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Research, Scholarship, and Creative Activity

Super Models

Computers give researchers a new handle on drug design

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Spring 2005 Volume 3

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ECONOMIC DEVELOPMENT IS BECOMING A CRITICAL PART of the mission of universities across the country. This new mission is necessitated by the move from a manufacturing-based economy to a knowledge-based economy. Molly Broad, president of the University of North Carolina system, has clearly articulated that economic development is an important role for each public university in North Carolina.

The term "economic development" has a range of definitions. Jesse White Jr., director of the Office of Economic and Business Development at The University of North Carolina at Chapel Hill, distinguishes economic development from economic growth. He sees economic growth as a short-term phenomenon, such as the creation of new jobs. Economic development, on the other hand, is the creation of long-term capacity for sustaining the production of high-end jobs, sound companies and widely distributed wealth. Others see economic development as more clearly described by the phrases economic and community development. Regardless of the definition, the role of a university is evolving.

Clearly the commercialization of intellectual property is a key component to the role of a university in economic development, and UNCG is no stranger to this activity. Recently the Office of Technology Transfer licensed an encryption algorithm for Dr. Shan Suthaharan from the Department of Mathematical Science (see page 4). This is a particularly powerful license because the work was done at UNCG and the license was sold to a company in the Triad, allowing maximum benefit to be derived locally from this arrangement. Additional commercialization of research from UNCG has come from the licensing of Dr. Phil Bowen's modeling software to a company based in Kansas and the licensing of Dr. Patti Reggio's computer-based model of a cannabinoid receptor to a major drug company (see page 8).

However, economic development from universities will take many forms. For instance, a critical feature to having a healthy economy is the development of social capital. UNCG plays an important role in this as evidenced by the numerous studies being conducted that have the potential to impact children and parents in positive ways. For instance, Drs. Susan Calkins, Susan Keane, and Marion O'Brien are researching emotional and cognitive development as predictors of outcomes for children (see page 12).

A healthy economy also requires a creative environment. Building a creative environment requires the work of many but the work of A. Van Jordan (see page 16) typifies one of the numerous ways in which UNCG will contribute to this effort.

Workforce development also is required to build a healthy economy. The School of Education at UNCG has recruitment and retention of the North Carolina education workforce as one of its priorities and has many activities in this area. For instance, during the last 18 months, the Teachers Academy has developed eight courses for the core education requirements for lateral entry teachers, has 16 licensure-only programs to assist teachers in their professional development, and has been funded by the U.S. Department of Education to prepare teachers to work with children with disabilities.

UNCG understands that part of its future will involve creating a positive environment for development of the economy and the community. UNCG stands ready for the task.

Rosemary C. Wander, PhD
Associate Provost for Research and Public/Private Sector Partnerships

For more information about research at UNCG and the Office of Research and Public/Private Sector Parnerships, *go to* www.uncg.edu/research.

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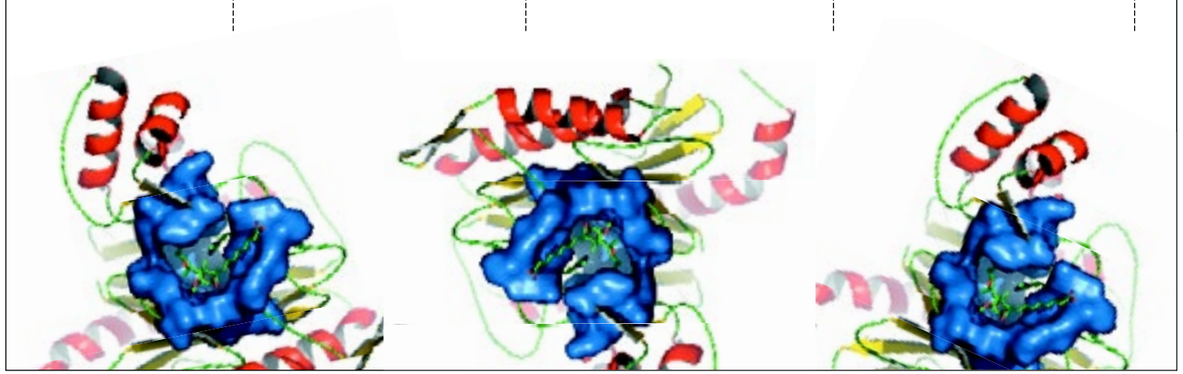


