A UNIVERSITY ON THE RISE

Jay Golden, Vice Chancellor for Research, Economic Development and Engagement

Chancellor Cecil P. Staton’s vision is that East Carolina University will be America’s next great national university. As the region witnesses unprecedented growth, ECU has a unique opportunity to capture this excitement through new research, economic development and engagement with communities across the region as we work together to build rural prosperity. In fact, we have committed to double our research awards and expenditures over the next five years. To spur this growth, we are making significant investments in people, infrastructure and pan-university research collaborations.

Our faculty are leading the development of eight new research clusters that build on strengths in big data and analytics, STEAM (science, technology, engineering, arts and math) education, health behavior, energy and natural resources, biomedical sciences and engineering, precision health, coastal and marine sciences and human health and disease. Additionally, ECU is increasing its private sector and Department of Defense partnerships for use-inspired research and workforce development.

Take a look at the research conducted over the past year as part of this mission. Our ambitious vision for ECU, coupled with the dedication of our faculty, staff and students, means that the university is well positioned to meet the challenges vital to our state, our nation and our world.

A MESSAGE FROM CHANCELLOR CECIL P. STATON

For 111 years, ECU has been North Carolina’s rural and coastal university. The university is committed to raising its research profile and, as part of that mission, ECU is deploying its intellectual capabilities, community partnerships, network of alumni and extensive research and development facilities to focus on conducting research that will support healthy, educated, ready-to-work and prosperous communities. Thank you for taking the time to learn about our research initiatives as ECU molds itself into a national model of how a major research university can lead regional transformation.
ECU’s health innovations make an impact

East Carolina University’s first 111 years have been filled with research breakthroughs. As one of the first eastern North Carolina colleges dedicated to educating rural residents, ECU has had its share of impacts on education, health and economic development in the region. While the university began as a teachers training school, today it has evolved into a thriving institution whose medical advances have positively affected the lives of thousands of patients throughout North Carolina’s 100 counties.

In 1974, the North Carolina General Assembly established ECU’s medical school, now known as the Brody School of Medicine. Since the school’s first 28-member graduating class in 1977, the school has produced researchers and techniques that have played a role in defining national health care. ECU became a leader in weight-loss surgery after patenting the “Greenville Bypass” gastric bypass technique. University surgeons have performed the operation for over 30 years, helping patients live longer, healthier lives in the process. The university is also a pioneer in minimally-invasive robotic surgery and is home to a state-of-the-art integrated cardiovascular disease center. Nearly 20 years ago, the Brody School of Medicine performed the first robotic heart valve surgery in North America. Today, ECU remains a leader in the field, as surgeons here have performed more operations on the heart’s mitral valve than any other university in the world.

While ECU’s past is bright, it is our future that we are really excited to share. Researchers in the health sciences field at ECU are leading the way in exercise therapy, treatment of chronic diseases, dental medicine and health literacy efforts that will not only affect eastern North Carolinians, but patients across the world. Today, the Brody School of Medicine’s health sciences efforts are buoyed by the university’s School of Dental Medicine, College of Allied Health Sciences and the College of Nursing. ECU is determined to become the next great national university, and it will achieve this goal through its research initiatives and successes in the health sciences field.
EXERCISE WITH A PURPOSE
Damon Swift, Assistant Professor, College of Health and Human Performance

An estimated 1 in 3 North Carolinians are believed to have prediabetes, but ECU’s Damon Swift, assistant professor of kinesiology, is hoping to change that number with his research in the university’s Exercise Intervention Lab. Swift is leading a three-year, NIH-funded research project that tracks how exercise intensity affects African Americans who are at risk for type 2 diabetes. His aim is to increase awareness of the role exercise and fitness play in the prevention of diabetes.

As part of Swift’s research, participants have their vital signs tracked second-by-second on a treadmill, measuring the vigoroussness of their exercise program. Their mitochondrial function is also monitored, as Swift believes it plays a role in insulin sensitivity. Swift says that the high-energy level associated with vigorous exercise may improve insulin sensitivity more effectively than moderate exercise. His research could lead to a better understanding of the function exercise plays in diabetes prevention, while helping an at-risk population battle a chronic disease.

We want to see how we can reduce risk in a population that has a lot of risk to begin with. We do not have a lot of information on how we can get these people healthier. We want to start repairing health disparities in eastern North Carolina and we’re trying to make a difference in their lives. Every single person that walks out of this study leaves healthier than when they came in.

DAMON SWIFT
Assistant Professor

BATTLING THE INCURABLE
Daniel Wilkinson, ECU Postdoctoral Student
Mark Mannie, Professor, Brody School of Medicine

ECU postdoctoral student Daniel Wilkinson and his mentor, Microbiology and Immunology professor Mark Mannie, are hoping to change the way researchers study autoimmune diseases like multiple sclerosis. Wilkinson has introduced a process that produces large numbers of regulatory T cells — cells in the body that stop other pathogenic T cells from causing autoimmune disease. These regulatory T cells are typically unstable; however, Wilkinson’s process grows these cells in a way that keeps them stable and allows them to maintain their identity.

The lab became the first in the world to accomplish the feat and Wilkinson has a provisional patent on the process. The lab’s goal is to license the technology so a company can use the process to create a treatment for autoimmune diseases. The process may impact research on other autoimmune diseases, including rheumatoid arthritis, lupus and type 1 diabetes.

