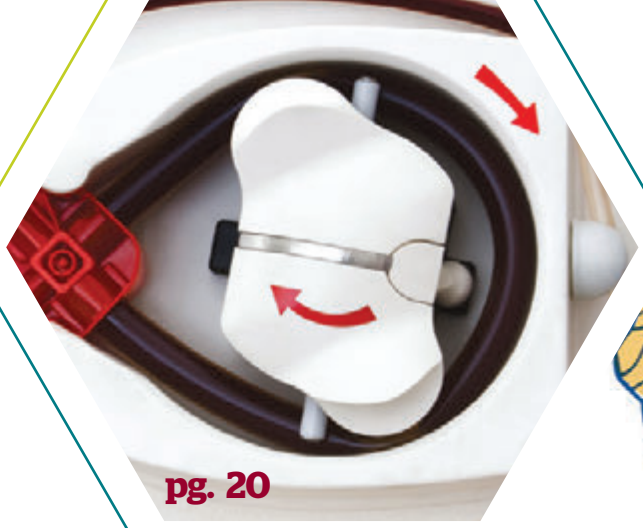
WINTER
2014

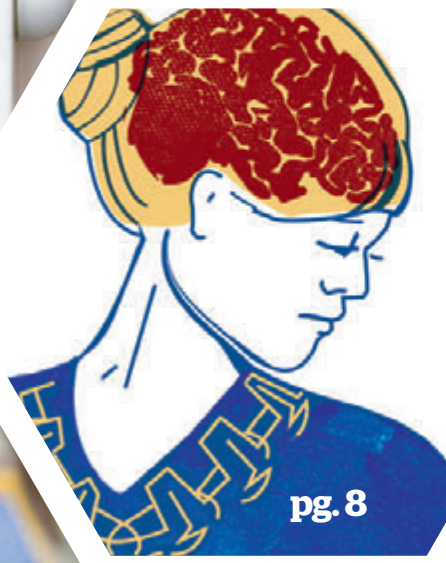
Breakthrough

UNIVERSITY OF SOUTH CAROLINA / RESEARCH

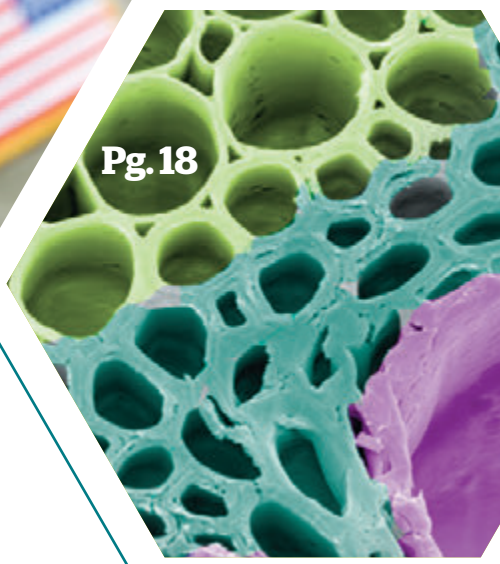
Three of a kind

Also in this issue


pg. 20


pg. 8


pg. 4


Pg. 18

pg. 17

Office of Research
University of South Carolina

President Harris Pastides

Vice President for Research Prakash Nagarkatti

Interim Vice President for Communications Wes Hickman

University Writers Group / University Creative Services
Creative Director Bob Wertz
Editor Chris Horn
Magazine Designer Michelle Hindle Riley
Contributing Writers Steven Powell, Craig Brandhorst
Photographer Kim Truett
Cover Illustrator Maria Fabrizio, '08 BFA

Website sc.edu/vpresearch

To comment on an item in Breakthrough or to suggest an idea for a future issue, contact the University of South Carolina's Office of Research at 803-777-5458 or email vpresearch@mailbox.sc.edu

In this issue

Visit sc.edu/research for more information

Video at sc.edu/breakthrough

Prakash Nagarkatti, Ph.D.
Vice President for Research
University of South Carolina
www.sc.edu/research

Solving global challenges requires an interdisciplinary approach. Here at USC, we're capitalizing on our diverse strengths. From a USC School of Medicine professor investigating the intricate links between mental and physical health to a prestigious institute studying energy independence from every angle, including communications, business and law, this issue of Breakthrough is filled with examples of the interdisciplinary work happening throughout South Carolina's premiere research institution.

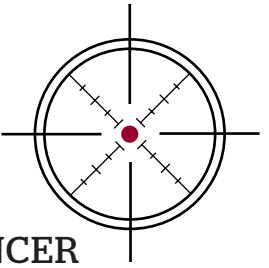
Research and scholarly activities that bring together different branches of knowledge have benefits beyond the academic settings where they take place. They also result in the major advances we rely on to solve problems and keep the world moving forward. This is precisely the type of progress I envisioned when I founded the internal research funding award and recognition initiatives that have become the signature of the USC Office of Research.

For example, we have taken a unique interest in engaging undergraduate and graduate students by facilitating discovery for every discipline through the Magellan and SPARC programs, respectively. Recently, we started Caravel, a new online journal in which we proudly publish meritorious undergraduate research. You see this research journal highlighted inside the back cover of this magazine, and I encourage you to make a visit to the Caravel website to see what our promising undergraduates are accomplishing.