Pursuing Chopin's Pleyel

> "When I am somewhat indisposed, I play an Erard piano and I easily find a sound ready to hand. But when I am in form and feel strong enough to find my own sound, I must have a Pleyel." Frederick Chopin

Dr. Andrew Willis was puzzled.

The associate professor of music had read that Chopin preferred to perform on a Pleyel piano when he was feeling healthy and in good form because he could find his own sound.

"I wanted to know what he was talking about," Willis said. "But Pleyel pianos are not easy to come by."

The pianos, which were manufactured in France by Ignaz Pleyel beginning in 1807, were among the standard instruments of Chopin's day. Much as Steinway is considered top-of-the-line now, most pianists then chose to perform either on Pleyels or Erards. Willis, who has had an enduring interest in historical pianos, wondered what made Chopin prefer one over the other.

In the spring of 2003, he took a research leave to study as many Pleyel pianos in Europe as possible in 40 days by visiting museums and collections in France, Switzerland, Germany, Austria, the Czech Republic, Netherlands, Belgium and England.

During his travels, he created a database that noted the instrument maker, date, compass, action type and any special features. He played as many instruments as he could, took photos, made short sound recordings whenever possible, and recorded the weight and size of the various keyboards.

"In most cases, the older the piano, the lighter and smaller the keyboard," Willis said. "I did get enough information to solve the mystery of what Chopin meant."

He discovered, on average, the Pleyel action was around 10 percent heavier than the Erard in the number of grams required to depress a key and produce the softest audible tone. But in compensation, its tone was more flexible.

"It's a judgment call on what you like," he said. "It does seem to me the Pleyel sound is more varied, with contrasting timbres, and the Erard is smoother and more consistent."

To his gratification, he left Europe with a mystery solved and the purchase of an 1848 Pleyel to add to his collection of pianos, which also includes an 1841 Bösendorfer from Vienna.

Last October, Willis presented it in concert in the "Music for a Great Space" chamber music series in Greensboro.

"It certainly seemed to be very well-received in its American debut," Willis said.

He finds that playing old or restored pianos challenges him. "The sound, the shape, the size, the feel are very, very different from one piano to the next."

But part of it comes with the territory. "As a pianist, you have to have a certain fearlessness," he said. "You have to be flexible; after all, you can't carry your instrument with you."

During his travels, Dr. Andrew Willis examined as many European Pleyel pianos as possible in 40 days. Among those were an 1831 Pleyel in Rupperstha, Austria, (left) and an 1848 Pleyel in Holland (right). The 1848 Pleyel is now part of his collection of pianos.

Old school

School of Nursing creates geriatric curriculum

Knowing older adults comprise half of all patients in health care facilities and considering that number will climb even higher with the graying of the baby boomers, it seems logical to assume most health care providers receive geriatric care training. But that isn't the case.

That's a paradox the School of Nursing is striving to resolve. With a $625,000 federal grant from the Health Resource Services Administration, nursing faculty members Dr. Beth Barba and Dr. Anita Tesh developed and implemented the Geriatric Workforce Enhancement Project, a three-year program to train more than 300 health care providers in geriatric care methods.

The program works primarily with three hospital systems — Alamance Regional Medical Center, Moses Cone Health System and Catawba Valley Medical Center — and also with registered nurses who are seeking their bachelor's degree in nursing through UNCG. Barba, Tesh and other faculty members teach them a geriatric care curriculum that includes case studies, research-based learning and — most importantly — collaborative learning.