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**Hearing Research, Seeing Research**

ECU’s health sciences research also focuses on two important functions – hearing and speaking. Ning Zhou, assistant professor in the Department of Communication Sciences and Disorders, is an auditory researcher at ECU studying how the auditory nerve responds to electrical stimulation. Jamie Perry, chair and associate professor in the Department of Communication Sciences and Disorders, conducts speech research in her lab. Her research focuses on understanding cleft palate speech by using MRI and advanced computer image modeling to get a clear picture of cleft palate anatomy. Both researchers are taking work from the lab into the doctor’s office, potentially affecting the way patients are served at the clinical level.

**Educating Farm Families**

Migrant and seasonal farmworkers in North Carolina face a number of health challenges, particularly when it comes to nutrition and health information. A program led by Health Education and Promotion assistant professor Joseph Lee and Joyner Library teaching assistant professor Leah Cordova aims to improve health literacy in migrant and seasonal farmworker families. The pair partnered with community organization Student Action with Farmworkers to provide students with iPads, data access and reliable health information to promote healthier lifestyles for students and their families. The researchers believe their project can provide infrastructure for other programs, with the goal of reducing chronic disease and promoting preventative measures.

**Integrating Oral Health Care**

Associate Dean for Research Sharon Gordon and ECU’s School of Dental Medicine are showing dentists how oral health integrates with overall health. ECU’s SoDM is conducting two clinical trials to study interventions for oral mucositis – a debilitating complication from cancer treatment that results in pain, the inability to eat and a higher infection risk. One study tests a mouth rinse that helps promote cell regeneration to reduce the duration of OM, while another uses an injection to minimize the damage from radiation treatment. The studies are one-of-a-kind at ECU, testing new applications to clinical care.

**Telemedicine**

ECU is a leader in telemedicine, offering telehealth services since 1992. The program provides rural residents access to health care that would otherwise be unavailable, including access to primary care, chronic disease care, psychiatric consultation and education programs. The Healthier Lives at School and Beyond program offers services to elementary schools, partnering with local medical providers to supply acute medical care. ECU delivers behavioral and nutrition counseling to at-need students.

**Education Centers**

The Eastern Area Health Education Center in Greenville is one of nine centers in North Carolina linked to university health science centers, community hospitals and health agencies. The center is affiliated with ECU’s schools of medicine, nursing, allied health and dental medicine. The center provides support for 278 medical practices in eastern North Carolina, while providing over 300 professional development programs and awarding over 70,000 hours of continuing education credit for health care professionals in a 23-county service area.

**Dental Clinics**

The School of Dental Medicine has reinforced its commitment to serve the community through its eight service learning centers. The centers, located in rural counties throughout North Carolina, are designed around a medical model that takes dental students out of the classroom and into areas of high need. Dental students learn about the region’s poverty and social determinants of health, providing not only dental services, but often serving as the first line of defense against chronic illness and disease.
Invasive species are nothing new to North America. Since the beginning of maritime travel, those that braved the high seas have brought with them non-native plants and animals that have affected the biological and ecological outcome of native species. In the United States, invasive species cost the country an estimated $120 billion in damages every year, ranging from the zebra mussels in our lakes to the nutria that roam our marshlands.

At ECU, April Blakeslee, assistant professor of biology, focuses her research efforts on invasive marine species. Her work is now featured at the North Carolina Estuarium in an interactive exhibit that was a collaborative effort with estuarium staff and a graduate student in ECU’s School of Art and Design. The exhibit focuses on the importance of biological invasions in eastern North Carolina. It also features on-going research in Blakeslee’s lab of an invasive parasitic barnacle, Loxothylacus panopaei, which was native to the Gulf of Mexico but is now found throughout the east coast, including as far north as the Long Island Sound.

This “body-snatching” barnacle is dangerous because it takes over the internal physiology of its host and castrates it, leaving the crab unable to reproduce. Infected crabs are often termed “zombie crabs” because they continue to function but are reproductively dead. Blakeslee believes that the parasite could have a dramatic impact on the crab populations and also have community-wide implications. The crabs serve as an essential food source for numerous fish, birds and invertebrates.

The biological invasion exhibit also includes information on the lionfish and hydrilla — two other invasive species that make their home along the east coast. Blakeslee said she hopes the exhibit and her research will help visitors come away with a better understanding of invasive species, their effects on the environment and what people can do to aid marine management and conservation efforts in preventing the spread of other invasive species.

Blakeslee is continuing her invasive species research — studying their effect on biodiversity, population genetics, parasite ecology and biogeography — with the hopes of protecting and preserving marine health and habitat for those that enjoy our coastlines.
Jennifer McKinnon, Associate Professor, Thomas Harriot College of Arts and Sciences

Beyond the shallow waters of our coastlines lie stories waiting to be told. Jennifer McKinnon, associate professor of history, is shedding light on those stories with help from the nonprofit organization Task Force Dagger. McKinnon and Task Force Dagger—which specializes in supporting U.S. Special Operations Command Service members and their families—have teamed up to explore and research underwater World War II archaeological sites in the western Pacific Ocean.

