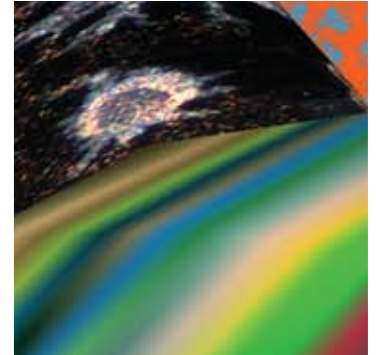
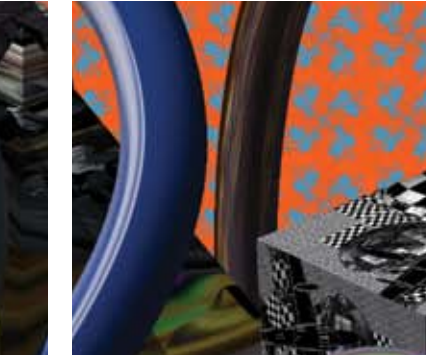


# Breakthrough

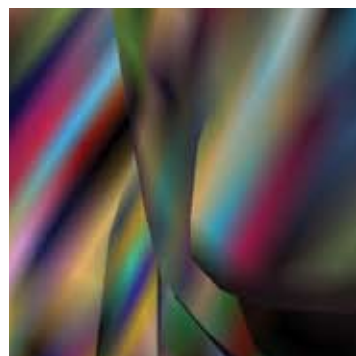
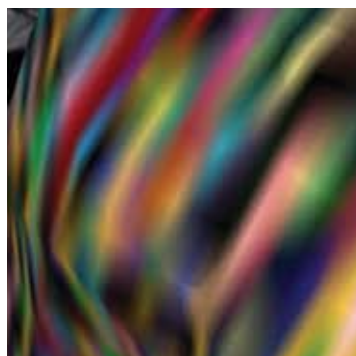
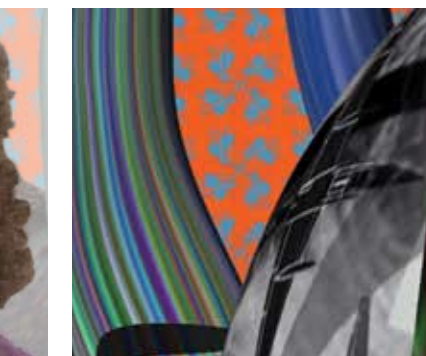
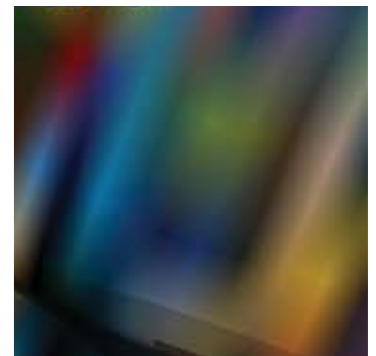
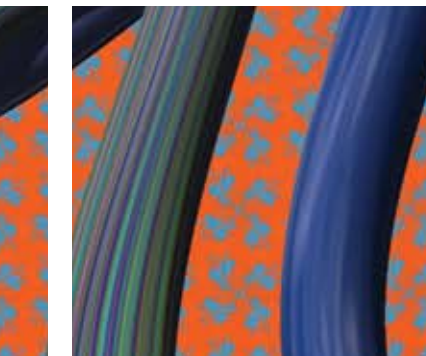
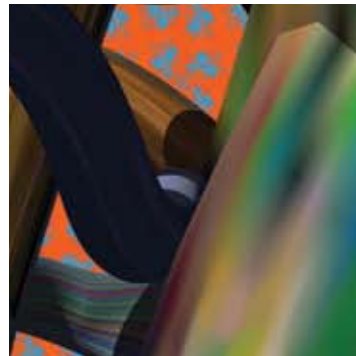
UNIVERSITY OF SOUTH CAROLINA RESEARCH & HEALTH SCIENCES



Winter 2008



South Carolina's Centenary Plan has created a new pool of intellectual capital and generated impressive gains in research productivity.



Art and science meet in an NSF-sponsored research grant.

# Breakthrough

IN THIS ISSUE



The University of South Carolina is in the midst of another innovative period and a productive year for research. As we move forward in our commitment to excel in research and scholarship, our academic community is being stimulated by fresh minds and new ideas.

The Centenary Plan was launched in 2004 in response to the impending retirement of hundreds of professors of the Baby Boom era. We took this once-in-a-generation challenge and turned it into an intellectual investment opportunity. Since the program's inception, 87 professors have been hired and/or approved for the program from a vast array of disciplines including art, physics and astronomy, public health, biochemistry, pharmacology, and many others. The return for this investment, measured in intellectual capital, has been huge and continues to grow. You will read more about the Centenary Plan's success in this issue.

Carolina continues to produce new research stars through another state-wide initiative, the S.C. Commission on Higher Education's Centers for Economic Excellence (CoEE) program. Since 2003, Carolina has been awarded \$28.5 million for seven centers, and \$21.3 million for joint ventures with other S.C. research universities. In the most recent award year, we received funding for centers focused on

- strategic approaches to clean coal
- rehabilitation and reconstruction sciences
- health care quality
- and the SeniorSMART Center, which you can read about in this issue.

Clearly, we are striving to accomplish more each year, and with our stellar faculty and committed staff we should achieve our goals.

This issue of *Breakthrough*, while showcasing some of our major accomplishments, just scratches the surface of our research and scholarship. I hope you enjoy this taste of what the University is doing to advance knowledge, increase economic development, and to improve the lives of South Carolinians and people everywhere.

A handwritten signature in black ink that reads "H. Pastides".

Harris Pastides, Vice President for Research and Health Sciences  
University of South Carolina

[www.sc.edu/research](http://www.sc.edu/research)



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### Blue chip investment

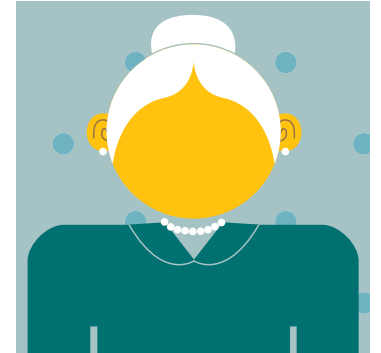
A bold plan to recruit 100 new research faculty members is paying a handsome return on the investment.



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### Alert and Mobile

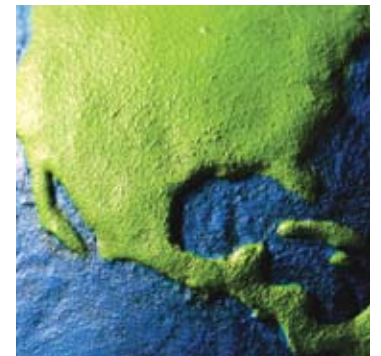
South Carolina's new SeniorSMART Center is good news for a graying population that's anxious to maintain its independence.



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### Fighting back

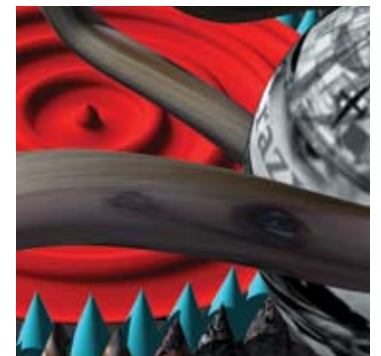
The re-emergence of tuberculosis is a serious public health concern, and Ana Lòpez-Defede is serious about addressing the threat.



15

### Biology, poetry, and nanorod marimbas

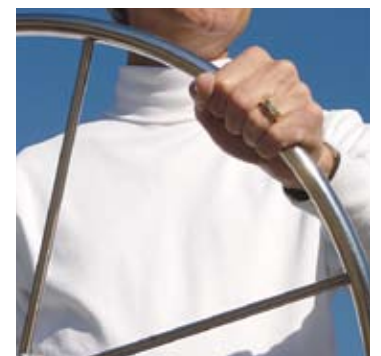
An innovative project brings science and humanities together in the lab to explore new frontiers in cardiac research.



19

### Full steam ahead

The School of Medicine's new dean has boarded a ship well underway toward its goal of teaching and research excellence.





**Sean Norman**

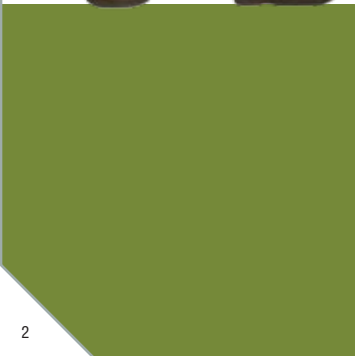
- environmental health sciences department
- molecular microbial ecologist

**Heather Kitzmann Ulrich**

- psychology department
- adolescent obesity researcher

**David Mott**

- pharmacology, physiology, and neuroscience department
- epilepsy researcher



# Blue chip investment

**The University's Centenary Plan is generating a handsome return in scholarly work and research funding—and building a solid research faculty base for the future.**

Financial advisors counsel a long, steady approach to investing—a proven method for accumulating wealth.

The University of South Carolina's Centenary Plan (CP) is taking the long-range approach, but the faculty recruitment program already is registering some immediate returns.