On an afternoon at Wellspring Retirement Community in Greensboro, a group of 16 nursing students took part in the Geriatric Workforce Enhancement Project training. The students went through lessons and shared personal experiences in this larger classroom setting, and then broke into smaller groups, where they practiced teaching the curriculum, just as they would teach people in their hospital.

The hope, Barba said, is to create a sort of geriatric learning ripple effect.

"We hope we can train the trainer, get a core group of registered nurses in the three hospital systems we are partnering with. If we can provide these nurses with the teaching materials, then even though they are not necessarily teachers, they'll be able to take this material back to the hospital and teach it to other nurses."

Dr. Nancy Gladwell and her mother

In Search of Lost Leisure for Caregivers

For the 54 million Americans who provide care for other adults, making time for leisure is often an elusive goal. Whether due to issues of time (they spend on average 20 hours a week caregiving), money or emotional stress, most of these nurturing individuals suffer from poor health, social isolation and depression.

"Caregivers hold out for help, thinking they'll wait until it gets really bad, but it is really bad," said Dr. Leandra Bedini, professor in the Department of Recreation, Tourism and Hospitality Management. "Everyone is worried about the care recipient. Our research focused on the caregivers because they're the ones who are ignored."

Bedini and colleague Dr. Nancy Gladwell, associate professor in the department, are investigating why 71 percent of caregivers state that they value leisure, but only 12 percent are able to protect it.

Bedini and Gladwell interviewed 13 caregivers about the impact on leisure travel. From their responses, a survey was compiled and distributed to family caregivers throughout North Carolina. The data from the 105 respondents identified five categories of challenges: environment (crowds, safety and medical assistance), experience (worry or guilt of caregiver), service provision (customer service and facilities), finances, and shared leisure (mutual interests between caregiver and care-recipient).

Up to this point, agencies have focused their energies on improved physical accommodations, but Bedini and Gladwell's research indicates intangible factors present the greatest barriers. "Our research flipped the traditional constraints hierarchy upside down," Gladwell said.

Thus far, their findings have been published in *Tourism Management* and presented at the National Recreation and Park Association's Symposium on Leisure Research. Bedini will present this study to the Canadian Congress on Leisure Research in May.

The researchers' next step is to conduct a national study that would provide data to serve as a basis for new programs and policies, such as leisure education and employee sensitivity training. They also hope to create a manual to help local service providers (YMCAs, churches, parks, and others) provide access to leisure opportunities for family caregivers.

"This is a need that will significantly grow as the baby boomer generation ages," said Gladwell, who like Bedini is a caregiver herself. "We really believe leisure is a piece of the puzzle, a piece which will help caregivers achieve better health and quality of life."

Test Preparation

> All measurements are fallible to some extent. Your bathroom scale can make a mistake, or you can make a mistake reading your bathroom scale. If you didn't use tests, what you would have is human judgment. And if there is anything that's incredibly fallible and vulnerable to all sorts of biases, it's human judgment." Dr. Ric Luecht

Standardized testing isn't perfect, but it's better than the alternatives, according to Dr. Ric Luecht, a professor in the Department of Educational Research and Methodology. College-entrance exams seek to provide college admissions officers with objective measurements of academic achievement, eliminating any bias due to factors such as race and socioeconomic status.

His goal is as simple as filling in a bubble with a No. 2 pencil: design accurate and valid tests. He describes his work as a blend of computer science, human factors engineering, systems engineering and psychometrics.

In pursuit of that goal, he has worked for ACT Inc., formerly American College Testing, and the National Board of Medical Examiners, which develops and administers the United States Medical Licensing Exam. He has helped Microsoft Corp. design tests and analysis methods to certify systems analysts and the American Institute of Certified Public Accountants computerize the Uniform CPA Examination.