McKinnon’s research led to the creation of the WWII Maritime Heritage Trail: Battle of Saipan which identifies and documents selected submerged remains of amphibious vehicles involved in the battle, including tanks, aircraft and shipwrecks. McKinnon’s partnership with Task Force Dagger continues to provide opportunities for underwater archaeological research and wounded veteran recreational therapy, uncovering history that was once lost under the murky depths of the ocean.

ECU researchers Michael O’Driscoll and Alex Manda are attempting to answer pressing questions that solve water-management problems. O’Driscoll’s research focuses on groundwater exchange—the transfer of water from the atmosphere, to the ground and back to the atmosphere. Understanding how groundwater affects the hydrology, chemistry and ecology of lake, river and wetland systems helps govern water resource management and policy. Manda’s research dives into how population and environmental change affect the availability of water while attempting to understand how these factors affect water quality. As water sources continue to become scarce, O’Driscoll and Manda’s research may provide insight into understanding the water we use.

Randall Etheridge’s lab at ECU is focused on enhancing the management and design of human-altered systems to lessen their impact on downstream ecosystems. His research attempts to develop sustainable solutions to water quality and quantity challenges faced by coastal communities. To reach these goals, Etheridge uses technology in the field that monitors nutrient concentration and water flow. He hopes to figure out what conditions promote the export of nutrients to North Carolina’s Lake Mattamuskeet, while also understanding the cause of reduced water flow in the canals that connect the lake to the Pamlico Sound. Etheridge’s work could influence management policies in the state and other regions.

The University of North Carolina Coastal Studies Institute is leading the way in coastal and marine research in North Carolina. ECU serves as the administrative campus of the university system institute that includes additional faculty and researchers from Elizabeth City State University, UNC-Chapel Hill, UNC-Wilmington and N.C. State University. Researchers at CSI study coastal development and natural resources along North Carolina’s coast while offering outreach and communication opportunities with community members and stakeholders. Initiatives underway at the institute include coastal engineering and renewable ocean energy research, coastal processes research, maritime heritage research, estuarine ecology and human health research, and public policy and coastal sustainability research.
Sir Isaac Newton’s Third Law of Motion states that “for every action in nature there is an equal and opposite reaction.” For much of history, researchers have conducted laser tests that push particles, spending centuries studying light’s ability to move objects forward. However, Yong-Qing Li, a physics professor at ECU, is conducting tests that border on the realm of science fiction. Li and his lab have successfully pulled — not pushed — a particle over 10 meters, crushing his previous testing-record of one meter in earlier experiments. The test simulates a tractor beam where particles are pulled toward a source instead of away from it, opening up new theoretical possibilities.

Li’s tests rely on photophoresis, a phenomenon in which small particles suspended in a gas move when illuminated by an intense light beam. Light is typically used to move particles forward, as it strikes other particles to push them. Li’s tests, on the other hand, reel in objects, moving particles against the laser beam. Li’s tests were conducted with particles encased in glass tubes with lower atmospheric pressure than that found on Earth. The particles were then heated up with a laser, causing them to absorb energy and collide with molecules to change their momentum. A stronger laser could possibly pull particles at normal atmospheric pressure. The experiment opens up new uses, including pulling objects over long distances or lifting particles from space.

While the future applications of Li’s work are still being realized, it is possible that the ground work started at ECU could play a big role in moving objects — both on our planet and beyond.
An innovative collaboration between ECU’s College of Engineering and Technology and the College of Nursing may lead to a new way to identify dementia in senior citizens. The technology, led by a team effort including Sunghan Kim, Chris Mizelle, Sonya Hardin and Erik Everhart, provides a faster and non-invasive way to detect dementia by pinpointing whether a patient has mild cognitive impairment. Mild cognitive impairment can lead to Alzheimer’s Disease and dementia. The identification platform, which uses a skull cap fitted with 16 electrodes, detects brainwave signals that allow researchers to administer a visual test to see how fast a patient reacts to familiar faces. A slower reaction time may indicate symptoms of MCI. The team believes this platform will give doctors the ability to begin treating patients diagnosed with dementia quicker than previous testing methods. With 1 in 10 people over the age of 65 suffering from some form of dementia, the testing platform will have major implications on how the disease is identified in the future.

### DIAGNOSING DEMENTIA

Sunghan Kim, Assistant Professor, College of Engineering and Technology
Chris Mizelle, Assistant Professor, College of Health and Human Performance
Sonya Hardin, Professor, College of Nursing
Erik Everhart, Professor, Thomas Harriot College of Arts and Sciences

### THE POWER OF CONCRETE

A pair of ECU professors in the Department of Construction Management are conducting research that could impact concrete’s role in infrastructure, including how it is produced. George Wang’s research focuses on recycled concrete – which accounts for up to 75 percent of the debris from construction sites – and its role as a replacement for natural concrete aggregate. Amin Alkhnoukh’s research also examines concrete durability, looking at the effects of nano- and micro-particle additives on the durability of concrete exposed to sulfates, chlorides and other potential chemical and environmental attacks. These researchers’ efforts to improve concrete means more efficient use of resources, providing improved function over the lifespan of construction projects.

### EFFICIENT VACATION GETAWAY

North Carolina’s 20 coastal counties accounted for 6.8 percent of the state’s total gross domestic product in 2013, pulling in $32 billion. When visitors come to the region, they often stay in vacation rental homes. ECU’s Tarek Abdel-Salam, associate dean for research in the College of Engineering and Technology, studied the sustainability of those homes thanks to funding from the EPA. Abdel-Salam examined the energy inefficiencies of these traditionally high-energy dwellings. His efforts found that simple retrofit choices can make an impact on energy consumption, including use of efficient lamps, tank-less water heaters and occupancy sensors. His findings allow vacation home owners to conserve electricity without breaking the bank, providing needed environmental guidelines for a thriving industry.

