RESEARCH ADVANCES SAFETY OF UNMANNED AIRCRAFT

NC State has joined a coalition of leading research universities selected by the Federal Aviation Administration to study ways to safely integrate unmanned aircraft systems into the nation’s airspace.

The new Center of Excellence for Unmanned Aircraft Systems, led by Mississippi State University, will develop secure, reliable and robust data links to ensure connectivity between unmanned aircraft and other users of the National Airspace System, such as air traffic controllers and piloted aircraft. The center also will develop communication protocols and standards for evaluating the performance of links in nominal, contingency and emergency flight operation scenarios.

“NC State is proud to be a leader in this important research effort,” Chancellor Randy Woodson notes. “The collaboration and innovation that happen at NC State will bring critical advances to the rapidly evolving field of unmanned aircraft.”

NC State’s research will be centered in its NextGen Air Transportation program on Centennial Campus. NGAT was established in 2012 under the North Carolina Department of Transportation’s Division of Aviation. The program has approval from the state and the FAA to conduct research operations for purposes such as agricultural research, emergency response, and surveying and mapping. In just over two years, NGAT has made more than 300 flights and logged 100 flight hours at six locations. NGAT is developing the statewide infrastructure for research and operational integration of unmanned aircraft systems.

K9 TRAINING TECHNOLOGY MOVING TO MARKET

Police and military dogs may soon have a training tool they can really sink their teeth into. NC State and K2 Solutions Inc. have entered into an exclusive option agreement to commercialize a realistic bite sleeve that mimics a human arm.

The technology was developed and refined by teams of NC State students and professors in textile engineering and materials science. Originally funded by the U.S. Army Research Office and the University of North Carolina system, it was named best overall project at NC State’s Senior Design Day in 2014, then refined by another team in 2015.

K2 is a disabled-veteran-owned small business in Southern Pines that provides canine training, handler instruction and other consulting services to national security and defense clients.

STUDY EXAMINES GENETIC LINK TO CHEMICAL SENSITIVITY

NC State researchers are working with colleagues from across the United States to discover why genetic differences in humans affect the toxicity of some chemicals but not others. The project is the first large-scale, cell-based screening to test variations in environmental chemical sensitivity across a range of human populations and link them to genetic data. The data will improve risk assessment and shed light on the ways in which genes interact with certain chemicals.

Testing chemicals for potential human health hazards involves toxicity response, but we know that different people react differently to chemical exposure,” says Fred Wright, who has dual appointments in statistics and biological sciences at NC State and is a co-lead author of a paper describing the project. “We wanted to design an experiment that could quickly test a lot of different chemicals against large variety of populations, both to determine variability among responses and to see if toxicity responses could be linked to specific genes.”

Results reveal that, for some chemicals, the range of sensitivity among individuals is greater than previously thought. The NC State team, including statistician Alison continued
Motsinger-Reif and biostatistician Yi-Hui Zhou, was instrumental in discovering several genetic variations that correlated to chemical sensitivity.

OUTFITTING FIRST RESPONDERS

What pant and shirt combination should a well-dressed EMT or firefighter be wearing? That’s a challenge that NC State’s textiles experts are tackling.

They’re creating the next generation of uniforms for first responders — clothing that’s more comfortable, with better protection.

Researchers with T-PACC, the Textile Protection and Comfort Center, are designing and testing a new base ensemble of shirts and pants for emergency workers as part of a $718,000 grant project funded by the U.S. Department of Homeland Security.

“This base ensemble is what a firefighter would have on before grabbing a helmet and turnout coat on the way to a call,” says Marc Mathews, a T-PACC research associate. “We want to equip first responders with clothing that’s more flame resistant, repels water and protects against jagged debris at a scene. At the same time, the clothing has to be comfortable and appealing enough for a firefighter to wear while working a 24-hour shift.”