The plan to recruit 100 new research faculty in several strategic disciplines is nearly complete: 87 have been recruited, and the performance of those already on board has met the University's high expectations. Collectively, Carolina's CP faculty have authored more than 220 publications, submitted nearly 100 grant proposals, and have been principal investigators on \$11 million in new research grants (and more than \$25 million as co-principal investigators).

"That funding wouldn't have been here otherwise because these are new faculty," said **Rose Booze**, South Carolina's associate vice president for research and director of the Centenary Plan.

The Centenary Plan provides five years of matching salary and start-up support to each faculty recruit's academic unit. Faculty recruited through CP are expected to generate revenue from federal grants and industrial contracts that eventually will cover their salaries and expenses.

"Some of our CP recruits start out as research faculty, then switch to tenure-track positions at the invitation of their academic units," Booze said. "These faculty, because of their demonstrated success in research, are very attractive to our academic departments engaged in national searches for new tenure-track faculty members.

"Many prefer the research track, though, which allows them to concentrate on research without the commitments of teaching and committee work that come with a tenure-track position."

Flexibility and strategic investment are hallmarks of the plan. The University has used CP recruits to build research capability

quickly in areas such as alternative energy and biomedical science. With South Carolina's Innovista research campus gaining momentum, the Centenary Plan could prove to be an intriguing draw for industrial companies. Private firms have the opportunity to co-sponsor CP faculty with their academic partners to gain immediate research firepower.

"The Centenary Plan is generating great results, and we look forward to even larger returns in the future. This program has been quite successful," Booze said.

Here's a closer look at three faculty recruited through the Centenary Plan.

## Stopping epilepsy in its tracks

Three million Americans suffer from epilepsy, an illness characterized by brain seizures and sometimes accompanied by symptoms of depression, psychosis, and cognitive deficit.

**David Mott** wants to understand how the disease develops, how to stop it, and how to develop therapies that can help all epileptic sufferers. The last point is especially important because 30 percent of those with epilepsy either can't use or aren't helped by current seizure medications.

"For individuals who are not born with epilepsy, there is some initiating event—head trauma, concussion, infection, or mild stroke—that marks epileptogenesis," said Mott, an assistant professor in the School of Medicine's pharmacology, physiology, and neuroscience department. "One of the things I'm interested in is learning how to stop epilepsy during the latency period."

With grant funding from the National Alliance for Research on Schizophrenia and Depression, Mott is using rodent models to study how the brain changes during the genesis of epilepsy.



With special MRI machines, he focuses on the hippocampus—the center of learning and memory—and neighboring brain structures to see what roles they play as epilepsy develops.

“If untreated, epileptic seizures harm learning and memory and permanently damage the brain, so it’s urgent to find treatments that will help everyone,” Mott said.

Mott is focusing on protein receptors found in neurons that are linked to seizure activity. Altering the DNA of these receptors could prevent seizures and preclude the side effects of mainstream seizure medications.

“We need new ways to go after epilepsy,” said Mott, who interacts with the Epilepsy Foundation and with members of epilepsy support groups and is pursuing research funding from the National Institutes of Health for further studies.



## Battle of the bulge

Junk food, too much TV watching, not enough outdoor playing—they’re among the obvious culprits for America’s childhood obesity epidemic that is predicted to affect half of all U.S. children by 2010.

**Heather Kitzman Ulrich** isn’t interested in the blame game, though. The research assistant professor in psychology wants to focus on adolescent obesity, an ambitious goal because it lies in mostly uncharted waters. Most obesity research has focused on elementary school children whose attitudes and responses are quite different than older children.

Ulrich is getting plenty of insight into adolescents as research director for Project ACT, a five-year, \$3 million NIH study aimed at promoting physical activity among sixth graders at 24 middle schools across South Carolina. Her mentor, psychology professor **Dawn Wilson**, is principal investigator of Project ACT, which has shown promise for effecting real change.

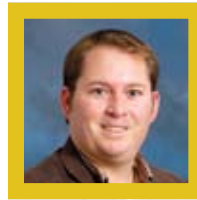
Looking beyond Project ACT, Ulrich envisions a program that will affect a broader swath of overweight adolescents. “My overall goal is to develop a cost-effective, easily disseminated program for overweight adolescents that will have a large impact on a lot of people,” Ulrich said. “We have three preliminary studies underway that could give us solid data for a larger research project.”

The first involves focus groups with African American, Hispanic, and Caucasian families with overweight adolescents. The groups have concurrent and separate sessions with parents and children and discuss what different families want in weight loss goals.

Another study targets parenting skills specific to weight loss behavior. “We want to know how parents are monitoring their kids’ TV watching, for instance. Is it an authoritarian method or a collaborative approach? It’s ironic that kids whose parents ride them about diet and exercise tend to have a higher body mass index,” Ulrich said.

A four-week feasibility trial of an adolescent obesity curriculum will target goal setting, healthy eating, and incorporating physical activity into daily routines.

Ultimately, Ulrich hopes to garner extramural funding for a program that will combine the findings from all three studies and prove effective at the real goal—helping adolescents win the battle of the bulge.



## A bug’s life

Mention the word “microbe,” and people often think of pathogenic germs that spawn infection, disease, and death.

**Sean Norman** has a different take. The assistant professor of environmental health sciences in the Arnold School of Public Health sees the microbial world as “the largest unexplored biological reservoir on Earth,” and notes that most known microbes are either beneficial or benign to humans.

Norman, a molecular microbial ecologist, has a \$774,000 NSF grant to study quorum sensing—the little understood phenomenon of chemical communication among microbes—in natural environments.

“Microbes exchange chemical compounds to communicate, and that regulates everything from how they express their pathogenic traits in the human body to their biodegradation of pollutants in nature,” Norman said. “If we can interrupt that communication, we could possibly interrupt their pathogenic traits or exploit the traits such as bioremediation that are beneficial to us.”

Norman’s NSF grant supports field work in San Salvador and Highborne Cay in the Bahamas where he studies microbial mats, one of the oldest ecosystems on the planet. Harvesting samples of the mats is like cutting slices of thick, slimy pie, he said. The material inside contains a rich mixture of DNA that yields clues to quorum sensing.

Norman also is studying the effects of urban sprawl on watersheds surrounding Columbia, S.C., particularly looking at the ability of bacteria to degrade harmful compounds found in the Congaree River. He’s also studying how pathogenic bacteria are affected by pharmaceuticals that are consumed and excreted by humans.

Another project, this one in collaboration with chemistry professor **Cathy Murphy** and fellow environmental sciences faculty member **Tara Sabo-Attwood**, is aimed at binding nano-sized gold particles to antibodies of the pseudomonas bacteria. The idea is to bind these bionanoparticles to the bacteria, then irradiate infected tissue at a wavelength that would dramatically heat the nanoparticles and explode the attached germ cells.

“It would be a way to kill the bacteria without relying on antibiotics,” Norman said. “The concept is called targeted thermal disruption, and it could be life saver for people with cystic fibrosis who often are attacked by opportunistic bacterial infections such as pseudomonas.” ■

## On the cover

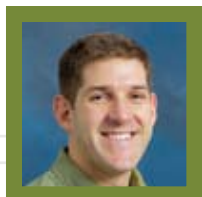
Faculty recruited through the Centenary Plan hail from several disciplines, including chemistry, physics and astronomy, and public health. Their proven strength in research—most have successfully competed for externally funded research grants—has had an immediate effect on the productivity of their academic departments and has benefited the University's overall research enterprise.



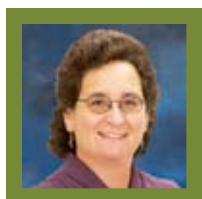
**Sheryl Wiskur**  
Department of Chemistry  
and Biochemistry



**Jianzheng Zuo**  
Department of Mechanical  
Engineering



**Ben Twining**  
Department of Chemistry  
and Biochemistry



**Sandra Altshuler**  
College of Social Work  
Center for Child and Family Studies



**Wayne Outten**  
Department of Chemistry  
and Biochemistry



## Polymer nanocomposite research advances with partners, NSF grant

The University of South Carolina's research on polymer nanocomposites has attracted four industrial partners and a three-year, \$600,000 grant from the National Science Foundation.

The NSF project will team graduate students from chemistry and chemical engineering with International MBA students from the University's Moore School of Business. Together they will work with professors from engineering, chemistry, and business to study problems posed by the industry partners.

The project builds on the University's growing expertise in polymer nanocomposites, the microscopic additives that enhance polymers used to make plastics, fibers, and other materials.

"We're going to be doing technical research in the lab and at the same time doing market analysis and tackling other business issues that our industrial partners have asked for assistance on," said **Harry Ploehn**, a chemical engineering professor in the College of Engineering and Computing.

"NSF doesn't normally fund projects that are so applied, but they're interested in accelerating technology transfer and increasing the efficiency of the innovation process. That's what our polymer nanocomposite research is all about—adding value from innovative research to the polymer industry."

The University's industrial partners in polymer nanocomposites are Eastman Chemical, which makes food packaging plastics; PBI Performance Products, which makes heat- and flame-resistant fibers used in firefighting gear; Mead Westvaco, which makes coated paper for packaging; and Michelin Tire Co. Other Carolina faculty involved in the project are chemistry professor **Hanno zur Loye** and **David Pond**, adjunct research professor in chemistry and biochemistry, and **Bill Sandberg**, a management professor who teaches entrepreneurial studies in the Moore School of Business.