### EXPANDING INTO PHARMACEUTICALS

The efforts of a collaboration between ECU and Pitt Community College came to fruition in early 2018 as the pair launched the North Carolina Pharmaceutical Services Network to train workers entering the nation’s pharmaceutical industry. Created thanks to a $1.75 million grant, ECU’s Department of Chemistry is partnering with regional pharmaceutical leaders – including Patheon and Mayne Pharma – to expand its laboratory operations footprint, while quadrupling the number of students enrolled in its pharmaceutical skills training courses. Courses at ECU focus on testing and documentation skills for working in a regulated laboratory. Workers will now have more opportunities to become a part of the state’s pharmaceutical workforce, opening new doors with top-notch training.
The arts have always been a big part of ECU’s history. The College of Fine Arts and Communication hosts schools of art and design, theatre and dance, communication and music, while featuring the state’s largest studio art program. One way ECU is using its expertise in the arts to impact surrounding communities is in its support of the ECU GlasStation. Located in a former service station in historic downtown Farmville – just 15 miles away from the university’s west campus – the building was repurposed into a glassblowing studio and education center.

The university offers academic classes and conducts community outreach programs through the GlasStation, including courses that teach participants how to create candy dishes, glass garden balls and glass paperweights. The GlasStation allowed ECU to introduce a new hand-blown glass curriculum, enrolling five students in its first class last year. The program is led by Michael Tracy, a glass and graphite artist from Virginia Beach. Students enrolled in Tracy’s courses work with electric furnaces and heat glass over 2,000 degrees, learning to shape glass with different levels of heat, movement and pressure.

Additionally, ECU received a $20,000 grant from the National Endowment for the Arts to research the economic and cultural impact of the studio. The award will fund research by anthropology and economic graduate students over a two-year period. Students will focus on the GlasStation’s revitalization impact on Farmville’s business district. Researchers will conduct surveys, interviews and observations to collect data from Farmville community members. An analysis of how property is used, rented and sold in the historic district will also be conducted. By measuring the impact art projects have on communities, ECU hopes to share the positive outcomes the arts can have on a region by blowing glass instead of smoke.
ART MEETS CHEMISTRY

ECU Masters of Fine Arts in Ceramics candidate Rachel Clark shared her new ceramics application process in the December 2017 issue of Ceramics Monthly. Clark’s process—a take on oxide fusion—does not require the use of a kiln, allows for printing onto mixed media surfaces and keeps production costs low compared to traditional printing methods. Oxide fusion involves applying an oxide to the surface of a fired ceramic and using a laser etcher to fusion print. During the process, the etcher vaporizes material onto the print surface, inlaying the metal to the ceramic surface before fusing to the ceramic material. The process allows for rapid cooling and impressive colors.

INITIATING NEW MUSIC

The creation of new music involves ideas, input and effort from lots of people—performers, composers and commissioners. The N.C. NewMusic Initiative is making all the elements of this process a part of music students’ curriculum in a commissioning program unique to ECU. In addition to creating the NewMusic Initiative’s annual year-long concert series, founding director Edward Jacobs has created a commissioning model for music programs across the country. The NewMusic Initiative’s mission to build a diverse audience through concerts and workshops featuring extraordinary guest artists has now grown to include a model for teaching students to play a pivotal role in creating the future of music.

OUT OF THE WATER

Art is not just confined to a studio or a canvas. Often, it can be seen in the tools and products we use on a day-to-day basis. A group of ECU students learned the art of paddleboard making, putting an artistic twist on a popular means of transportation on the open water. The course, led by former Outer Banks kayak guide Judson Snapp, brought a diverse group of students together to work on the project. The course was designed to combine a materials class with problem-solving skills and aesthetic design. Students were tasked with combining form and function, integrating their artistic skill into professional production.

METAL DESIGN

Mi-Sook Hur, a professor in ECU’s School of Art and Design, showcased her metal designs at the Facèré Jewelry Art Gallery in Seattle as part of the 2017 “Signs of Life” exhibit. The exhibit displayed a combined literary journal and jewelry art exhibit that featured the work of nine artists and nine writers who were paired to celebrate the jewelry and literary arts. ECU’s metal design program is nationally ranked and Hur has become a leader in rediscovering and utilizing Limoges-style enamelwork. The difficult process uses fine bits of glass that are fused on to a metal body, requiring multiple firings to achieve an artist’s desired effect.

DANCE

Theatre and Dance assistant professor John Dixon shared his artistic talents with James Madison University, setting his dance “Stuff and Nonsense” on five dancers of the Virginia Repertory Dance Company. The dance pokes fun at contemporary ideas of beauty while amplifying the gritty underside of human vulnerability. Dixon’s choreography was performed alongside nationally and internationally known guest artists. The Virginia Repertory Dance Company is a pre-professional performing company made up of selected junior and senior dance majors. The company puts on one main-stage concert before touring Virginia in the spring.