The T-PACC team will create and test prototypes using commercially available materials. A subcontractor, Protect the Force, will help manufacture 150 prototypes for field testing.

The project builds on T-PACC’s longstanding research. NC State researchers have pioneered many tests used to evaluate clothing for emergency workers, military personnel, high-performance athletes and others who use protective gear.

REBAR TO LEAD NC STATE RESEARCH INNOVATION EFFORTS

Alan Rebar, an internationally recognized expert in clinical laboratory medicine, will take the helm of NC State’s Office of Research, Innovation and Economic Development this fall.

Rebar comes to NC State from Purdue University, where he served as a professor of clinical pathology, headed the research office and oversaw Discovery Park, the university’s 40-acre research park.

Rebar is a diplomate of the American College of Veterinary Pathologists, a former member of the Council of the American College of Veterinary Pathologists, past president of the American Society for Veterinary Clinical Pathology, former editor of the journal *Veterinary Clinical Pathology* and current editor of the *Journal of the American Animal Hospital Association*.

He has authored or co-authored 120 refereed publications and eight textbooks, and he has made nearly 300 invited lectures at workshops and conferences in the United States and around the globe. He has also served as a scientific advisor to numerous federal agencies and companies.

In recognition of his achievements, Rebar received the Award of Merit from the American Animal Hospital Association in 1989 and its Gaines Cycle Fido Award for outstanding contributions to small animal medicine and surgery in 1994. He also received the 2001 Waltham Award for his work to improve the well-being of companion animals.

Rebar earned two doctorates — in veterinary medicine in 1973 and in veterinary pathology in 1975 — both from Purdue.

STUDY EXAMINES ENVIRONMENTAL IMPACTS ON HEALTH

Researchers from NC State’s planned Center for Human Health and the Environment have received a five-year, $6.5 million grant from the National Institute of Environmental Health Sciences to investigate the effects of environmental factors on humans.

Through interdisciplinary research and collaboration, the center seeks to construct a complete picture of how environmental stressors influence human-health outcomes.

The grant will advance research and support community outreach. The grant will make the center one of 22 across the nation dedicated to studying environmental-health impacts.

The center brings together 70 investigators from 13 departments and six colleges at NC State, as well as investigators from East Carolina University’s Brody School of Medicine, North Carolina Central University, the North Carolina...
But effective treatment of individual patients, especially for a progressive and recurring disease like cancer, requires a physician to make a series of decisions over time while taking the patient’s information into account. And as we get access to more patient data, like genetics, medical history and characteristics called biomarkers that might be associated with the patient’s response to a particular drug, it only makes sense to try and design clinical trials that can take those factors into account as well.

To address the problem, Davidian and colleagues are designing clinical trials that not only take many factors into account but also that can take place at each decision point in a course of treatment.

COYOTE IS NEW TOP DOG

It’s believed that wolves once roamed the southeastern United States before they were eliminated by overhunting and habitat loss. Now the region has a new top dog, the coyote, but because coyotes are native to western North America and only moved to North Carolina in the last few decades, little is known about how they affect the state’s environment — especially prey populations. To learn more about coyotes and their place in North Carolina’s ecosystem, NC State researchers have conducted a series of studies at Fort Bragg that shed some light on the habits of this predator.

The researchers found that coyotes range widely across the state’s landscape, with the annual space they cover averaging 33 square miles. Some individual coyotes dispersed up to 214 miles away from Fort Bragg before establishing new home ranges. The coyotes studied ate a variety of foods, including insects, fruits, mice, rabbits and white-tailed deer.

Most impressive was the apparent top-down influence coyotes had on deer populations.
NEW MODEL PREDICTS SIZE OF GULF ‘DEAD ZONE’

A computer model developed at NC State by environmental engineer Dan Obenour is one of four models being used by the National Oceanic and Atmospheric Administration to predict the size of the hypoxic dead zone in the Gulf of Mexico.