Sandberg believes the NSF project will benefit both IMBA students and science/engineering students.

"We want business students to have a better understanding of the process by which science moves from basic to applied as it goes into the marketplace," he said. "And we're introducing the chemistry and chemical engineering students to business considerations. They're going to be working for industry, and they'll be more valuable if they understand and appreciate those concepts."

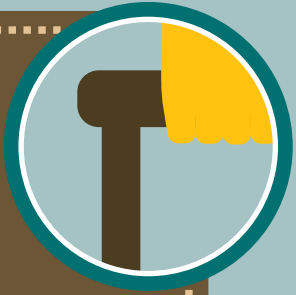
"The tension that exists in research and development in many businesses is between the scientists and the business managers who don't understand each other's time frames or needs. That's why we want our business and science students to work more together."



Future hearing aids might be programmed to detect phone rings, door bells, and other alarms and alert the user in some other way if needed.



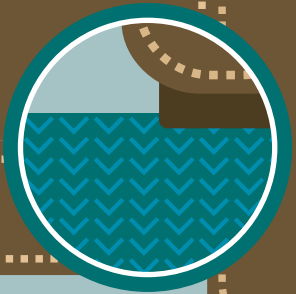
A special cane might "sense" when its user has fallen or is exceptionally unsteady, then notify appropriate medical personnel.



A wristwatch might also monitor a user's vital signs (heart rate, blood pressure, and perhaps even blood sugar levels).



Carpet sensors could be developed to detect trips and falls and alert medical personnel if the home's occupants need assistance.



# Alert and mobile

**New research center aims to keep the state's graying population safe at the wheel and living independently.**

With an aging baby-boomer generation already here and an influx of retirees seeking the good life in a popular sunbelt state, the graying of South Carolina is firmly in place.

And it will become grayer still: South Carolina's 65-plus population is projected to grow by 133 percent between 2000 and 2030. In other words, the timing is perfect for launching one of the University of South Carolina's newest research centers focused on finding ways to help people stay physically mobile, mentally agile, and independent.

The SeniorSMART (Supporting Mobility, Activity, Rehabilitation, Transportation/Technology) Center will concentrate on three themes: SHARP Brain (helping seniors maintain or improve memory and brain function); SMART Wheels (promoting independent mobility outside the home); and SMART Home (helping seniors maintain independent mobility inside the home).

"There are other research centers around the country focused on the elderly, but no one is engaged in all three of these areas together—home, automobile, and brain research," said **Paul Eleazer**, professor of internal medicine at South Carolina's School of Medicine and the center director.

Imagine an "intelligent" carpet that detects when someone has fallen, Eleazer said. Connected to a video camera, the system alerts medical personnel if the fallen person doesn't get up.

Or picture an automobile with sophisticated sensors that monitor the alertness of the driver, temporarily taking over the driving if trouble seems imminent.

Those items aren't commercially available yet, but they're among the many technological possibilities that could be considered by the SeniorSMART Center, which will focus its multidisciplinary research on ways to foster living independence for the elderly.

"This will involve a collaboration of our engineering, social work, public health, and medical schools as well as pharmacy and nursing," Eleazer said. Joining Carolina in the center's research will be Clemson University and Health Sciences South Carolina (HSSC), a public-private partnership of the state's research universities and three major health care systems.

The center has been funded with \$5 million through the state's Centers of Economic Excellence Review Board, which considers research center proposals by South Carolina's three research universities. Matching funds will complement the state funding.

The center's three themes— SMART Home, SMART Wheels, and SHARP Brain—seek to strengthen the three primary foundations of independence for older adults. SMART Home will integrate expertise from social work, geriatrics, neuropsychology, and neurology to focus on development of hard and soft technologies, combined with social support networks, to allow older adults to remain safe in their home environments.

University researchers plan to meet with homebuilders to design elderly-friendly homes with built-in systems that promote independence. "The upfront costs would obviously be lower than trying to retrofit a house later on," Eleazer said.

SMART Wheels will integrate work in automotive design at Clemson University and geriatric disciplines to assess and rehabilitate older adult drivers to improve safety, as well as improving automobile design for older adults.

"Some of the technology developed for the home could be used in cars," Eleazer said. "The idea is to help older people maintain their ability to safely operate a vehicle, and to rehabilitate those who have temporarily lost that ability due to stroke or some other impairment."

SHARP Brain will team up experts in nutrition, exercise, geriatrics, neuropsychology, and neurology to focus on maintaining and promoting brain health while reducing the impact of diseases such as Alzheimer's, Parkinson's, and stroke.

"We want to promote brain health and prevent its decline," Eleazer said. "So some of the research might weigh the advantages of doing crossword puzzles versus math puzzles. Is it better to do these activities while seated or while walking on a treadmill? What mental exercises will improve cognition?"

Working with Eleazer will be **Dennis Poole**, dean of Carolina's College of Social Work; **William Logan**, director of geriatrics at the Greenville Hospital System; **Victor Hirth**, Carolina/Palmetto Geriatrics; **Johnell Brooks**, Clemson University; **Harriett Williams** and **James Laditka**, Carolina's Arnold School of Public Health; and **Judy Baskins**, Palmetto Health/Carolina.

"As increasing numbers of people reach their senior years of life, it's essential to provide ways for them to maintain their independence as long as possible, said **Paula Harper Bethea**, S.C. Centers of Economic Excellence Review Board chair. "This center is an important step in taking care of our aging population." ■

## Comet theory, Clovis research, and a Carolina archaeologist

**Al Goodyear** is no stranger to archaeological controversy. His Topper dig site in Allendale, S.C., has unearthed evidence—met with skepticism by some and embraced by others in the archaeological community—of human occupation in South Carolina 50,000 years ago, long before the last ice age.

Last year, the Topper Site on the banks of the Savannah River was in the news again. A theory proposed by 25 geo-scientists purports that a comet exploded over Canada nearly 13,000 years ago, possibly wiping out both beast and man and pushing the earth into another ice age. And they say evidence of the comet's collision is present at Goodyear's Topper Site.

Goodyear, a research professor in the University of South Carolina's Institute of Archaeology and Anthropology, has found numerous stone tools that were used by Clovis people, who lived 13,100 to 12,900 years ago, and

from the Redstone people who emerged afterwards. "I saw a tremendous drop-off of Redstone points after Clovis," Goodyear said. "When you see such a widespread decline or pattern like that, you really have to wonder whether there is a population decline to go with it."

Archaeologists have long known that the woolly mammoth and mastodon suddenly disappeared around the same time period 12,900 years ago, but their demise was thought to be the result of over-hunting by Clovis people or climate change associated with a new ice age.

The idea that a comet collided with Earth and caused these events was farfetched until scientists began looking for evidence of a comet impact, which they call the Younger-Dryas Event. They turned to Goodyear and the pristine Clovis site of Topper.



Lead Technician Daniel Sisco, left, works with the Roche Genome Sequencer FLX System; Lab director Joe Jones is at right.

## EnGenCore laboratory features cutting-edge DNA equipment

The University of South Carolina's newest research lab—the Environmental Genomics Core Facility—is open for business with an array of DNA-analyzing instruments second to none in the Southeast.

The facility, dubbed EnGenCore by its staff, is located in the Arnold School of Public Health Research Center and focuses on gene expression and gene discovery. The lab is open to University researchers and to outside users on a fee-for-use basis.

One of EnGenCore's biggest draws is a next-generation genome sequencing instrument capable of large-scale projects.

"The Roche Genome Sequencer FLX is our pride and joy," said **Sean Norman**, an environmental health sciences faculty member at Carolina. "It can sequence a bacterial genome in seven hours—one-hundred million bases. That would take several weeks if not months on a standard piece of equipment. We're the only lab in South Carolina with this instrument, one of only a handful in the world."

To handle the massive amounts of data that the genome sequencer generates, a Linux-based computer cluster with 64 processors is set up with appropriate software for analysis.

On the environmental front, scientists studying the state's rivers and other ecosystems will use the lab to determine the genetic effects of pollutants on organisms and explore other issues in the environment. But the scope of scientific questions the facility can address extends much further.

**Phil Buckhaults**, a University of South Carolina School of Medicine faculty member and scientist at the S.C. Cancer Center, has used EnGenCore to identify 100 new genes related to cancer development in the breast and colon.

"If you look at a dozen metastatic tumors and a dozen non-metastatic tumors and find the same gene in the metastatic tumors, you know that gene is responsible for metastasis," he said. "That would have taken many, many months the old-fashioned way—this machine did it overnight."

Discovering the new genes is an important scientific discovery—Buckhaults' findings have been published in a major journal—but the future implications are even more important, he said. "This methodology will revolutionize the way cancer patients are diagnosed and improve the information from which treatment decisions are made," Buckhaults said. "It will be a tremendous aid to oncologists as they look at the individual needs of each cancer patient."

**Tara Sabo-Attwood**, an environmental health sciences faculty member, is using another instrument in the facility—the Affymetrix microarray platform—to probe the entire human genome for changes in the expression of gene transcripts associated with toxicity of nanoparticles to better understand their potential human health impacts.

Norman has used the facility to complete the first-draft genome sequence of a sulfate-reducing bacterium. Identifying the genome composition will help scientists understand how the bacteria functions in natural ecosystems where it is involved in the biodegradation of pollutants and global biogeochemical cycles.