COMMISSIONED AND EXHIBITED WORKS

ECU junior Christopher Short was tasked with a special mission for the 2017 installation of Chancellor Cecil P. Staton. Short was commissioned to create a new music piece for the ceremony to be performed by the ECU Chamber Singers. A competition was held between ECU student composers that included works combining instruments, vocals and electronic components. Short’s piece was an adaption of a 1946 speech from late British poet laureate John Masefield. Short said that the commission provided an academic exercise that tested his talent, as it was the most-advanced choral composition he had ever created.

MUSIC

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VETERAN IMPACT

Anna Froula, Associate Professor, Thomas Harriot College of Arts and Sciences
Jennifer McKinnon, Associate Professor, Thomas Harriot College of Arts and Sciences
Anne Ticknor, Associate Professor, College of Education

The transition from military life to college life can be a difficult one for veterans returning to North Carolina. However, the adjustment to being a civilian can open up new educational opportunities for veterans. ECU is in the process of designing programs, both inside and outside of the classroom, to help make that switch easier. Anna Froula, associate professor of film studies in the department of English, has designed a two-week program that brings together war scholars and student veterans at ECU. The Soldier to Scholar bridge program was created to help ECU veterans acclimate to the university during their first semester on campus. Veterans and scholars discussed the experience of war through the study of humanities texts, including novels and poetry from World War I, films from World War II and the Iraq War, and the soundtrack from “Hamilton: The Musical.” The process introduces veterans to potential course material and allows them to dive into critical thinking activities.

Froula also teamed up with Anne Ticknor, associate professor of literacy studies in the College of Education, and Jennifer McKinnon, associate professor of history, to design a program that focuses on Saipanese veterans of contemporary wars. The trio received a fund from the National Endowment for the Humanities to work with veterans, members of the surviving Saipanese civilian population from World War II and the families of military service personnel to learn more about the war’s human impact. The faculty members traveled to Saipan last summer and led discussions with local veterans and community members. The project aims to understand war as a shared human experience and identify ways war shapes history and culture. Much like Froula’s Soldier to Scholar bridge program, the group used films, memoirs, poetry, paintings and graphic novels to explore war from different perspectives.

With two major military bases within a two-hour drive of campus, ECU remains committed to serving North Carolina’s military population.
Kevin White, Assistant Professor, College of Health and Human Performance

An ECU researcher is using data to help an at-risk group. Kevin White, assistant professor in the School of Social Work, is analyzing data collected through the national Quality Improvement Center for Adoption and Guardianship Support and Preservation to improve outcomes for children who leave foster care through adoption or guardianship. Children in the foster care system often face developmental issues—including serious physical and mental health challenges. White’s work intends to support foster parents so that more children can be placed in stable, permanent homes. Through data analysis, White is building statistical models that compare the outcomes of children in stable homes against the outcomes of children that bounce from home to home after adoption or guardianship. White’s work also evaluates evidence-based interventions, including counseling, that can help parents manage difficult childhood behaviors. With over 2,200 children leaving foster care to adoption or guardianship in North Carolina during the 2015–2016 fiscal year alone, White’s research has the potential to impact thousands of children in the state by helping families provide more stable, long-term homes.

ENVIRONMENTAL ECONOMICS

ECU assistant professor Greg Howard is using the power of economics to shape best farming practices in eastern North Carolina. Howard’s research focuses on determining what monetary incentives are useful in changing the way farmers handle nutrient runoff from fertilizer and waste byproducts. These pollutants have a negative impact on water systems in the region. Howard is charged with finding a balance between economic incentives that are both cost effective and provide benefits to the environment. The incentives Howard devises could change farming habits in an industry that contributes $84 billion to North Carolina’s economy.

COMMUNITY MANAGEMENT

Animal feeding operations are big business in North Carolina. The state recognizes more than 6,500 animal feeding operations. ECU’s Jacob Hochard, assistant professor of economics, is leading a three-year, EPA-funded research project that investigates the community-level management of pollution-related health risks associated with concentrated animal feeding operations. Hochard’s objective is to identify and measure the effect of swine production on human health. The study’s recommendations will inform the roles of public health infrastructure and other ecological buffers to human health risks, especially for communities living downstream of feeding operations.

PREVENTING TRAGEDIES

On average, 24 people per minute are the victim of intimate partner violence—a total of more than 12 million women and men over the course of a single year. Heidi Bonner, an assistant professor in the department of criminal justice, is trying to change that number. Bonner is currently collecting data from the Lethality Assessment Program being conducted in Pitt County. The county is one of a handful in the nation where the implementation of this program is being evaluated to determine if it prevents homicides committed by those in intimate relationships. Bonner’s evaluation could determine the programs’ effectiveness, possibly saving lives in the future.

PUBLISHED BOOKS

ECU authors published more than 20 books in 2017 including:

MICHAEL VERBER
Tell Me Something I Don’t Know

LIZA WIELAND
Land of Enchantment

ALETHIA H. COOK
Terrorist Organizations and Weapons of Mass Destruction
Since the beginning of its medical school in 1974, ECU has been at the forefront of medical innovation. That tradition continues with ECU’s partnership with RFPi, a leader in real-time, non-invasive medical imaging care. T. Bruce Ferguson and Cheng Chen, both with the university’s College of Engineering and Technology, have teamed up with investor Phil Hodges and RFPi CEO Jeffrey Basham to develop a new invention that helps surgeons observe blood flow during surgical procedures. Currently, surgeons are restricted by visible light and are not able to see the blood supply traveling through vessels in real time. However, ECU’s researchers and RFPi have developed a non-invasive, minimal-risk imaging device that allows surgeons to visualize blood flow.