With so many exciting research ventures on the horizon at USC, Breakthrough readers can look forward to many more issues highlighting innovative, interdisciplinary projects like the ones you see here today.

"I would ask him how he was, and he would always say 'fine,' but he wasn't. War changes people."

USC social work professor **Nancy Brown** is working to create a military social work program at USC that trains people in the community to identify and help veterans struggling with post-traumatic stress disorder. Among active-duty U.S. troops, 350 suicides occurred in 2012, nearly twice as many as a decade before. Brown is motivated, in part, by the memory of Marine Lance Corporal Mills Bigham, a veteran of the Iraq war who ended his life in 2010. Brown's son, Will, was also deployed to Iraq and was Bigham's best friend.



SMART-BOMBING CANCER

In the military, collateral damage means innocent civilians dying. In medicine, it means side effects — and that can mean death for the patient. But USC pharmacy professor Peisheng Xu is helping craft new pharmaceuticals that could dramatically improve a patient's odds when heavy-duty drugs are prescribed. Xu's team is perfecting drugs with two parts — one that functions as a guiding mechanism, and the other as a warhead. When it comes to cancer, for example, the drugs are designed to move through the human body innocuously, ignoring the good, healthy cells. "The goal of my research is to give the patient the right drug, to the right tissue, to the right cell, in the right dose, at the right time," Xu says.

TWO NEW AAAS FELLOWS NAMED

Two University of South Carolina professors have been named fellows of the American Association for the Advancement of Science. Duncan A. Buell, a computer science professor, and Joseph T. DiPiro, executive dean of the S.C. College of Pharmacy, are now among 25 AAAS fellows at USC. Buell was elected for leadership and distinguished contributions in reconfigurable computing, in public policy related to computer science education and in public audits and verification of election data. DiPiro was elected for distinguished contributions to the field of pharmacy and to pharmaceutical education, including leadership in national organizations, for service as editor of the American Journal of Pharmaceutical Education and textbooks in pharmacy. AAAS is the world's largest general scientific society and publishes numerous newsletters, books and journals, including Science magazine.

"Novelty and innovation are stifled in obesity research because the most money goes to those who are studying that which is 'popular' and not that which is 'different', controversial, contentious or unable to be explained in 140 characters."

In a recent paper published in the Mayo Clinic Proceedings, **Edward Archer** and fellow Arnold School of Public Health professors **Steven Blair** and **James Hébert** challenge the conventional wisdom of obesity research that doesn't consider the complex factors of weight management. One example they cite is the overreliance on Body Mass Index in scientific studies. The authors argue that in many instances inflammation markers and more precise measures of actual fat storage are far better indicators of health.

WANT TO LEARN A NEW LANGUAGE? TRY SINGING IT!

Fernanda Ferreira remembers learning French songs in grade school and likes the idea that her research might affirm what her teachers back then believed — that singing can help you learn a language.

A psycholinguist in USC's College of Arts and Sciences, Ferreira worked with colleagues at the University of Edinburgh on a study in which 60 volunteers were assigned to learn Hungarian phrases. The group that sang the foreign words significantly outperformed the volunteers who tried to learn the phrases by speaking them.

"Learning a language can be difficult, and yet with increasing internationalization and globalization, it is becoming more and more important for people to be able to communicate in more than one language," Ferreira said. "Anything we can figure out about how to make language learning easier is potentially very useful."

EIGHT RECEIVE INAUGURAL BREAKTHROUGH LEADERSHIP IN RESEARCH AWARD

The Office of Research has named eight professors recipients of its inaugural Breakthrough Leadership in Research Award. Faculty members were selected on the basis of demonstrated leadership through activities including successful mentoring of junior faculty; establishing research centers with university-wide impact; promoting research at K-12; community outreach through research; and creating programs aimed at increasing diversity.

Lucia Pirisi-Creek, Department of Pathology, Microbiology and Immunology, School of Medicine

Frank Berger, Department of Biological Sciences, College of Arts and Sciences

Ron Prinz, Department of Psychology, College of Arts and Sciences

Simon Hudson, College of Hospitality, Retail and Sport Management

Gloria Boutte, Department of Instruction and Teacher Education, College of Education

Michael Sutton, Department of Mechanical Engineering, College of Engineering and Computing

Scott Gwara, Department of English Language and Literature, College of Arts and Sciences

Albert Goodyear, S.C. Institute of Archaeology and Anthropology

The multibillion-dollar parasite

A statistics professor takes on one of the health care industry's worst scourges.

It doesn't claim lives, like cancer or heart disease, but one of the worst parasites in the U.S. health care system does have a cost. Fraudulent health care charges are estimated to range from $50 billion to $150 billion yearly.

USC's **Don Edwards** is working hard in the fight to recover that lost money, using statistics like a surgical tool.

"It was somewhat surprising to me, but my business, statistics, is absolutely center stage in the battle against health care fraud," said Edwards, a professor of statistics in the College of Arts and Sciences.

Health care fraud is difficult to prove. Abusive providers must be found, and they might be doctors, hospitals, ambulance services, providers of power wheelchairs, or any groups that bill Medicare.

"One way to do that is through data mining, which involves terabytes of health care data," Edwards said. "It's really finding a needle in a haystack."