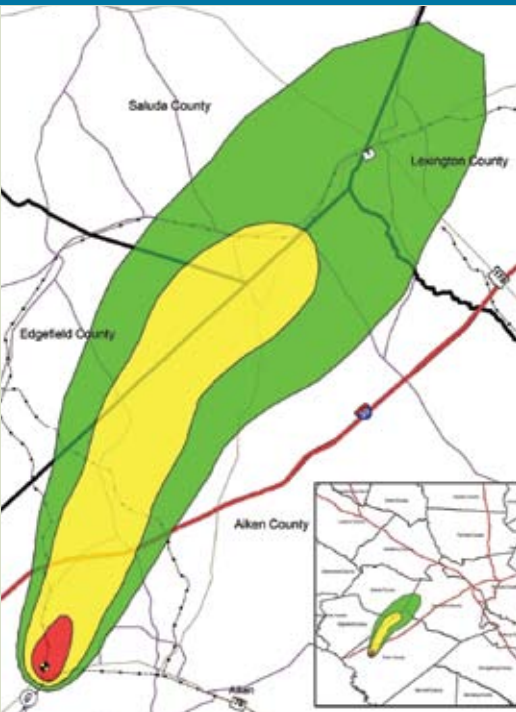
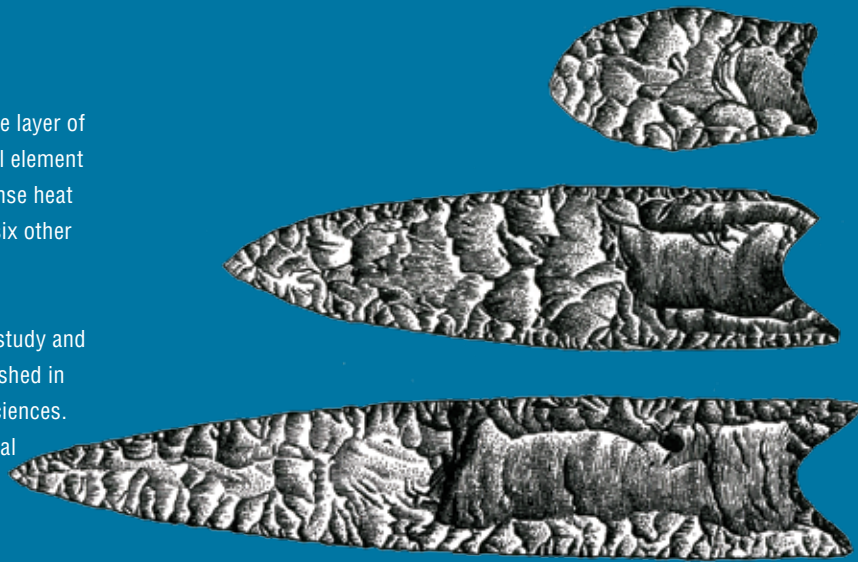
Other potential users of EnGenCore include pharmaceutical companies, biotechnology firms, hospital systems, and environmental consultants.

**Joe Jones**, formerly a scientist at Monterrey Bay Research Aquarium, is director of EnGenCore. To learn more about the facility, go to [www.sph.sc.edu/engencore](http://www.sph.sc.edu/engencore).

Arizona geophysicist **Allen West** traveled to Topper and found in the layer of Clovis-era sediment high concentrations of iridium, an extra-terrestrial element found in comets, and nano-diamonds thought to be related to the intense heat of impact. The researchers also found high iridium concentrations at six other Clovis sites throughout North America.

The comet theory dominated the 2007 meetings of the American Geophysical Union held in Mexico. Goodyear's Clovis-Redstone point study and West's research on the comet were featured at the meetings and published in the September 2007 of the proceedings of the National Academy of Sciences. The comet will be the subject of documentaries featured on the National Geographic Channel and NOVA television in early 2008.

At right, a Clovis point, top, (13,000 years old), and Redstone points (12,800 years old)



Above, A plume dispersion map shows the extent of the chlorine gas cloud's exposure level in South Carolina communities.

Below, scene of the tanker car accident in Graniteville, S.C.



Image courtesy of The Augusta Chronicle

## Follow-up in Graniteville: more scientific studies needed

Nearly three years after the nation's deadliest chlorine spill in Graniteville, S.C.—nine killed and 72 hospitalized following the Jan. 6, 2005, event—a University researcher continues to spearhead efforts to assess the long-term health effects on the hundreds who were exposed.

**Erik Svendsen**, an epidemiology and biostatistics research professor, works with colleagues at South Carolina and at the S.C. Department of Health and Environmental Control where he holds a joint appointment as state environmental epidemiologist. Much of the initial work in Graniteville involved health screenings and referring residents for follow-up medical attention.

“We first came into the Graniteville community with the attitude of ‘Let’s help,’ not ‘Let’s study,’” Svendsen said. “That was the right thing to do, and it went a long way in earning their trust. Now that the initial crisis is over, it might be an auspicious time to see what more we can learn from this long term.”

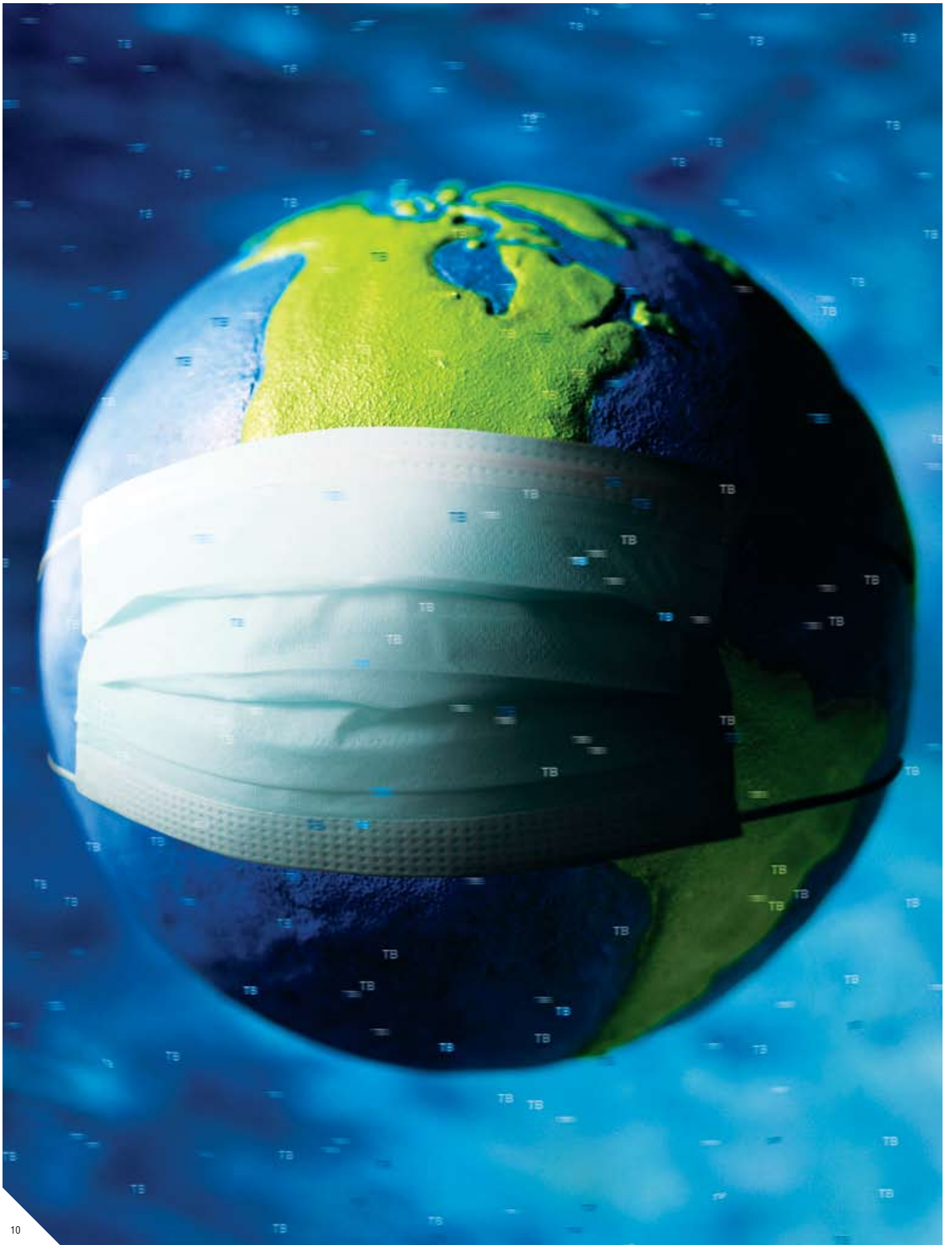
Svendsen, in his dual roles with the University and with DHEC, is introducing science into health department practice, which traditionally focuses on treatment only. “The idea is that since DHEC is already going to work with a community or a population [that is dealing with a public health issue], let’s also learn something from it that will contribute to the scientific body of knowledge.”

Svendsen recently received a three-year, \$450,000 Career Development Award from the Centers for Disease Control. As part of the award, Svendsen will be mentored by seven scientists from Carolina and other institutions, including University epidemiology professor **John Vena**. He plans to use a portion of the award to fund more staff support to tackle some of the scientific aspects of the Graniteville incident.