RFPi’s technology — dubbed iCertainty™ — generates images from real-time data capture and instant analysis. The technology’s use is relevant for many medical disciplines, especially where analysis of the physiology and pathophysiology of flow and perfusion might impact the technical decisions of the clinician and outcomes of a procedure. The device is expected to provide patient benefits by improving clinical outcomes; physician benefits by enhancing the delivery of patient care; and hospital and third-party benefits by reducing the overall cost of care. Ferguson believes the technology will help surgeons make fewer guesses during procedures, leading to better choices with the data iCertainty™ provides.

The project has been seen as a big success at ECU as it brings together university researchers and community business partners to help combat health disparities in the region. So far, iCertainty™ has been used in animal studies, has received two patents and received the 2016 Tech Connect Technology of the Year award. RFPi is hopeful that it can bring the device to market. So far it has been successfully deployed in pre-clinical and clinical studies over the past three years and is moving toward full commercialization. iCertainty™ has received angel funding from Hodges, the founder of Metrics Inc. and one of the largest shareholders of Mayne Pharma. With a proof of clinical concept, a need for better medical imaging technology and a dedicated group of researchers, RFPi’s iCertainty™ technology is poised to help doctors and patients throughout the world.
INNOVATION AND ENTREPRENEURSHIP

SURGICAL BREAKTHROUGH
Carlos Anciano, Assistant Professor, Brody School of Medicine
Ranjeet Agarwala, Assistant Professor, College of Engineering and Technology
Preston Sparks, ECU Cardiothoracic Surgery Fellow

The innovation of 3D printing has led to new ways to solve old problems. ECU's Carlos Anciano and Ranjeet Agarwala used the technology to help a patient suffering from chronic pain by building a 3D printout of the patient's rib cage. Anciano's patient was told by doctors that they were unable to do anything for his chronic pain after undergoing corrective surgery for scoliosis. The patient was referred to Anciano, who went to work with Agarwala and Preston Sparks, a cardiothoracic surgery fellow, to find an answer.

After consulting the patient and putting their heads together, the trio printed out a life-size 3D model of the patient's rib cage. Anciano used the model as a topographical map to rebuild the patient's chest wall with titanium mesh. The surgery took nine hours to complete, but thanks to a novel solution provided by ECU faculty members, one patient has a brighter outlook on life with a chance to manage previously unmanageable pain.

PLANTING THE SEED

CANCER PATENT SUCCESS
Many in the medical field hope to find success; however, most understand that it may not be achieved while they are still completing their studies. ECU doctoral student Daniel Ladin refused to accept that approach, earning a U.S. patent while still a student. The pharmacology and toxicology doctoral student is part of a team that synthesized a molecule that has proved effective at killing cancer cells. The molecule attacks cancer cells without harming surrounding tissue. Ladin believes the product can be used as a topical agent to treat skin cancer, providing a less invasive and cheaper treatment option.

CANCER DIAGNOSTIC TOOL
A new tool developed by ECU researchers may improve the field of cancer diagnostics. Qun Lu and Yan-Hua Chen have developed a new, non-invasive clinical detection tool for the screening of multiple cancer types. The pair have found that the protein delta-catenin can distinguish between benign prostate hyperplasia and prostate cancer. Prostate cancer is one of the more common cancer types found in men, affecting 11 percent of adult males. Lu and Chen's test tool will be able to reduce the number of false-positive test results and reduce the need for invasive biopsies, leading to better diagnosis options for patients.
WORKFORCE DEVELOPMENT AND EDUCATION

SEN SATIONAL SIMULATIONS

Office of Simulation and Safety Education

Getting students ready for the real world can be a difficult task. Research papers, chapter readings and group discussions do wonders to introduce students to the critical-thinking side of learning, but taking those tools and putting them into practice is often challenging for new hires. ECU is making attempts to bridge this gap through its health care simulation programs conducted by the Office of Simulation and Safety Education. Through the Interprofessional Clinical Simulation Program at the Brody School of Medicine, students have the opportunity to put what they have learned to the test in a controlled environment, using a variety of simulation methods including interactive computer programs, virtual reality simulators, procedural task simulators, life-sized patient simulators and simulated patients.

Two innovative, cutting-edge components of the Interprofessional Clinical Simulation Program are the Mobile Healthcare Simulation Unit and ECU’s Disaster Day.  The Brody School of Medicine unveiled its Mobile Healthcare Simulation Unit in 2017. This vehicle is designed to take health care training and continuing education opportunities on the road to medical professionals throughout eastern North Carolina. As one of just nine units in the country, the program allows medical professionals to practice in a realistically-simulated hospital resuscitation bay and ambulance, providing a link between the classroom and real-life experiences.

This past year, ECU hosted its third annual Disaster Day. The event simulates a mass-casualty situation that prepares students for real-life emergencies. First- and second-year medical students responded to a mock explosion at a 5K race, practicing their triage techniques and resource allocation skills in the field. Students were tasked with assessing multiple patients while determining what life-saving procedures are best suited for each injury. While completely different in their approaches to teaching students and medical professionals, these two simulation events reinforce ECU’s commitment toward student preparedness and life-long learning through a variety of hands-on and virtual simulations.