The next step is an audit of a provider flagged as potentially abusive. That's where Edwards is heavily involved, advising the Columbia, S.C.-based Medicare contractor Palmetto GBA and U.S. attorneys as they prepare a sampling plan of the billing data that will withstand the rigors of a trial.

A case might involve thousands of transactions, and examining each of them in detail to determine whether the payment was valid would be impossible. Instead, a smaller sample of the transactions is thoroughly audited, and payments in the sample found to be invalid are used to project the total invalid amount in the full number of transactions.

"You have to prepare the sampling plan like a tank. You have to defend everything you do in court, under oath, against a very aggressive, well-funded team," he said.

Edwards and several alumni of USC's statistics department devised a sampling strategy that's been widely adopted. Published in 2005 in the journal Health Services & Outcomes Research Methodology, the "minimum sub method" remains a standard in the field today. Working with Gail Ward-Besser and Jennifer Lasecki, who earned their master's degrees from USC's statistics department in 1988 and 1997, respectively, Edwards is devising another sampling method, termed "conservative pennysampling," which is described in a paper now in press in the Global Journal of Health Science.

Three of a kind

A School of Medicine researcher studies the links between depression, cardiovascular disease and inflammation.

Stress, resiliency, inflammation, depression and cardiovascular disease converge in a study at the School of Medicine.

At first blush, the idea that depression and cardiovascular disease are closely related might seem unlikely.

How could pervasive feelings of sadness or hopelessness — a problem seemingly of the mind only — affect one's risk for developing high blood pressure?

But it's true. Individuals with hypertension are much more likely to develop a psychiatric disorder down the road. And those who are clinically depressed are more likely to have a heart attack.

Understanding the underlying mechanisms is imperative in order to better treat the two illnesses because some treatments for depression exacerbate cardiovascular disease, and vice versa. That's where USC's **Susan Wood** is poised to make a contribution.

"Not only is the inflammation present in our bodies contributing to these diseases, but stress can produce changes in the inflammatory factors in the brain, as well." — Susan Wood

An assistant professor in the School of Medicine's Department of Pharmacology, Physiology and Neuroscience, Wood, who came to USC in the spring of 2013, has spent the past seven years developing a highly refined animal model.

While she works with rodents in the laboratory, Wood's research is rooted in some well-established clinical results with humans. "In humans, if we passively cope with stress — if we just kind of let it happen — it's associated with an increased risk of developing psychiatric disorders," she said. "But if we proactively cope and take a stand, saying, 'I'm not going to let this affect me,' then it's associated with being resilient to the stress."

Wood's animal model uses a common source of stress — a bully, essentially — and, as in humans, the subjects of the stress vary greatly in their coping response.

A laboratory rodent (the intruder) is introduced to a much larger rodent (the resident). In clinical terms, this situation is called a 'resident-intruder model.' In the rat world, finding yourself in a cage with a much larger rat is quite stressful. In the presence of this large resident, some of the smaller rat intruders roll onto their backs and expose their bellies, much like a small dog will do in the presence of a much larger dog.

"In the passive response, the animal exhibits a supine posture each day," Wood said. "This is a response they adopt naturally. And in seven years of studying this model, I've found that this submissive, passive response leads to pathology."

The pathology includes depressive-like symptoms as well as a range of biomolecular markers indicating that cardiovascular disease is soon to follow.

Rodents are very hierarchical. They all want to be at the top, and when they're reduced to forced submission, it's damaging to their health. But in Wood's animal model, individual differences in the rats come into play: some don't roll over when confronted by the "bully resident"; they stand up for themselves and rarely lie on their backs in submission.

In the face of stress, these individuals are resilient, and their outcomes are much better. They develop neither depressive-like symptoms nor the markings of cardiovascular disease.

"I think that's one of the great features of this model," Wood said. "It mimics what we see in humans. If you passively cope, you're more vulnerable. In this animal model if you passively cope, you're more vulnerable as well. It increases the translational value of the research."

Wood has been carefully studying the differences between resilient and vulnerable individuals, and one defining difference is brain inflammation, which is known to be associated with many disorders, including arthritis, depression, cardiovascular disease and diabetes.

"Recently, we've started to understand that not only is the inflammation that's going on in our bodies — south of the blood-brain barrier, basically — contributing to these diseases, but that stress can produce changes in the inflammatory factors in the brain, as well."

Using her animal model, Wood has shown a distinct difference in brain inflammation between vulnerable and resilient individuals, with some markers for inflammation increased in the former but suppressed in the latter. Focusing on the "fight-or-flight" part of the brain (see "Zeroing in on targets" on next page), she has begun to develop a plan to convert vulnerable individuals into resilient ones.

Wood has spent years identifying brain regions, neuromodulators and neurochemical changes associated with these two very different responses. Now she wants to see if her team can actually produce the response. Instead of just saying there's an association, she hopes to make a certain change in the brain that will cause the animal to be resilient.

"That's going to open up novel treatment options for these co-occurring disorders, and therapeutics with potential to produce a more resilient individual in the face of stress," she said.

"Our goal is to understand the mind — when it works properly and what happens when it doesn't work properly."

Institute for Mind and Brain

USC's concerted efforts to unlock the mysteries of the human brain took another step forward with the creation of the Institute for Mind & Brain in January 2013. With an interdisciplinary team including nearly 20 faculty members from both the College of Arts and Sciences and the Arnold School of Public Health, the institute addresses one of the most fundamental questions of human existence: how does the brain give rise to the mind?

