineering</li> <li>» MS Computational Science &amp; Engineering</li> <li>» MS Computer Science</li> <li>» MS Electrical Engineering</li> <li>» MS Food and Nutritional Science</li> </ul> | <ul style="list-style-type: none"> <li>» MS Health and Physical Education</li> <li>» MS Industrial &amp; Systems Engineering</li> <li>» MS Information Technology</li> <li>» MS Instructional Technology</li> <li>» MS Management</li> <li>» MS Mechanical Engineering</li> <li>» MS Mental Health Counseling</li> <li>» MS Nanoengineering</li> <li>» MS Physics</li> <li>» MS School Counseling</li> <li>» MS Technology Management</li> <li>» MSA School Administration</li> <li>» MSW Social Work (<i>Jointly with UNCG</i>)</li> </ul> |
|--|---|

# TECHNOLOGY TRANSFER

## AVAILABLE TECHNOLOGIES

- » Remediation using controlled release biodegradable polymers
- » Food-grade process for the inactivation of peanut allergens
- » Method for selectively sized direct-write micro- or nano-manufacturing
- » Densifying carbon-carbon composites using fewer carbonization cycles
- » Highly sensitive, temperature-independent differential pressure sensor
- » Improvements in the preparation of palladium thin films
- » Acoustic emission sensors for non-destructive monitoring of structures including composites
- » Enhancing membrane flux in cross-flow filtration
- » Newly configured building materials for temporary, structurally robust modules
- » Production of carbon nanofibers from Alkali (Kraft) lignin
- » Accelerated growth of Alexandrian laurel
- » Aspirin conjugates as novel therapeutics
- » Therapeutics derived from ginger metabolites
- » Increasing the fiber content of foods without affecting texture or taste



## COMPANIES SPUN OFF FROM N.C. A&T

**Bioadhesive Alliance:** Produces a low-cost and durable adhesive that reduces the amount of petroleum needed in asphalt. It is a green product, obtained from swine manure. It gives pavement greater water resistibility and temperature tolerance. And it provides a use for one of the state's most problematic waste materials.

**Advaero Technologies:** Provides low-cost, high-quality carbon composite materials, components, and assemblies to the military, experimental, and commercial aircraft industries. Advaero began by reverse-engineering and testing stronger and lighter components for the U.S. Marines' out-of-production CH46 helicopter.

# OUTREACH AND COMMUNITY ENGAGEMENT

## EDUCATION OUTREACH

- » Engineering Research Center Young Scholars Program (high school)
- » Summer Bioengineering Institute (high school students and teachers)
- » Summer High School Transportation Institute
- » N.C. DOT Summer Internship Program
- » Research Apprenticeship Program (high school students)
- » Research experiences for teachers and other professional development

## COMMUNITY ENGAGEMENT

- » Health Care Access in Guilford County, a white paper commissioned by Cone Health Foundation.
- » Community Empowerment Network (Eastern North Carolina), see Page 10.
- » Center for Behavioral Health and Wellness (Greensboro), see Page 9.
- » Community Empowerment & Sustainable Workforce Development Initiative (Greensboro), Workforce development for low-income adults in energy efficiency, green construction, and weatherization.
- » Conservation Agriculture for Food Security (Cambodia and the Philippines)
- » Malawi Leadership Program



## N.C. A&T COOPERATIVE EXTENSION

Cooperative Extension provides research-based educational programs and information to individuals, families and communities. The program focuses on:

- » Sustaining agriculture and forestry;
- » Protecting the environment;
- » Maintaining viable communities;
- » Developing responsible youth; and

- » Developing strong, healthy, and safe families.

Extension specialists on campus provide training and technical assistance to agents and paraprofessionals working in counties across North Carolina. These county personnel work one-on-one with the families and individuals in the various programs.