I like the simulation of the mass casualty (event) because it really puts me out of my element. Everything else so far has been pretty controlled in terms of the setting so this is the first time where the point is to surprise you, (to) take you out of your comfort zone and see you function in that setting. It’s good to figure that out while it’s still low stakes.

AMBER GAUTAM
Second-year medical student
Elizabeth Baker Hodge, Assistant Dean for Innovations and Strategic Initiatives, Professor, College of Education

As student technology changes, so must the technology we use in the classroom. At ECU, researchers and labs are focused on integrating new technology while providing an immersive learning experience for education students and community members. Professor Elizabeth Hodge, assistant dean for innovations and strategic initiatives, is one faculty leader guiding ECU's journey into immersive education. Hodge believes that online learning environments must be technology rich and organized by interrelated learning themes, providing interactive and complimentary activities to learning that enable individuals to address their interests.

With a focus on virtual environments, Hodge has led projects that use Chroma Key, a special effect technology that allows educators to appear on-screen with materials to help walk students through tutorials and demonstrations; Crystal Island, an educational computer game and curriculum that focuses on teaching middle school students literacy skills; and tablet computing in education. Hodge's research shows that the benefits of learning within a virtual environment outweigh those provided by traditional methods, as virtual worlds promote greater in-depth knowledge of content.

ECU's Lab School officially launched in 2017, welcoming its first class of 75 families last fall. The school aims to build upon students' strengths and provide real-world learning experience with research-based instruction. The Lab School not only tends to students' academic needs, but provides students with additional resources to enhance their physical, social and emotional development. These services include counseling, medical screenings, parent education and home literacy support. The unique environment provided to students at the Lab School was created to cultivate and support a love of lifelong learning, offering students in Greenville new ways to learn.

The Department of Computer Science in ECU's College of Engineering and Technology will conduct research into new ways to teach the discipline thanks to a $2 million grant from the National Science Foundation. The five-year grant — the largest ever awarded to the department — allows it to investigate curricular innovations, faculty development and diversity in student learning in computer science. The results are expected to be disseminated to other universities to help shape the way departments teach computer science. With more than 18,000 open computing jobs in North Carolina alone, the department's efforts could go a long way in preparing students for the workforce.

America's population is aging. The number of Americans aged 65 or older will more than double by 2060, rising from 46 million to 98 million over the next 40 years. ECU's College of Nursing is preparing for this trend with its Geriatrics Workforce Enhancement Program. The program allows nurse practitioners, physician assistants and medical students to treat patients together at partner facilities. The focus of the program is on transforming training environments into fully integrated geriatrics and primary care systems. By providing dementia and related disorder education, establishing geriatric screening offices and allowing nurses, physicians and medical students to assist patients together, ECU is improving health care for older adults and maximizing patient and family engagement.
Researchers in the Maritime Studies Program are partnering with the Department of Defense to perform underwater archaeological research on a downed World War II plane off the coast of Italy.

College of Education Department Chair Guili Zhang’s best-selling book and award-winning research compares education in the U.S. and China, aiming to reshape family education and advance mathematics education.

ECU researchers are conducting studies in Puerto Rico and the U.S. Virgin Islands about social relations, activities and other behaviors that contribute to the recovery from natural disasters, including Hurricane Irma and Hurricane Maria.

The ECU College of Nursing has teamed up with a nursing school in Nicaragua to share teaching methods.

Biology professor Rebecca Asch conducts research on the effects of climate change on commercially important fish in the Pacific Ocean.

ECU’s Regina DeWitt traveled to Antarctica to achieve a greater understanding of the changes in the Antarctic Ice Sheet and its role in Quaternary sea-level changes across the globe.

Nursing in Nicaragua

Researchers in the Maritime Studies Program are partnering with the Department of Defense to perform underwater archaeological research on a downed World War II plane off the coast of Italy.
East Carolina Research and Innovation Campus

East Carolina University is making exciting progress in the development of its Research and Innovation Campus, announcing plans to begin rehabilitating a 10-block area encompassing more than 30 acres in Greenville’s historic warehouse district. The East Carolina Research and Innovation Campus — designated a millennial campus due to its goal of enhancing ECU research, teaching and economic development in service to the region and state — is comprised of four strategically chosen tracts around the city. In the warehouse district, two new projects are already underway, including the much anticipated Life Sciences and Biotechnology Building which will provide a home for transformative activity through the cooperative work of the university and its partners.

The campus is expected to house new innovation centers and serve as a much-needed convergence space for innovators, new businesses, existing enterprises and contract manufacturing. Simultaneously, collaborators in industry, military, health care, education, government and local communities will find unique opportunities to gather. The campus will include a planned Biobased Energy and Products Innovation Center, which will become the epicenter for packaging and biobased-product innovations in the region. The center will serve as a workforce development site for regional, national and global manufacturers in a range of industrial sectors. It will also support two of the state’s largest industries — hog and poultry farming — through efforts to create a regional biogas industry from animal wastes. The millennial campus will also see the creation of a new Consortium for Advanced Manufacturing and Complex Systems Innovation. This will be a core element of the campus and will conduct applied research and pursue innovative challenges to lead state-of-the-art development in advanced manufacturing science, technology and practice.