Hypoxia is caused by a combination of factors, but the two most significant variables are the nutrients that the Mississippi River dumps into the Gulf and the stratification of the waters in the Gulf.

Each year the Mississippi River delivers nutrients — largely stemming from agricultural runoff across the Mississippi River basin — that serve as fertilizer for aquatic plant life, resulting in algal blooms. As the algae decomposes or is eaten and excreted by animals, it creates enormous amounts of organic matter that sinks to the bottom of the Gulf.

This increase in organic matter presents a smorgasbord for the bacteria that devour it. But those bacteria use up oxygen. As they thrive on their newfound meal ticket, they consume more and more oxygen in the water. The resulting dead zone has so little oxygen that fish and shellfish — including economically important species, such as shrimp — can’t survive there.

GU JOINS TEAM TAPPED TO STOP DIABETES

An NC State faculty member is one of six scientific researchers tapped by the American Diabetes Association to join an ambitious effort to combat the pervasive disease. Pathway to Stop Diabetes will fund the work of more than 100 scientists in the coming decade.

A biomedical engineer, Zhen Gu will receive $1.625 million over five years to accelerate his research to develop an artificial closed-loop system that mimics pancreas activity and releases insulin in response to glucose level changes.

More than 30 million Americans suffer from diabetes, a long-term condition marked by high blood glucose levels. The American Diabetes Association estimates that one in three Americans will suffer from diabetes by 2050 if the current trend continues. The disease can lead to serious health complications, including eye and skin disorders, a type of nerve damage called diabetic neuropathy, high blood pressure and stroke.

Pathway to Stop Diabetes, now in its second year, is sponsored by Sanofi, Novo Nordisk, AstraZeneca, and the Eli Lilly and Company Foundation.

PROJECT PREPARES ACADEMIC LEADERS

As a number of top community college leaders across North Carolina prepare to retire, the John M. Belk Endowment has awarded NC State a grant to fund a professional development program for the next generation of leaders.

“Envisioning Excellence for Community College Leadership” is led by NC State in partnership with the Aspen Institute, an educational and policy studies organization, to integrate evidence-based best practices into the institute’s leadership training programs, which are primarily targeted toward department chairs, deans, administrators and doctoral students.

“Excellent leaders make an exceptional difference in student success,” notes Robert Templin, former president of Northern Virginia Community College, who joins the NC State faculty for this initiative through a joint appointment with the Aspen Institute. “Investing in community college leaders now will pay dividends for decades to come by strengthening North Carolina’s middle class and contributing to the state’s economic prosperity.”

Research shows that community colleges have the highest levels of student success have exceptionally talented leaders whose expertise enables them to inspire student, academic and organizational excellence. At the same time, North Carolina partners see pending retirements as both a challenge and an opportunity to align professional development programs with ambitious goals for student success.

CLEAN ENERGY CENTER HELPS N.C. ’FUEL WHAT MATTERS’

A public service center based at NC State is leading a federally funded campaign to clean up the state’s air — and citizens who lend a hand can win prizes for participating.

The North Carolina Clean Energy Technology Center, formerly the Solar Center, has launched “Fuel What Matters.” The campaign helps individuals and organizations make transportation choices that will reduce emissions in North Carolina. More than half of our state’s citizens live in counties that don’t meet national air quality standards, and transportation is the No. 1 source of air pollution in the state’s urban areas, explains Anne Tazewell, manager of the Transportation Program at the center.

“That’s why, to address this problem, the federal government provides Congestion Mitigation Air Quality funding to the North Carolina Department of Transportation, and the DOT in turn granted the funds to us,” Tazewell adds. “CMAQ funding is focused on transportation because if you can reduce emissions from that one source, you can make a major improvement in air quality.”