A health registry begun in July 2005 now includes 958 names, about 70 percent of the total number exposed to the 60 tons of chlorine gas that escaped from wrecked railroad tanker cars. A plume dispersion model (at left) was created to show which areas were exposed to significant levels of chlorine gas. Before completely dissipating, the two-mile-long plume traveled eastward from Aiken County into Lexington County and parts of Edgefield and Saluda counties.

“Half of the people initially screened showed decreased lung function; one-fourth tested positive for inflammation of their airways,” Svendsen said. “The plume model also helped us to understand why some people could smell the gas, but were not exposed to levels significant enough to cause health effects.”

Along with University colleagues in public health, engineering, and the Center for Public Health Preparedness, Svendsen also has consulted with scientists who conducted research at the Bhopal chemical disaster in India and at a toxic incident in Germany.



# Fighting back

Carolina researchers are helping reshape global fight against TB.

The cure for tuberculosis (TB) has existed for 50 years. Yet one-third of the world's population has been exposed to the TB bacterium that causes the disease, which commonly attacks the lungs and kills 1.6 million people worldwide every year. It's the leading cause of death from infectious disease.



Lòpez-De Fede

"TB anywhere is TB everywhere," said **Ana Lòpez-De Fede**, research associate professor at the University of South Carolina Institute for Families in Society and a leading TB researcher. "It's an airborne disease, which means we are all at risk."

Lòpez-De Fede is a TB researcher, funded by the Centers for Disease Control (CDC), and a member of the National Advisory Council for the Elimination of Tuberculosis, appointed by the federal Health and Human Services secretary.

"As a council, we provide oversight of all efforts to combat tuberculosis," Lòpez-De Fede said. As a researcher, she was among the first to receive CDC funding to study the social and cultural determinants of TB.

Lòpez-De Fede's efforts are needed now more than ever. Some 150,000 South Carolinians are believed to be infected with TB, which is the highest number of TB cases in the Southeastern United States. Within the past 10 years, there has been a drastic increase in TB among African-Americans in the United States, especially in South Carolina, which ranks third nationally in the number of cases present within the African-American population.

## Re-emergence of TB as a public health threat

In the 1960s, TB was no longer considered a public health threat, so the focus—and research funds—shifted to other areas.

"The CDC (Centers for Disease Control) pulled out all funding for TB," Lòpez-De Fede said. "Then we were hit with the AIDS epidemic."

Most people who die with AIDS actually die from TB. Groups most at risk for TB include those whose immune systems are compromised, those who have health complications such as

diabetes and high blood pressure, people who are malnourished, those who stress their bodies through substance abuse, and people in geographic locations where there are active TB cases. TB can flourish where people live close together, such as nursing homes and prisons.

Even when TB wasn't a concern in the United States, the disease was still present—and killing people—in other parts of the world, Lòpez-De Fede said.

Two things have since led to TB's re-emergence in the United States. Though TB is curable, the cure requires drugs that must be taken with regularity for up to a year. People in poor countries frequently have limited and sporadic access to these drugs, and their course of treatment is often not completed—they are not cured, and the bacteria's exposure to antibiotics promotes drug-resistance. At the same time, increased world travel and immigrating populations have helped to spread the disease, including into the United States.

"TB becomes drug resistant when the antibiotics that are our first line of defense don't work. People stop and start treatment. TB suppresses itself again, and then comes back more forcefully," Lòpez-De Fede said.

Since TB anywhere is TB everywhere, what is the best way to protect the public health?

"Here in the United States, TB infection rates are so low that there is no need for universal screening," said Lòpez-De Fede. "A better strategy is to screen high-risk groups."

The most high-risk groups have been immigrants from countries where the disease is present, such as Russia, Africa, and Thailand. That's where public health officials have put their resources. But another segment of society is now experiencing a TB comeback: African-American communities in the Southeastern United States.

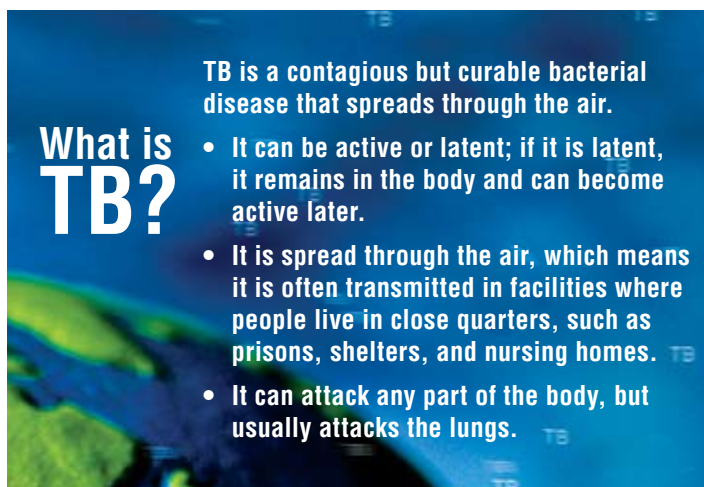
Carolina researchers such as Lòpez-De Fede are taking a multifaceted approach to examine the factors that contribute to this re-emergence, particularly in these high risk populations, and developing methods to address them.

López-De Fede's research, in collaboration with the CDC and South Carolina's Department of Health and Environmental Control (DHEC), explores why these populations are experiencing high rates of infection—and also why they are resisting treatment. The study compares three sites in South Carolina, Georgia, and Chicago.

"We can genotype the TB strains, so it made sense to look at these three areas because there is a lot of movement among the African-Americans between these Southeast and Northern geographic pockets," López-De Fede said. "Our job was not only to look at communities, but also to look at common themes that ran across the TB cases."

What the researchers found was that there are many barriers to diagnosis and treatment for infected African-Americans. Many were exposed to TB and unaware of it.

"If you're exposed, it's important to get treatment," López-De Fede said. "One individual in five who has a latent form of the disease will develop symptoms within five to ten years."



**What is TB?**

**TB is a contagious but curable bacterial disease that spreads through the air.**

- It can be active or latent; if it is latent, it remains in the body and can become active later.
- It is spread through the air, which means it is often transmitted in facilities where people live in close quarters, such as prisons, shelters, and nursing homes.
- It can attack any part of the body, but usually attacks the lungs.

"We know that because TB is so rare in this country, many doctors don't recognize it at first," she said. But many people in these groups did not get or complete treatment. Why?

The study conducted individual interviews, focus groups, and involved opinion leaders, such as ministers and legislators, as they searched for commonalities between the cases. One key informant was a woman who ran a local bar where many of the infected people gathered. Fifty percent of the cases in that geocoded area were patrons of that bar.

"A good many of these people were being treated and getting re-infected," López-De Fede said.

But that wasn't all. There are many obstacles to the diagnosis and treatment of TB in African-Americans living in poor, rural areas. Lack of knowledge about the disease, social stigma, fear of rejection and isolation, and the long duration of the treatment makes treatment difficult for this already marginalized group in society. The problem is compounded for people already struggling with substance abuse and addiction.

"TB is still not widely understood. Because of the stigma that TB is associated with HIV/AIDS, people infected with TB would not tell others that they had the disease even if they didn't have HIV/AIDS," López-De Fede said. "For many of the people in our study, they wouldn't tell us who they were socializing with—they didn't want to."

This made locating potentially infected people more difficult. Frequently, TB infected multiple generations of the same family.

"What our research did was provide a framework for how we can provide effective treatment that is culturally appropriate, whether or not you have health insurance. We focused on how to remove the barriers to diagnosis and treatment," López-De Fede said. "TB is here. It is a threat we can do something about. What we need to do is be sure the individual enters treatment and completes treatment."

**Gail Burns-Grant**, project officer at the CDC in the division of TB elimination, said research findings from López-De Fede's project are important in the fight against the disease.

"Ana's work didn't focus on the interventions, but it was very important in helping us realize what we need to do nationally in project areas that have a high rate of TB in U.S.-born African-Americans, in the places where it is now emerging," Burns-Grant said.

"U.S.-born African-Americans and foreign born people have a disproportionate rate of TB infection. With Ana's work, we realize that though there are similarities in what we need to do to treat these population segments, there are differences. Her work showed us that we must ensure that the interventions we roll out with our partners are culturally appropriate.

"People like to blame marginalized people for the disease," said López-De Fede. "But the truth is that we do a poor job of protecting them. We can never think public health issues are just domestic. We must have a global perspective."

## Medical School Researchers Test New TB Screening Test in Field

Traditional TB screening protocols present their own barriers to diagnosis and treatment. Public health officials look forward to the day when QuantiFERON®-TB Gold is in widespread use.

This new TB screening test, which was field tested by Carolina researchers, is faster and more accurate than the old skin-prick test. QuantiFERON®-TB Gold is a blood test that requires one patient visit, unlike the skin-prick test, which requires a follow-up visit for test interpretation. The new blood test gives results within 24 hours, and, unlike the tuberculin skin test, doesn't have the potential to trigger the body's immune responses, which might cause a false positive in a later TB test.

The work on QuantiFERON®-TB Gold is being spearheaded by **Robert Best** and **Anthony Gregg** in Carolina's Department of Obstetrics and Gynecology and holds great promise in the fight to eliminate tuberculosis.



## Fetal nicotine exposure might correlate with future drug abuse

Children whose mothers smoked while pregnant might be more susceptible to abusing cocaine and methamphetamine as adolescents, said a University psychology faculty member who is studying the phenomenon.