"Our goal is to understand the mind — when it works properly and what happens when it doesn't work properly," said **John Henderson**, a psychology professor and director of the institute. "We have people studying the effects of stroke, ADHD, autism and traumatic brain injury. Understanding how damage affects the brain helps tell us how it works generally."

Laboratory space at the institute includes eye-tracking hardware and software, electroencephalographic instruments and brain stimulation equipment (including TMS and tDCS). These resources complement the extensive functional magnetic resonance imaging (fMRI) facilities at the McCausland Center for Brain Imaging at Palmetto Health Richland.

With some of the faculty scattered across campus, the Institute for Mind & Brain provides a home base for collaboration.

"The idea was that we create a place where people would interact with each other," Henderson said. "The environment really fosters collegiality and spontaneous discussions. Some people call it the Shangri-La for scientists."

Zeroing in on targets

An assistant professor in the School of Medicine's Department of Pharmacology, Physiology and Neuroscience, Susan Wood is conducting research focused in part on the locus coeruleus, the brain's primary location for norepinephrine synthesis.

Norepinephrine, a hormone and neurotransmitter, is the basis of the "fight-or-flight" response and is sometimes used as a target in treating depression and other disorders. Wood's early work showed that the neurotransmitter corticotropin-releasing factor (CRF) was a central player in individuals vulnerable to stress-induced dysfunction.

Wood then followed up by identifying 35 genes with altered expression in the vulnerable individuals. In particular, two proteins related to inflammation and associated with both depression and heart disease were less expressed in resilient individuals.

Untangling the paths to incarceration

Women and men end up behind bars for a variety of reasons but not necessarily the same reasons. In fact, traumatic experiences like rape, sexual abuse and gender-specific family discord often play a significant role in women's paths toward incarceration.

To better understand the specific etiology of crime as it relates to females, research associate professor of social work **Dana DeHart** is part of several multisite projects, funded by the National Institute of Justice and the Bureau of Justice Assistance, that are designed to gather the personal narratives of incarcerated women and girls. DeHart and her co-investigators then analyze those narratives for patterns.

"One thing we're trying to do is to tease out the intersection of certain factors and how victimization during childhood or adolescence might then lead to mental health issues such as depression or anxiety, and attempts to try to cope with that victimization," she says.

Those problems, DeHart says, often lead to additional problems, including alcohol and drug abuse. In many cases, worsening circumstances lead to the commission of a crime followed by jail time.

Frequently, women inmates also have experienced a co-occurring trauma such as the loss of a caregiver, and repeated trauma seems to be a primary factor leading to incarceration.

"One thing that differentiates these women from what you might see in the general population is the sheer volume of the trauma that they've experienced," DeHart says. "A lot of people will say, 'Oh, well, I was abused and I didn't go out and kill people.' But if you listen to these women's stories, you'll hear that these women were abused over and over and over."

The complexity of these problems indicates that a more comprehensive approach to prevention needs to be implemented, according to DeHart.

"Coordination between correctional agencies, mental health agencies, substance abuse agencies could occur prior to women becoming so deeply enmeshed in the justice system, as well as upon their re-entry into the community," she says.

"One thing we're trying to do is to tease out the intersection of certain factors and how victimization during childhood or adolescence might then lead to mental health issues such as depression or anxiety, and attempts to try to cope with that victimization."

hs Health Sciences

Dropout prevention

It's no secret that South Carolina's high school dropout rate could stand to be reduced. It's also no secret that addressing it requires an all-hands-on-deck approach — and that the earlier educators, social workers and other professionals intervene, the better.

"When kids repeat ninth grade, that's a huge risk indicator for dropout," says assistant professor of social work **Aidyn Iachini**, who is working on several projects that directly or indirectly address the issue. "And when kids drop out we know there can be serious long-term consequences such as unemployment and entry into the criminal justice system. So what can we do to intervene?"

Since 2011, Iachini has served as faculty lead for a novel program that pairs master's of social work field placement students with school resource officers in South Carolina's Richland School District II to monitor and assist high school students at risk for dropping out.

"The idea is for the high school students to develop that positive relationship with a caring adult," says Iachini, who is also helping the national Girls on the Run program revise its curriculum to address similar issues for younger girls at the national level. "That's a key protective factor to keep these kids in school."

But the problems that lead to dropout can be complicated and even systemic, says Iachini, which is why USC's MSW field placement students are also gathering information about what other factors may be influencing these students' ability to be successful in school.