To help North Carolinians cut down on petroleum use, the Fuel What Matters website, at www.fuelwhatmatters.org, provides tools designed for individuals and others for transportation fleet managers. For individuals, the site offers information to help consumers purchase automobiles that run on alternative fuels, such as electricity, biodiesel, ethanol, natural gas and propane. It also provides a handy mapping and scheduling tool for planning trips via walking, biking or public transit.

For fleet managers, the site offers information on how to implement the use of alternative fuels across a fleet, first by conducting a fleet assessment and then by determining alternative fuel vehicles that are best for a business or organization.

To encourage North Carolinians to spread the word about clean transportation, the campaign has offered cash prizes to those who post about the campaign on social media. Include the hashtag #fuelwhatmatters in a post on Facebook, Twitter or Instagram to be entered in a random drawing for a $100 prize. Prize drawings will be held monthly through mid-October. You can also submit a Fuel What Matters video for a chance to win $500.

COPING SKILLS ARE DYNAMIC

A study led by NC State psychology researcher Shevaun Neupert finds that people are not consistent in how they prepare mentally to deal with arguments and other stressors, with each individual displaying a variety of coping...
behaviors. In addition, the study found that the coping strategies people use could affect them the following day.

The findings stem from a pilot study of older adults, which is the first to track the day-to-day coping behaviors people use in advance of stressful events.

“This finding tells us, for the first time, that these behaviors are dynamic,” says Neupert, who is lead author of a paper describing the study. “This highlights a whole new area for researching the psychology of daily health and well-being,” he adds.

“The more we understand what’s really going on, the better we’ll be able to help people deal effectively with the stressors that come up in their lives.”

SAVING DAIRY FARMERS TIME AND MONEY

Tucked away in the corner of a laboratory in Raleigh, five electrical engineers are engaged in an unlikely pursuit: finding a way to make the U.S. dairy industry more profitable.

The team is poised to launch a proof-of-concept project that they hope will demonstrate how a wireless tracking system can improve the health and productivity of dairy cows.

“Our goal is to help farmers survive and ensure their operations are economically viable,” says Anthony Laws, an undergraduate at NC State who signed on to the project as part of his senior design class in electrical and computer engineering.

At the heart of the project are radio-frequency identification (RFID) tags, which can be equipped with sensors that allow them to transmit information back to a reader.

Each dairy cow would have an RFID ear tag, and RFID readers would be placed at the dairy’s milking station and at a nearby weighing station. The readers would transmit data to a remote system that records when cows enter and leave the milking station, as well as how much each cow weighs. Farmers can access that data.

William Carr, who retired from the New Jersey Institute of Technology and founded RFID Sensor Systems, developed the concept. But Carr came to NC State for assistance in turning his concept into reality.

The system also notifies farmers if a cow is staying too long in the milking station, if the cow is exhibiting significant changes when it comes to the milking station (which can be a sign of health problems) or if its weight changes significantly (another possible sign of health problems). The system also can notify farmers if a cow that requires medication enters the milking station.

“Ultimately, this system could be expanded to record and track a variety of other data, such as how much milk each cow is producing,” Laws notes.

EXECUTIVES SCORE PERCEIVED RISKS

Worries about government regulation, economic conditions and cybersecurity topped the list of risks perceived by corporate board members and C-suite executives, according to results of the third annual survey of business executives by global consulting firm Protiviti and the Enterprise Risk Management Initiative in the Poole College of Management at NC State.

“Executive Perspectives on Top Risks for 2015” summarizes concerns of the 277 board members and other top-level executives across industries who participated in the survey, identifying the perceived impact of macroeconomic, strategic and operational risks for the upcoming year.

More than half of the global-survey respondents indicated insufficient preparation to manage cyber threats is a risk that will “significantly impact” organizations this year. Following a string of recent data breaches, cyber threats jumped to number three this year, up three rank positions in year-over-year survey results.

Regulatory change and heightened government scrutiny was the No. 1 perceived risk, identified by nearly two-thirds of respondents. Uncertain economic conditions took second place, noted by 56 percent.