**Steven Harrod**, an assistant professor of psychology, is focusing on the neurobiological correlates of fetal nicotine exposure, using a four-year, \$1 million grant from the National Institute on Drug Abuse. He has hypothesized that such exposure makes adolescents, particularly females, more vulnerable to abusing brain-stimulating drugs.

"I'm interested in understanding the neurobehavioral changes that might happen as a result of nicotine exposure in the womb," said Harrod, who uses rodent models to mimic the rate and intensity of exposure. "Epidemiologists have previously shown that only 30 percent of female nicotine-dependent smokers actually quit smoking during pregnancy."

Harrod's model reproduces the brain spikes of nicotine exposure that mimic actual smoking behavior. He surmises that gestational nicotine exposure will later increase the stimulant effects of cocaine and methamphetamine in adolescent brains.

"Does that mean that every adolescent who was exposed to nicotine in the womb will go on to abuse such drugs? Of course not, but it could alter their neurotransmitters in such a way as to make them more vulnerable to psycho-stimulants if they ever experiment with them," Harrod said.

Neuroscientists have identified a motivational circuit in the brain that is fed by brain chemicals and which affects mood and reinforcement of behaviors. It's possible that fetal nicotine exposure might alter this circuit in a way that would reinforce drug-abusing behavior.

"If you're going to create some kind of pharmacotherapy to help adolescents who are abusing drugs, you have to understand all of the neurobiological variables," Harrod said. "This kind of basic research is aimed at trying to understand the complex world of drug-taking behavior."

"The reason I'm looking at adolescent drug use is because drug abuse doesn't start in adulthood—it begins during adolescence."

## TB Photovoice

While TB gets attention from public health and the medical communities, another Carolina researcher is helping to connect health professionals with the victims of the disease, giving it a human face and voice.

**Romel Lacson** created the Amaya-Lacson Tuberculosis Photovoice Project (TB Photovoice Project) at Carolina's Arnold School of Public Health in response to the death of his wife, 38-year-old Atlanta physician Claudia Amaya-Lacson, from TB in 2004. Amaya-Lacson probably contracted TB through her work at a sanitarium in her native Colombia, yet was not diagnosed until the disease had progressed too far to save her or the baby girl she was carrying.

The TB Photovoice Project gives TB patients a voice and a way to document how the disease has affected them. Each participant is given a camera to photograph their lives while in treatment.

Ultimately, they present their photographs and oral testimony to health professionals at conferences, making the first connection between the people who are struggling with the disease, its treatment, and the public health officials who are making policy that directly affects them.

"The project brings a voice that has been socially excluded," Lacson said. "It brings opportunities for people to be advocates for their health concerns."

Photovoice participants recently participated in the Southeastern TB Controllers Regional Conference. "This is the first time that people living with TB have been able to speak at this level about their experience," Lacson said.

"They shared what it was like to tell family members, take the meds, be excluded from family and friends and not be supported during this difficult time. They told what it was like to try to get their old jobs back and being rejected. You saw these real people go through this experience and you had to ask yourself, 'Why isn't something being done?'"

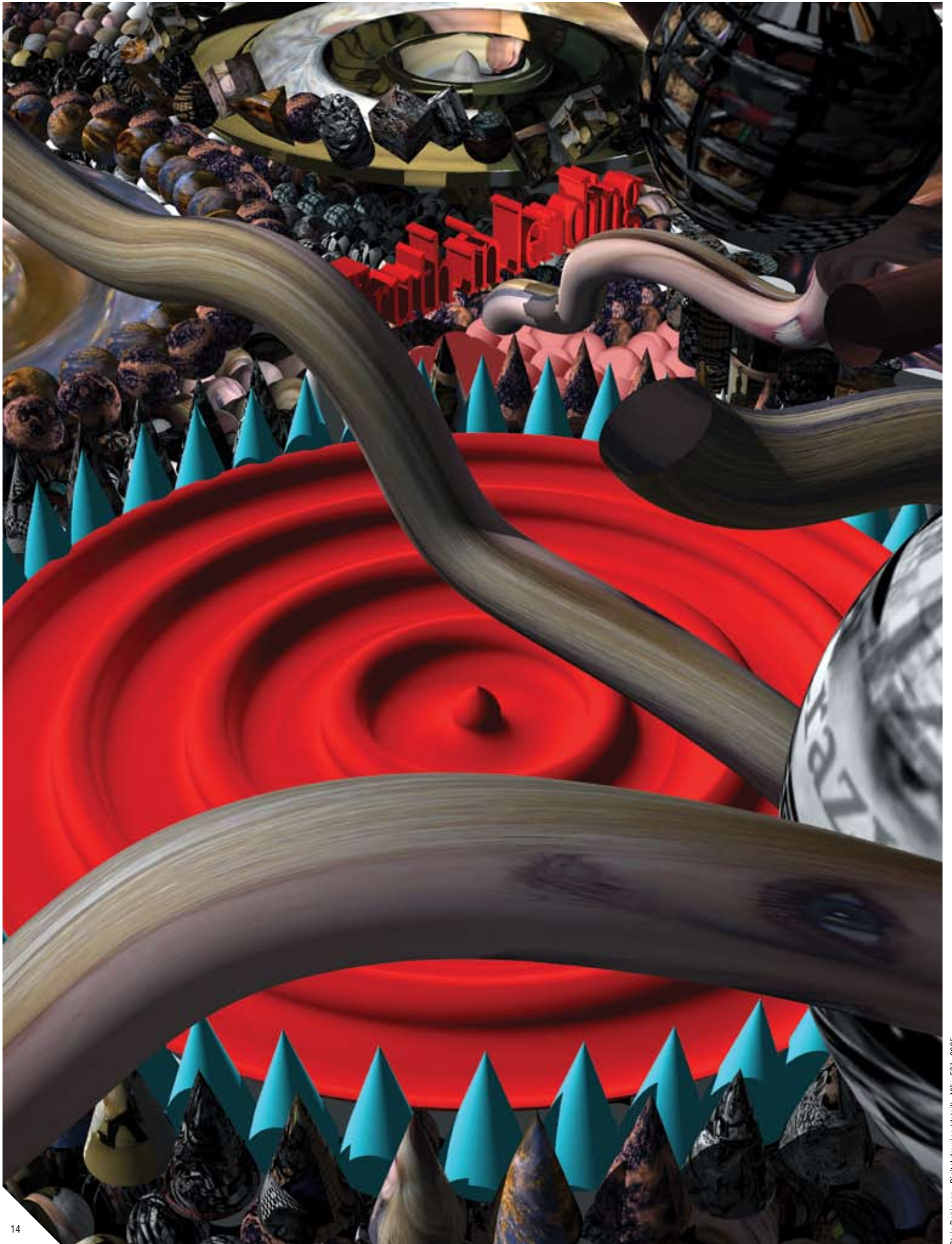
There are four TB Photovoice Project sites across the globe in Thailand, Brazil, Texas-Mexico border, and Florence, S.C., with more sites anticipated.

Participants and coordinators from each of the TB Photovoice Project sites also participated in the 38th Union World Conference on Lung Health of the International Union Against Tuberculosis and Lung Disease in Cape Town, South Africa last November.

"People who have suffered from TB want to help other people by serving as patient advocates. They want to give back, and this is one way that creates an opportunity," Lacson said. ■



Ana López-De Fede, TB Photovoice Director, with TB patients in Cape Town, South Africa, during a march for TB prevention and treatment in November.



## Poiesis

*Poetry is made  
not of simple  
strokes or simple  
thoughts. Poetry  
is made of connections.  
It is an extracellular  
matrix that forms  
a web around ideas  
and allows them to live  
and reflect light  
like nanoparticles  
to those who look.*

# Biology, poetry, and nanorod marimbas

## Science and the humanities meet in the research lab.

Through modern history, the realm of science has been the exclusive domain of scientists. Others need not apply. Scientists worked in their own insulated environments, spoke their own language, and published papers intelligible only to their own kind.

Today, a new way of looking at science—of doing science—is taking root in this country, and we can see it at work at the University of South Carolina. A cell biologist, a chemist, a mechanical engineer, and an artist, along with students majoring in epidemiology, American literature, poetry, international relations, music, and computer science are all taking part in the same science project.

This gathering of unlikely collaborators reflects a new trend in the allocation of science grants. In addition to funding pure and applied science, the National Science Foundation also seeks a “broader impact.”

“Those of us who receive NSF funding are not only responsible for doing good science,” said South Carolina mechanical engineering professor **Sarah Baxter**, “today we’re also responsible for extending the educational process and for interacting with nonscientists.”

As principal investigator, Baxter is an integral part of a project that holds significant promise for medical science.

**Left:** This is a digital drawing parodying an iconic image in nanotechnology (Quantum Corral, STM image of iron on copper) by IBM scientist Don Eigler. The central image mimics Eigler’s use of Scanning Tunneling Microscopy (STM) to arrange 48 iron atoms into a ring to ‘corral’ some surface state electrons and force them into quantum states and the resulting electron wave.

## Measuring cell behavior

Living tissue responds to mechanical loads. Lift weights regularly, and your muscles get larger.

“During developmental stages, some of the forces that tug and push on things cause stem cells to differentiate into one type of cell or another,” Baxter said.