The millennial campus offers ECU common ground and uncommon opportunity to grow its presence in research, innovation and commercialization, opening new doors for students, faculty and researchers.
EXPANDING RESEARCH PROGRAM ASSISTS IDEA DEVELOPERS

ECU understands that the future of its rural regions depends on business opportunities. Without these opportunities, students have nowhere to share and practice the skills they have learned while on campus. ECU is committed to revitalizing its local communities through micro-businesses, with a goal of creating 30 new micro-businesses per year led by ECU students and alumni. ECU will also introduce the Horizon Living and Learning Community, which will offer a focus in money management, entrepreneurship and business planning. Combined with its relationship with the Small Business and Technology Development Center, ECU is not only teaching its students, but creating job opportunities that provide a boost to local economies.

In 2017, ECU launched its new pan-university research clusters as part of its Rural Prosperity Initiative. The clusters focus on eight research areas — big data and analytics, precision health, health behavior, energy and natural resources, STEAM education, health and chronic disease, marine and coastal systems, and biomedical sciences and engineering. The research clusters are intended to enlist faculty and researchers from across the university to work on common interest areas, offering greater opportunities for interdisciplinary collaborations. Innovation seldom originates from isolation, and ECU is devoted to expanding its research reach, offering students, faculty and community members a brighter future through research scholarship.

Giving innovators a place to test their ideas is a core mission of ECU’s I-Corps program. This hypothesis-driven program embraces ideation and innovation while mentoring teams to quickly reach go or no-go decisions on product development. Phase I of the program focuses on ideation and customer delivery. Phase II participants are coached on designing and validating a business model around their idea. Phase III becomes self-paced, yet allows continued access to I-Corps resources. I-Corps has successfully guided 30 project teams in the first year of this five-year NSF grant-funded program. After a successful start, I-Corps is continuing to recruit new teams to take advantage of this valuable resource.

SPACE FOR INNOVATION

Van and Jennifer Isley Innovation Building

Providing a space for collaboration and creation is important, no matter the academic discipline. ECU students will soon have a new arena to innovate and solve multidisciplinary challenges thanks to the university’s planned innovation hub. The hub, named the Van and Jennifer Isley Innovation Building, will provide a space where business, engineering, technology and art students can collaborate on product innovation and entrepreneurship. The building will cover 28,000 square feet, including a 5,000-square-foot space where up to 300 students can bring their interdisciplinary innovations to life. The hub will also be the home of the College of Business Miller School of Entrepreneurship and will feature a world-class fabrication and rapid-prototype workshop run by the College of Engineering and Technology. The hub is one of various planned ECU spaces being created to support and promote innovation, providing students with the latest technology and tools needed to become leaders in product design and creation.

ECU’S BRIGHT FUTURE IN RESEARCH

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As ECU looks ahead to the future of research scholarship on campus, the university has made a pledge to increase scholarship opportunities. ECU researchers have a chance to truly impact the rural communities they serve and the university is taking steps to ensure that they have the tools necessary to engage, interact and innovate.

BUILDING BUSINESSES

In 2017, ECU launched its new pan-university research clusters as part of its Rural Prosperity Initiative. The clusters focus on eight research areas — big data and analytics, precision health, health behavior, energy and natural resources, STEAM education, health and chronic disease, marine and coastal systems, and biomedical sciences and engineering. The research clusters are intended to enlist faculty and researchers from across the university to work on common interest areas, offering greater opportunities for interdisciplinary collaborations. Innovation seldom originates from isolation, and ECU is devoted to expanding its research reach, offering students, faculty and community members a brighter future through research scholarship.
ECU is in the top three in the University of North Carolina System in research expenditures in Health Sciences, Biological and Biomedical Sciences, Geological and Earth Sciences, Expenditures of Funding from Health and Human Services, Expenditures of Funding from Businesses and Life Sciences (combined).

2016 HERD SURVEY RESEARCH EXPENDITURES

<table>
<thead>
<tr>
<th>PROGRAM</th>
<th>2016 EXPENDITURES</th>
<th>UNC SYSTEM RANK</th>
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<tbody>
<tr>
<td>Health Sciences</td>
<td>$9.6M</td>
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<td>Clinical Trials</td>
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ECONOMIC DEVELOPMENT

- 87 INVENTION DISCLOSURES AND PRE-DISCLOSURES RECEIVED
- 8 STARTUPS FORMED
- 6 PATENTS ISSUED
- $3.1 MILLION IN TOTAL REVENUE RECEIVED
- 15 TOTAL PRODUCTS TO MARKET
- 12 NEW US PATENTS FILED
- 35 ACTIVE COMMUNITY ENGAGED RESEARCH PARTNERSHIPS
- $1.2 MILLION SPONSORED RESEARCH BY COMMUNITY ENGAGED FACULTY
- SOUTHEAST REGIONAL WINNER OF THE W.K. KELLOGG COMMUNITY ENGAGEMENT SCHOLARSHIP AWARD
- 22 COMMUNITY BASED UNDERGRADUATE INTERNSHIPS
- 11 RESEARCH PROJECTS INCLUDING: FACULTY, GRADUATE STUDENTS, EC SCHOLARS, AND COMMUNITY PARTNERS AS TEAM MEMBERS

Production Staff
Communications Specialist: Matthew Smith
Visual Arts Specialist: Paige Middleton

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