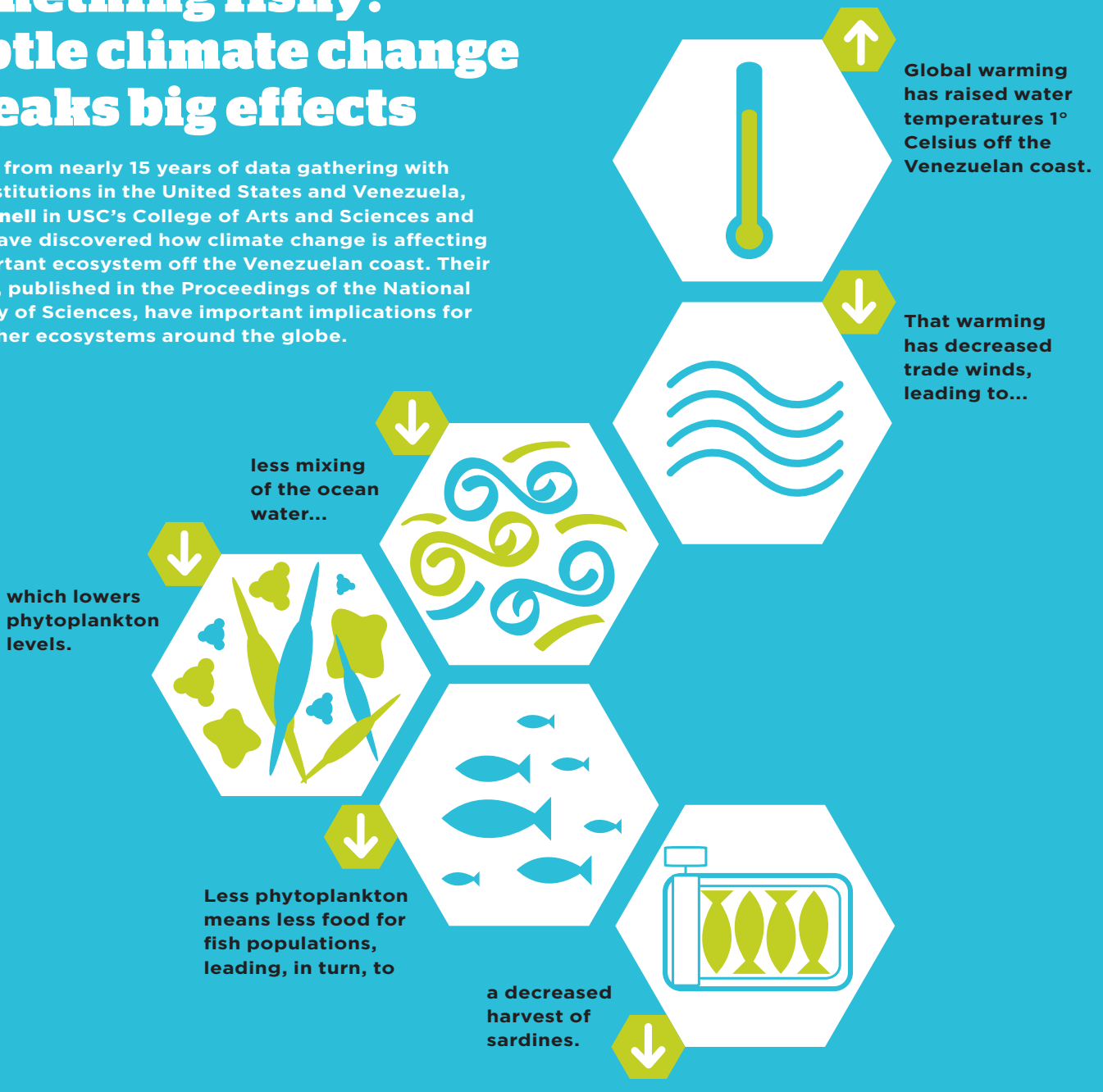
"Our MSW students are helping kids develop those positive adult relationships, but they're also trying to find out what else is going on — what are the other non-academic factors that impact a student's learning or their connection to the classroom? That could mean mental health issues or peer relational problems, or a student could really be struggling with issues in their family environment."