When, for example, a heart muscle becomes injured by a heart attack, some of the cardiac cells sense a change in their environment. As a result, they often deposit more collagen—a protein that forms connective tissue—to form a stiffened patch where the damaged cells have died. But that patch can actually impede the proper functioning of the heart.

Cells remodel their environment by applying forces and inducing strains. They interact with collagen, for example, by grabbing it, rearranging it, and sometimes making more of it. Learning how that process works—and how much of a strain cells can create—might help develop cell therapies involving mechanical stimulation rather than surgical procedures.

“If we can understand what kinds of strains are normal in a heart, we can then try to figure out what kinds of strains are not normal,” said **Cathy Murphy**, Guy F. Lipscomb professor in the Department of Chemistry and Biochemistry and a co-PI. With that understanding, scientists could perhaps control those cardiac cells, prevent the accumulation of excess collagen in the heart, and thereby maintain the heart’s function.

## The poetry of science

"I guess one of the main reasons I'm interested in poetry is because I want to find unique ways to communicate ideas to other people, and this [participant-observer] project involves doing just that," said MFA student **Julia Koets**. "Poetry, I believe, also seeks connections, sometimes between things that do not at first seem related, such as science and poetry."

Koets, who is concentrating her studies on poetry at the University of South Carolina, is merging science and poetry as she takes part in the NSF-funded cell biology project described in the accompanying article. Here is a sampling of her work.

### In Vivo

*We, artists, chemists, mechanical engineers, humanists, are seeking truth even though some see colors and others see numbers, graphs mapping the displacement of cells, fibroblasts undulating in collagen gels under darkfield optical microscopes. Gold nanoparticles reflect back these movements, the measured tension and compression of cells looking, adapting, knowing through pulls and retractions what surrounds them and how they will react. You can measure and know these cells, our inter-workings. But can you, can I understand why I see blues, reds, and oranges where you see shades in twos, hundreds, and fifties.*

To determine those strains, the researchers must measure the local mechanical fields. They are taking cardiac fibroblasts and placing them in a collagen gel, or matrix. (Fibroblasts, often referred to as "builder cells," aid in tissue repair.) Co-PI **Edie Goldsmith**, assistant professor in the School of Medicine's Department of Cell and Developmental Biology and Anatomy, runs a lab that isolates the fibroblasts and prepares the collagen gel. "Understanding how these cells physically interact with and deform that collagen may provide insight into therapies that could be developed in the future," Goldsmith said.

The next step entails sprinkling gold nanoparticles onto the cells and matrix. These nanoparticles, or nanorods, developed in Murphy's lab, are able to scatter light, a characteristic that makes them particularly useful in measuring the local mechanical fields. The assumption at work here is that when the cells reach out and grab and move things, the nanoparticles also move. Measure and compare the movements of those pinpoint of light, and you can calculate the strains. The researchers rely on a brightfield-darkfield microscope, a specialized optical instrument, to visually track the movement of the nanorods, and then use computer software to analyze the results.

While this description makes the process seem straightforward, things are not necessarily that easy. "It takes a while to get all of the conditions right," Murphy said. "We need to get enough movement in the matrix to be able to measure these really delicate strain fields."

### Visualizing the very small

To meet the NSF's broadened grant guidelines, Baxter, Murphy, and Goldsmith called upon an artist to join them. **Chris Robinson** is a professor of studio art in the Department of Art, a co-PI on the Nanotechnology Interdisciplinary Research Team, and a member of the University's NanoCenter. And, as a co-PI on the current project, he brings a unique talent to the effort.

"I am, of course, interested in making fine art," he said, "but I've also found myself delving into standard scientific visualization and doing some sort of basic graphic design."

He takes the existing microscopy images and enhances them for better visualization and to improve communication of difficult concepts. For example, the scientific community still sees disagreement about what shape an atom or molecule actually takes. If scientists themselves have trouble grasping such concepts, surely the lay public does, too.

"I think an artist can be sort of a contemporary mediator," Robinson said, "by putting some of this information into visual form."

### Seeking other views

The co-PIs invited various nonscientist students—people not normally supported on NSF grants—to be participant-observers who attend project meetings, follow the professors and science students around the labs, and become immersed in the concepts and language of science. But don't mistake their roles as merely passive ones.

## Plasmon Band

*Electrons oscillate across metal  
conduction bands like children  
rubbing their hands over the ocean sand  
right at the shore where the night foam  
melts under their feet. They rub their hands  
across the sand, revealing dinoflagellates,  
phytoplankton producing a bioluminescence  
that glows like undiscovered stars on Earth.*

"We told them, 'We want you to communicate science through your own disciplines, to reflect our stuff in yours,'" Baxter said. Each of the participant-observers attends the University.

**Julia Koets**, an MFA student in poetry, is taking her learning experience in science and incorporating it into her own poetry. [See sidebar.]

**Andrew Hoskins** is working toward his MA in international studies and is writing a journal paper on how the international community is reacting to nanotechnology, which he thinks might be the next big battleground in international relations.

**Brad King**, working toward an MA and Ph.D. in American literature, is exploring—and writing about—the role of discourse and communication in the project's research practice. He will lead a panel discussion and a reading session on this topic this semester.

**Jennifer Davis**, an MS student in epidemiology, developed an interest in ethics and science. She attended a conference on "Ethics in Science and Technology" and presented what she learned at the event.

**Alex Wroten**, pursuing a BS in music composition and computer science, is intrigued by how both music and science can be described by numbers. He's drawing music out of the project's numeric research data and creating a "virtual marimba." "It's an intriguing question," Baxter said: "What sounds would a nanorod marimba make?"

Why are such efforts important? "It would be nice to let others know there are individuals who are trying to bridge the gap between the hard sciences and the humanities," Goldsmith said. "The NIH and NSF get their money from taxpayers, and it's important that those taxpayers and society understand what we are doing with that money, how it's going to benefit them, and why they should invest in the science," she said.

Baxter hopes that the science and engineering students also benefit from the interaction with the other disciplines; making them more effective communicators, allowing them to see first hand the different ways scholarship takes shape, making them aware of other styles of learning.

"Collaborations of this kind represent a wide-open realm," Robinson added. "I think there's nothing but opportunity here." ■



Prakash Nagarkatti, right, and Mitzi Nagarkatti

## NIH establishes center to study complementary medicine

A \$6 million federal grant has put the University of South Carolina School of Medicine among the forefront of institutions studying alternative and complementary medicine.

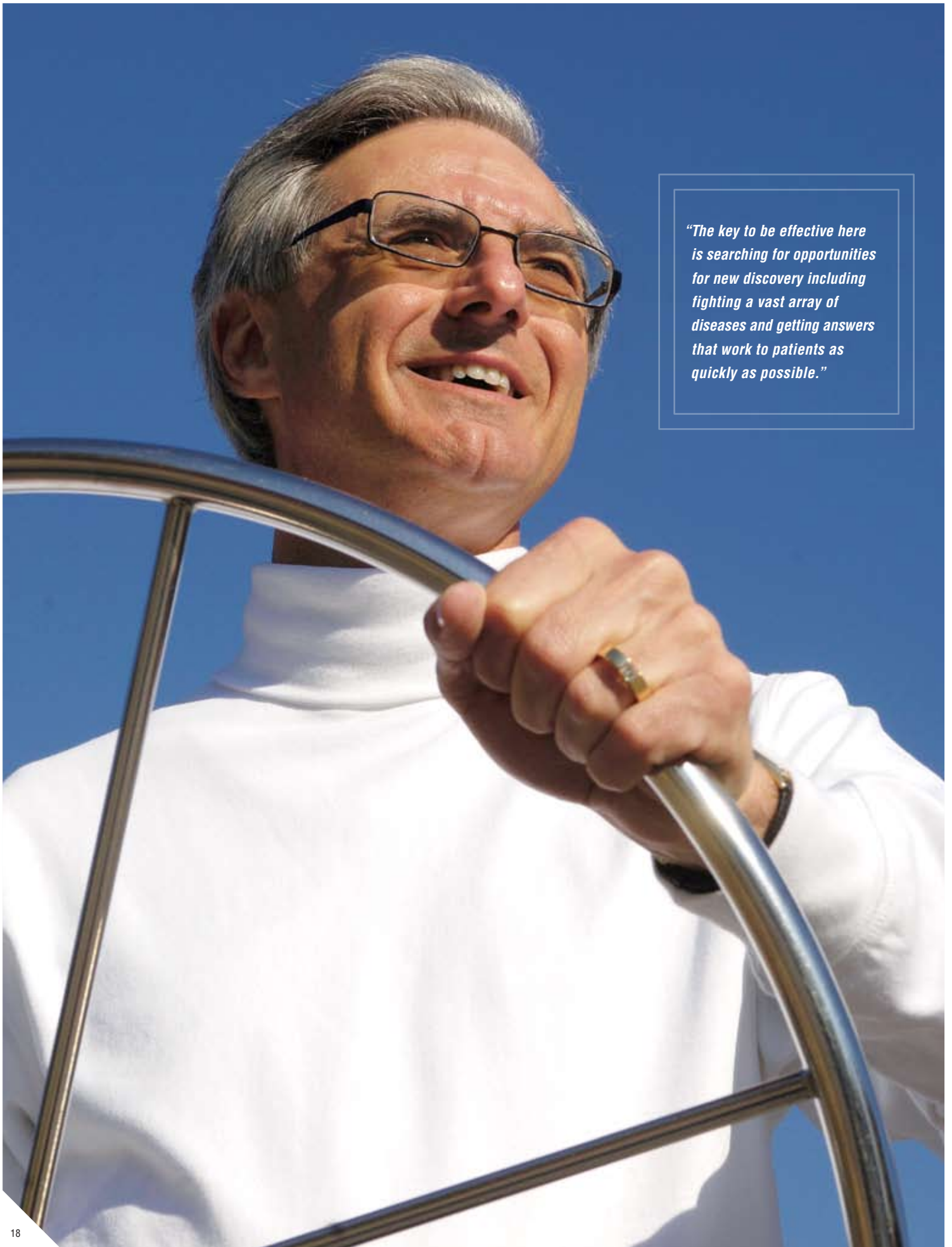
The National Institutes of Health grant has created a Center of Excellence for Complementary and Alternative Medicine Research on Autoimmune and Inflammatory Disease, joining other NIH-sponsored centers at Harvard Medical School, Massachusetts General Hospital, Oregon State and Temple universities, and the universities of Maryland, North Carolina, and California at San Francisco.