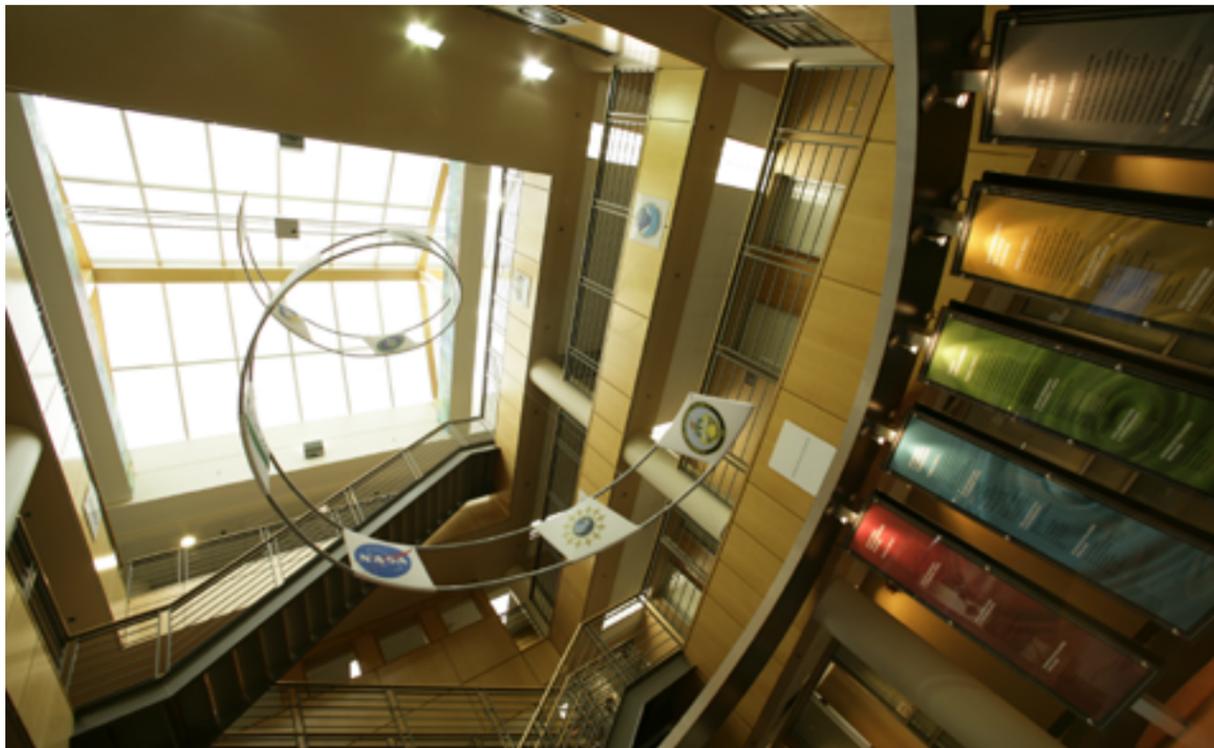
# RESEARCH ADMINISTRATION

## ADMINISTRATION

The Division of Research and Economic Development (DORED) administers N.C. A&T's research enterprise. DORED provides services to faculty and student researchers, to current and potential research partners, funding agencies, and economic development agencies.

## FORT INTERDISCIPLINARY RESEARCH CENTER

DORED is located in an 81,000 square foot building dedicated to research. The Fort IRC contains labs for the Engineering Research Center, Center for the Advanced Study of Identity Sciences, Center for Aviation Safety, and other projects. The design of the building focuses on creating architectural spaces that foster collaboration and encourage interaction among the various occupants of the center.



## DATABASE OF RESEARCHERS

REACH NC is a Web portal for experts and assets at N.C. A&T and other North Carolina higher education and research institutions. REACH NC's expert profiles can assist industry, community groups and university personnel in efforts to find information and potential collaborators for research and problem-solving.

<http://reachnc.org/>

## BASIC RESEARCH: PHYSICS & ASTRONOMY

As a land grant university, N.C. A&T emphasizes applied research. But basic research has an important place as well.

The Department of Physics, for example, conducts basic research in both nuclear physics and astronomy. That work benefits from access to outstanding off-campus facilities, both nearby and far away.

Faculty and student physicists have access to the Thomas Jefferson National

Accelerator Facility in Virginia and the Triangle Universities Nuclear Laboratory at Duke University in Durham. Astronomy research can be conducted at the Three Universities Observatory in neighboring Alamance County and at the Cerro Tololo Inter-American Observatory in Chile. A partnership with UNC-CH has opened opportunities at the National Radio Astronomy Observatory in West Virginia.

# ABOUT NORTH CAROLINA A&T

## PUBLIC, LAND-GRANT UNIVERSITY

- » Constituent institution of The University of North Carolina
- » Historically black university
- » Ranked No. 1 among public HBCUs by U.S. News and World Report
- » Founded: 1891
- » Graduate programs initiated: 1939

## POINTS OF PRIDE

- » College of Engineering ranks No. 1 in degrees awarded to African Americans
- » School of Agriculture and Environmental Sciences is the largest among historically black universities
- » Ranks third in sponsored funding among UNC institutions

## LOCATION

- » In the city of Greensboro in the Piedmont Triad region of central North Carolina
- » 300 miles south of Washington, D.C., and 350 miles north of Atlanta.

## RESEARCH PARK

- » 150-acre Gateway University Research Park, split into two campuses of 75 acres each. Founded and operated with UNC Greensboro.



## COLLEGES AND SCHOOLS

- » College of Arts and Sciences
- » College of Engineering
- » School of Agriculture and Environmental Sciences
- » School of Business and Economics
- » School of Education
- » School of Nursing
- » School of Technology
- » Joint School of Nanoscience and Nanoengineering (*founded and operated with UNC Greensboro at the Gateway University Research Park south campus*)