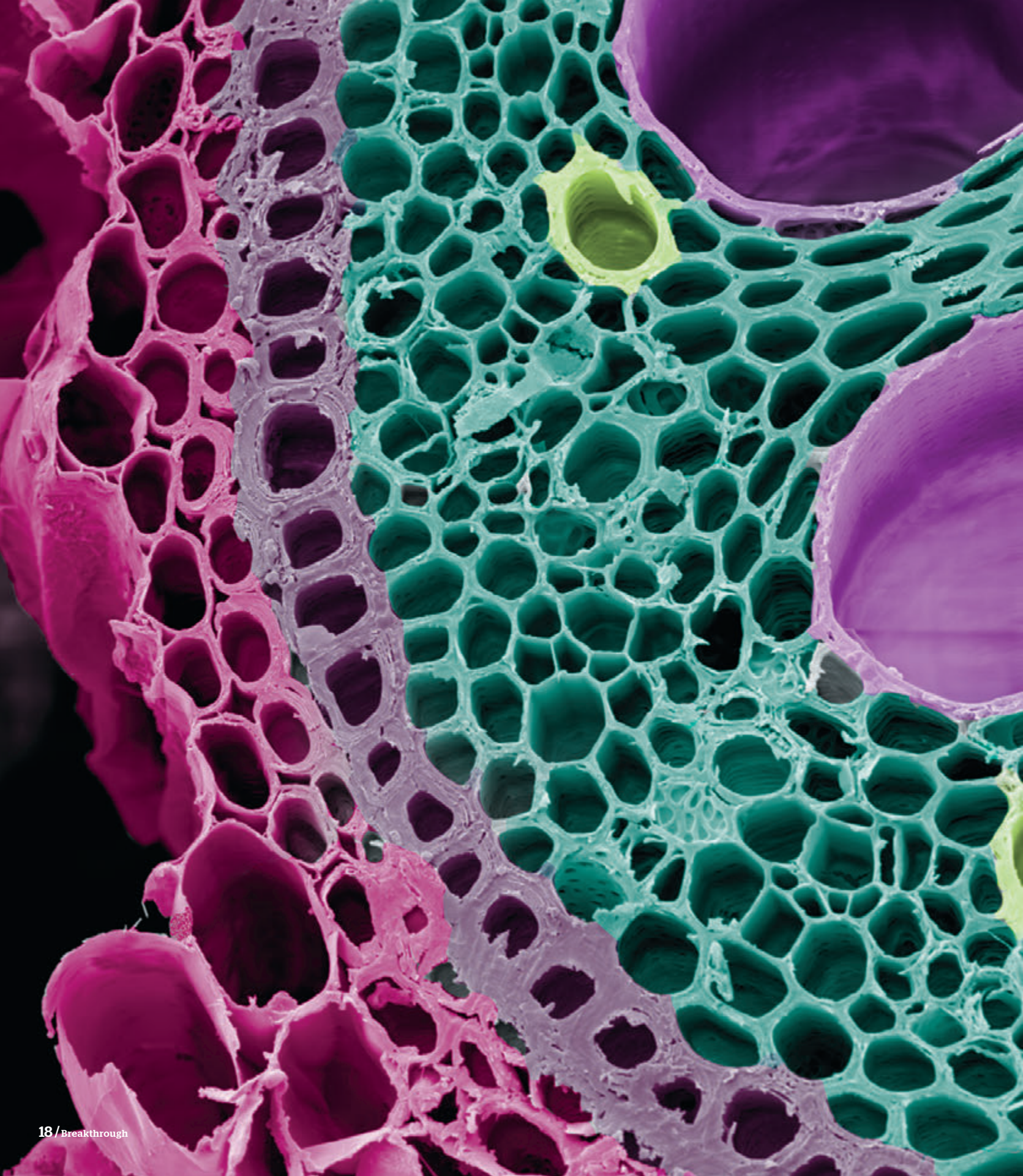
Iachini also believes that addressing the dropout problem means connecting what happens during the school day to what happens out of school.

"It is critical to make sure services and supports are available to students beyond just the traditional hours of the school day," says Iachini. "We need to consider how we make sure these students get connected to these out-of-school time opportunities."

Something fishy: subtle climate change wreaks big effects

Drawing from nearly 15 years of data gathering with other institutions in the United States and Venezuela, Bob Thunell in USC's College of Arts and Sciences and others have discovered how climate change is affecting an important ecosystem off the Venezuelan coast. Their findings, published in the Proceedings of the National Academy of Sciences, have important implications for many other ecosystems around the globe.





Giant reed

Commonly called the giant reed, Arundo donax (here magnified 2,140 times with a scanning electron microscope) holds promise as both a renewable energy source and a tool for environmental remediation. Erika Balogh, a certified electron microscopy technologist in biology professor Johannes Stratmann's lab and a graduate research assistant at USC's Electron Microscopy Center, is focusing her doctoral research on the plant's toleration for salty environments. "Under the supervision of Professor Laszlo Marton's lab I'm exploring the idea of propagating a special line of Arundo for saline environments, which can be grown on land that is no longer suitable for agricultural purposes," Balogh said.

This image, digitally colorized by Kathleen Clardy and Chris Brandon, was captured with a Tescan Vega3 SBU variable pressure scanning electron microscope in USC's Electron Microscopy Center. The microscope is one of several high-powered instruments maintained by the center, which provides analytical microscopy and imaging support for clients across the university and in the industrial and non-profit sector.

Q&A

With Teri Browne

College of Social Work
University of South Carolina

Before she arrived at USC in 2008 as an assistant professor in the College of Social Work, Teri Browne spent more than a decade as a dialysis social worker. Working with renal failure patients across the country, Browne witnessed the health disparities that typically result with kidney transplants. Browne was named a Rising Star faculty member in 2011 by USC's Office of Research and has been steadily advancing her research in health disparities.

What are the disparities associated with kidney transplants?

In South Carolina, African-Americans comprise the majority of kidney dialysis patients, but they receive a far smaller share of kidney transplants. Nationally, only 10 percent of African-American patients receive kidney transplants within three years of diagnosis of end-stage renal disease. As part of our NIH grant, we've surveyed dialysis centers in North Carolina, South Carolina and Georgia to analyze the protocols they use with patients. We've conducted focus groups with African-American patients to find what helped them in their quest to get transplants. It's a combination of a lot of factors, including socioeconomics, lack of health insurance, patients not trusting their doctors and poor health literacy. There's a definite need for better education.

Why have you made kidney transplant disparities the focus of your academic career?

My passion comes from having spent 13 years as a dialysis social worker before becoming a social work faculty member. I know the dynamics of how dialysis centers work, and I've seen firsthand how patients get lost in the shuffle — particularly if they don't understand the process of advocating for themselves. I believe that I can think these problems through in a way that might lead to practical solutions.

Aren't kidney transplants an expensive solution to renal failure?

A kidney transplant actually costs less than keeping a patient on dialysis. And kidney transplant patients have a much better quality of life than patients on chronic dialysis.

Are there enough donated kidneys to go around?