**Prakash Nagarkatti**, associate dean for basic science at South Carolina's School of Medicine, is the principal investigator and will lead the study on the mechanism by which resveratrol, a compound in the skin of red grapes, might help treat multiple sclerosis. **Mitzi Nagarkatti**, chair of the medical school's Department of Pathology and Microbiology, will study how a compound in hemp might be useful in treating autoimmune hepatitis. **Lorne Hofseth**, an assistant professor in the S.C. College of Pharmacy, will study the anti-inflammatory properties of American ginseng in treating colitis.

"One day, a compound in red grapes might be just what the doctor orders to treat multiple sclerosis," Prakash Nagarkatti said. "Colitis might be treated with American ginseng, and a compound from hemp oil could treat autoimmune hepatitis."

Prakash Nagarkatti said research to explore the benefits and risks of alternative and complementary medicine is vital because Americans spend billions of dollars each year on treatments and products outside conventional medicine.

"We need to know what's effective," he said, "and what products and treatments complement traditional medicine. The centers established by NIH are focused on the biological effects of specific compounds from plants and how they affect the treatment of specific diseases."



*“The key to be effective here is searching for opportunities for new discovery including fighting a vast array of diseases and getting answers that work to patients as quickly as possible.”*

# Full steam ahead

The School of Medicine's new dean is charting a course for research growth and continued teaching excellence.

When **Don DiPette** took the helm as dean of the University of South Carolina School of Medicine, he boarded a ship already moving full speed ahead.

He arrived in Columbia to find an organization with growing national strengths in ultrasound technologies, neurosciences, cancer, geriatrics, and cardiovascular research.

He also inherited a school that, within the first four months of his tenure, saw 1984 graduate and family and preventive medicine chair **Libby Baxley** receive a prestigious national teaching award from the American Academy of Family Physicians; received the largest grant in the school's history and the University's first nationally competitive center grant; and had 1981 graduate **Caughman Taylor** named chair of a nationally recognized Department of Pediatrics and senior medical director for the new state-of-the-art, free-standing Palmetto Health Children's Hospital.

DiPette will be the first to say this is the reputation that drew him to South Carolina. Few course corrections required; simply a new captain to keep pushing forward and foster steady growth of all three missions of the school: education, research, and clinical care.

"As with all young medical schools, we're great at education. It's our first mission, and it's typical to dedicate resources, energy, and time to build an exceptional educational platform," DiPette said.

But he warned the school won't take anything for granted, noting that medical education changes with technology. He emphasized its current vertical curriculum in ultrasound.

"The program that [former interim dean] **Dick Hoppmann** started last year gives us a huge opportunity to make a lasting contribution to medical education in the way that students interact with technology," he said. "It's a tremendous addition to the practice of medicine and it adds to the fun factor of becoming a doctor."

DiPette stressed the school's soon-to-open, state-of-the-art simulation center in partnership with Palmetto Health and innovations in plasticization in conjunction with traditional methods of teaching gross anatomy as further examples of the flexibility of the education module. The new dean will also evaluate and enlarge graduate programs and core residencies. "I believe we will expand opportunities for South Carolinians to stay in Columbia to continue training," he said.

Additionally he plans to increase the medical school class size over time. "It's not imminent, but as we live longer, and hopefully healthier lives, we will need to be prepared to meet the inevitable increasing physician manpower needs. Because we partner with community physicians as faculty, we're ideally positioned to expand our class size in a cost effective manner."

He expects to accomplish these educational goals in part through strategic partnerships. "We've always had a culture of collaboration and embracing collaborative technologies with partners like Midlands Technical College, Palmetto Health, Greenville Hospital System University Medical Center, and the University's Colleges of Nursing and Pharmacy and Arnold School of Public Health just to name a few."

DiPette has a defined focus on the school's clinical responsibilities. He believes the unique merit the school can bring to the community is attracting marquee physicians who complement rather than compete with existing doctors. "This approach clearly adds value. It brings in new science and new services and it also enhances the health of our citizens." He believes this effort will also aid the possibility of expanding fellowship programs. To start new fellowships, he said, the school has to bring in people who are physician scientists familiar with academic curricula.

Basic science and clinical research and collaboration within the University are where DiPette sees the school's "golden

opportunities” and a chance to significantly contribute to the University’s overall research stature. But he points out, for an institution that had chiefly been known for turning out primary care physicians, the School of Medicine already has a good research reputation. “We’ve already had nationally known investigators knocking on our door because they’ve heard we have momentum and that’s exciting to them.”

Linking basic science and clinical investigations is not only a national trend, but also one of the dean’s goals. The merging of the two leads to translational research, often called bench-to-bedside research. “The key to be effective here is searching for opportunities for new discovery including fighting a vast array of diseases and getting answers that work to patients as quickly as possible.”

DiPette’s research ambitions got off to a remarkable start in October when associate dean for basic science **Prakash**

**Nagarkatti** and pathology and microbiology chair **Mitzi Nagarkatti** received \$6 million from the NIH’s National Center for Complementary and Alternative Medicine to establish a Center of Excellence for Research (see story page 17). The center will focus on the effects of plant and herbal products on preventing or arresting inflammation in autoimmune diseases. Neuroscience and cardiovascular disciplines will be the next areas to anticipate significant growth.

Like any new captain, DiPette is excited about his position and the possibilities that taking a seasoned crew into uncharted waters bring. “I have an exceptional platform of outstanding faculty and staff. We’re a young school that’s flexible and nimble with an excellent faculty, outstanding clinical partners, and we’re part of a university that’s the flagship. It doesn’t get any better than this.” ■

## Newsbreak



### Challenging Horizons

#### After-school program is model of service-based learning

Since it began seven years ago, psychology professor **Brad Smith’s** after-school Challenging Horizons Program has been helping public school students learn to sharpen their academic skills and self regulate their behavior.

Along the way, the program has become a model for service-based learning at the University of South Carolina and a training ground for scores of Carolina psychology students who apply textbook principles to real life.

“Everything we see in the classroom [with the middle- and high-school students] is what we’ve learned in psychology courses,” said **Sam McQuillin**, a graduate psychology student from Charleston. “Psychology 489 [community psychology] really comes to life if you’re involved in Challenging Horizons.”

Challenging Horizons got its start with internal seed funding from the University’s Research Consortium on Children and Families. Subsequent

funding from Richland District One launched the program at two middle schools, and a grant from the federal Office of Minority Health funded a sister project in Bennettsville, S.C., called the Youth Empowerment Program.

Challenging Horizons began with a focus on middle school students diagnosed with ADHD, but quickly expanded to include students with other behavioral issues.

“We have a range of students we work with,” Smith said. “Some are impulsive, and some have been expelled. Some are a real handful, and you have to learn how to break up fights. Many of them have been identified as having the potential and aptitude for college but have underlying issues that need to be addressed.”

To do that, Challenging Horizons and Youth Empowerment work from a straightforward premise—along with academic tutoring provide clear and consistent rules, be calm and caring, and reward positive behavior.

“Kids who get really aggressive need a role model who is emotionally controlled,” said **Gill Strait**, a second-year psychology Ph.D. student who began working with Challenging Horizons as an undergraduate. “When they see you being consistent and fair, they respect that. That’s why we discourage yelling or lecturing from all of our student volunteers.”

“There is an aspect of big brother/big sister in terms of mentoring the students. We try to engrain in them a sense of self regulation so that they’re conscious of what they’re doing and know when to stop if it isn’t positive behavior.”

“You’re motivated when, over the course of a year, you see how much they’ve improved,” said **John Terry**, a senior psychology major and Challenging Horizons volunteer. “We had a seventh-grade student who had been kicked out of several schools—she was defiant and angry. Eventually, though, the program just clicked with her, and she went from the worst level to the best level and stayed there. You see that and just say, ‘Wow!’”

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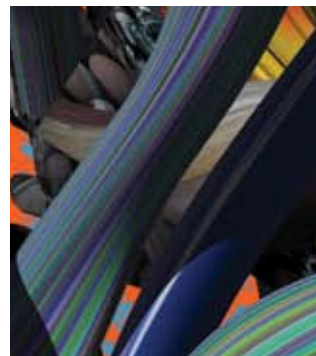
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