The number of kidneys from deceased donors is limited; not everyone is an organ donor, and the age of the deceased and the condition of their kidneys at death are limiting factors. The number of transplants from living donors is much lower, but that's where the real potential lies in making more kidneys available. For reasons that aren't altogether clear, African-Americans receive a disproportionately smaller number of kidneys from living donors.

What's the next step in your work?

It's clear that this is a problem that needs an interdisciplinary approach. Since 2011, there's been a growing interprofessional education effort among USC's health sciences colleges, so I'm looking forward to the possibility of working with colleagues in pharmacy, nursing, medicine and public health. I'm currently developing an intervention research model to address kidney transplant disparities, and last year I attended the first-ever conference for kidney transplant health care professionals in India; I was the only Western social worker invited.


5
10
15

Ghost writers

Students write code for an iPad app that conjures up 19th-century narratives and images from USC's historic Horseshoe.

"Sometimes programming can be a little dull, especially when you type code and just watch it compile. But on this project I get something I can see in three dimensions. Every day, I get to create something."

Casey Cole, in her third year as an undergraduate student, has already gotten started where nearly every seasoned university researcher wants to be: on an interdisciplinary team.

Cole is working on the Ghosts of the Horseshoe project, which features faculty advisers from opposite sides of campus: **Duncan Buell** in the Department of Computer Science and Engineering and **Heidi Rae Cooley** in the Department of Art.

The goal of Ghosts of the Horseshoe is an iPad-accessible immersion of the user into an important, but often overlooked, part of USC's history: 19th-century slavery. From the founding of South Carolina College in 1801 until the end of the Civil war in 1865, slaves lived and worked on campus, building much of the Horseshoe, now the university's historic center where the oldest buildings are situated.

With the Ghosts of the Horseshoe app developed by the students, the internal GPS and camera in an iPad allow the user to call up narratives and graphics about specific buildings on the historic Horseshoe. Cole is using a grant from the Magellan Scholar program to focus on buildings that once existed but were later demolished.

"Some of the buildings on the Horseshoe, not surprisingly, aren't there anymore," said Cole, left. "The original president's house, for example, used to be where McKissick is now. We want people to know what those buildings looked like." During the past summer and fall, Cole has written code to model the lost structures in three dimensions from historical data.

"In the app, a person will get to a spot where a building used to be, and they can, in full 3-D, explore what that building looked like," she said. "It is really, really cool."

Cole sees the Ghosts of the Horseshoe project as a way of helping people remember something that shouldn't be lost.

"We've been approached by people who teach high school history who want to use it in their classes, and USC plans to use it in University 101 courses," she said. "It's a great tool for not forgetting South Carolina's history. Not everyone is open to the idea of learning about slavery, but it's a really important topic, and it's often forgotten."

The project is also giving Cole the opportunity to combine two of her passions: art and computer programming. Initially an art major, she switched to computer science after taking her first programming class at USC.

"I love coding, and this project is right up my alley," she said. "Sometimes programming can be a little dull, especially when you type code and just watch it compile. But on this project I get something I can see in three dimensions. Every day, I get to create something."

J.R. Regalbuto

en Energy

Energy Leadership Institute coming into its own as forum for energy research and policy

It started nearly two years ago as an ambitious plan to draw experts from every field to study issues surrounding energy generation and energy independence — from engineering and public health to computing, communications, business, science and law.

And now the Energy Leadership Institute is coming into its own, a multidisciplinary cadre of some 125 faculty from six USC colleges and schools.

"We've got one of the nation's most comprehensive energy research groups at USC," said **Tony Ambler**, dean of the College of Engineering and Computing, who first championed the idea to create the institute. "We're studying clean coal, photovoltaics, batteries, fuel cells, hydrogen, biomass, nuclear energy as well as smart grid and micro-grid electronics. It's a phenomenal and productive investment in faculty and laboratories.

"But this would be just another energy institute if it were only made up of engineering faculty. That's why we've drawn on expertise from several other colleges within the university, including business, public health, arts and sciences, law and mass communications and information studies."

With a number of energy-based companies in close proximity to USC — including Duke, Progress Energy, SCANA, Siemens and Savannah River National Laboratory — there are plenty of high-stakes players to engage with the ELI.

"We all have a stake in this, and I think the Energy Leadership Institute is going to provide an unbiased forum for discourse, research and collaboration," Ambler said.

ELI is on its way to doing just that, having hosted a forum earlier this fall that drew scores of faculty and featured **Mike Couick**, CEO of the Electric Cooperatives of South Carolina, as keynote speaker. A second forum planned for the spring will focus on cradle-to-grave strategies for reducing carbon dioxide emissions.

J.R. Regalbuto, a chemical engineering professor and SmartState chair, is director of the institute. He's looking forward to an even larger conference planned for next summer.

"Arden Bement, a past director of the National Science Foundation, will be one of the co-chairs of the June conference that will begin the process of writing a roadmap for sustainable energy independence," Regalbuto said. "Our vision is to prepare a roadmap that can't be ignored because it will be prepared not by a single author, but by a panel of the country's leading energy experts and practitioners."

The document will take at least a year to craft, Regalbuto said, and will be presented at a fall 2015 conference at USC.

"Some pundits believe that this country's energy security issues are now moot because of the huge natural gas reserves that are being exploited by fracking," Regalbuto said. "But if you're a think tank like the Energy Leadership Institute, you think past the 70 years that shale gas will buy us. It's imperative that we look at the big picture and think strategically about energy policies that will benefit not only this generation but the generations to come."

Caravel

An Online Undergraduate Research Journal
Discovery for Every Discipline

In the 15th and 16th centuries, explorers like Columbus and Magellan circumnavigated the globe in a speedy, maneuverable vessel known as the caravel. Today, USC's Caravel undergraduate research journal carries students on a voyage to discovery for every discipline. USC's new online journal of undergraduate research features writing, audio and video created by and for undergrads to showcase their journeys to discovery in the arts, sciences and other scholarly pursuits. Set sail with them at caravel.sc.edu.

2012 sociology magna cum laude graduate with distinction, Anna Rogers on her experience writing Sexism in Unexpected Places: An Analysis of Country Music Lyrics: *This paper allowed me to see the process of sociological research. I learned how to do background research and how to write a thesis. I am very happy that I did this because it helped prepare me for graduate school and the type of research I will be doing in the future. It also allowed me to be the first person from the USC sociology department to graduate with distinction.*

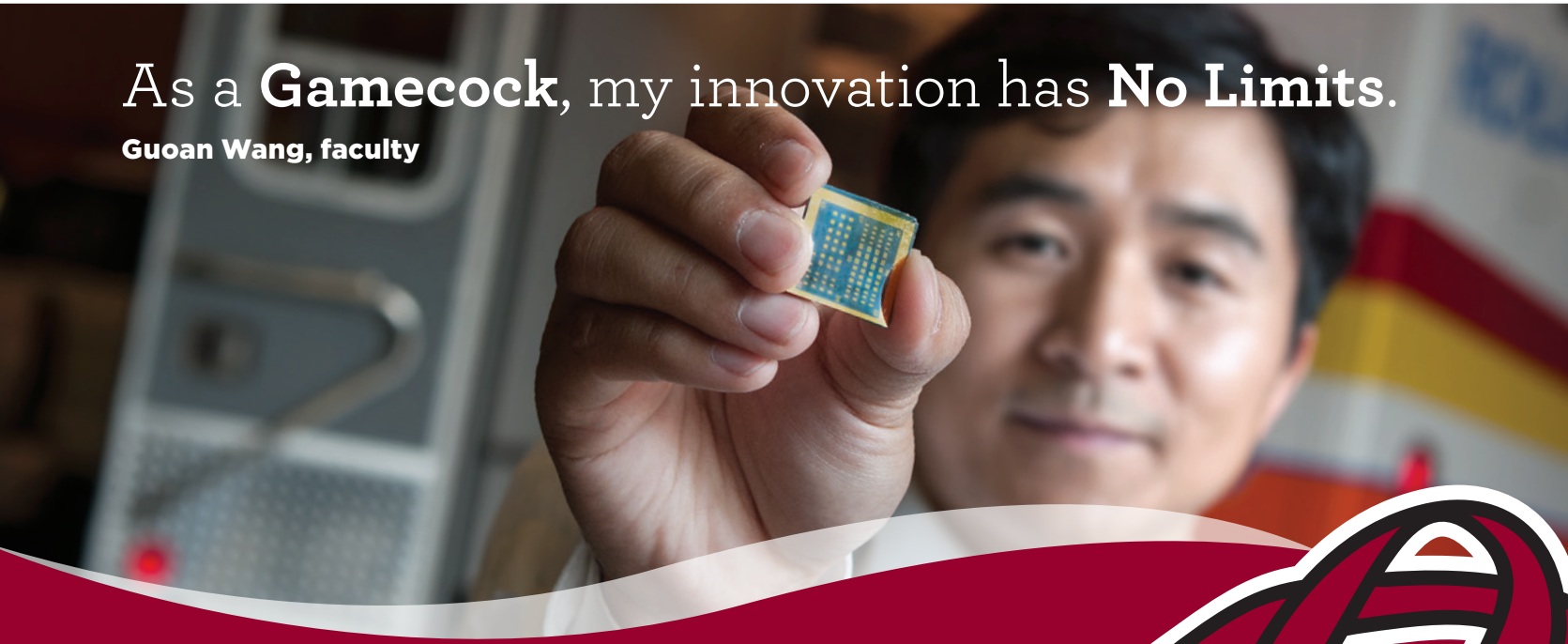
UNIVERSITY OF SOUTH CAROLINA

Office of Research

UNIVERSITY OF
SOUTH CAROLINA
Office of Research

Columbia, SC 29208

Nonprofit
Organization
U.S. Postage
PAID
Permit #766
Columbia, SC



As a **Gamecock**, my innovation has **No Limits**.

Guoan Wang, faculty

There's a squeezing sensation in your chest; nausea and a cold sweat soon follow. Is it a heart attack or last night's dinner? Should you call 911? One day, you may not need to. USC electrical engineer Guoan Wang envisions a time when health care professionals will monitor your symptoms and take appropriate action. He is developing new components for bio-implants, nano-devices that wirelessly monitor and transmit vital signs and also recharge themselves. For the chronically ill, the elderly, newborns or other high-risk patients, Guoan's research could save lives, and it could reduce health care costs for all of us.

UNIVERSITY OF
SOUTH CAROLINA

sc.edu/nolimits