He has developed some novel approaches to testing, including the design of computer algorithms for automated test assembly and a testing framework known as Computer-Adaptive Multistage Testing. Adaptive testing sequentially modifies the selection of the test questions, giving easier or harder questions, based on the accuracy of each test taker's previous answers. Computer-Adaptive Multistage Testing employs adaptive technology, but also lumps the test questions into preconstructed blocks called "testlets." Examinees can review their answers within testlets, but cannot make changes to completed ones. Instead of changing difficulty based on a single question, the exams are modified on the basis of completed testlets. Computer-Adaptive Multistage Testing provides many quality control and system performance advantages over other types of computerized adaptive tests.

Luecht also develops computer algorithms and software for automated test assembly that help improve the quality and quantity of tests produced. With the growth of computerized testing, testing companies now need huge banks of questions to prevent cheating, making the creation of equally difficult tests incredibly complex. For example, the National Board of Medical Examiners needs 40 to 50 test forms per year, all of identical difficulty and reliability, and meeting as many as 5,000 specifications for a 300-item test.

He has developed a computer algorithm and software to assemble these types of tests. His algorithm is called the Normalized, Weighted, Absolute-Deviation Heuristic — but the idea is "pretty simple," he quips. Putting together 40 to 50 test forms manually would take a couple of weeks, he said; his software can do it in a couple of minutes.

Luecht is on research leave, working on a book about computer-based testing and researching how to apply lessons from large-scale standardized tests to regular classroom tests.

Modeling Wellness

Dr. Jane Myers is not satisfied with just promoting health.

On the spectrum of well-being, health is neutral, the absence of illness, says the professor in the Department of Counseling and Educational Development.

She promotes wellness — "a state of positive mental and physical energy, an enthusiasm and zest for life."

In order to better understand wellness, Myers and colleagues combed through research in medicine, sociology, psychology and other fields to identify factors that help people live long and live well. More than 15 years ago, they devised a Wheel of Wellness with 17 qualities — exercise and stress management, to name a few — and spirituality at its center.

Following years of research and data collection, Myers and colleagues determined that wellness can be reliably measured using a different model of well-being, one that emphasizes the indivisibility of the self and a constellation of factors that mitigate for or against optimum functioning.

While each model can be useful to counselors, both researchers and counselors in the U.S. and abroad are finding the Indivisible Self model a strong basis for studying and promoting well-being.

Myers noted that the newer models do not mean the earlier one is not useful: "We finally decided that all the different models are different prisms to work with wellness. They're all holistic and they all look at issues of body, mind and spirit, as the ancient Greeks told us."

They also share a positive, strength-based approach to solving problems. If someone has a strong sense of humor, that could help him or her deal with other challenges, such as problems at work.

The application of the wellness models has produced some provocative results. Middle school students in North Carolina and Israel had similar scores for perceived safety. Researchers had believed that North Carolina students would feel much safer than their Israeli counterparts.

"In middle and high school, instead of talking about violence prevention, I'd like to focus on wellness and positive behaviors," Myers said. "Maybe in addition to, or instead of, more metal detectors in schools, we can have more counselors helping kids choose healthy behaviors."

Jerry McGuire, director of the Office of Technology Transfer, congratulates Dr. Shan Suthaharan at the license-agreement signing with Live Cargo. The company will develop and market Suthaharan's security encryption algorithm.

From Idea to Marketplace

It was one of those moments every innovator hopes for.

In February, Dr. Shan Suthaharan, director of computer science in the Department of Mathematical Sciences, saw his security encryption technology move into a new realm as the university signed a licensing agreement with Live Cargo. Live Cargo is a Greensboro-based technology company that develops proprietary software technology used for secure file transfer and storage.

Developed through the Office of Technology Transfer, Suthaharan's algorithm provides security to internet applications and data transmission. It is a simple, flexible and computationally inexpensive algorithm that provides high security and scalabilty over a large number of internet users. It can accept fingerprints and/or photographs, even digital video frames, to generate unique cryptographic keys for secure access control to a system or application over the internet. It also can encrypt data in order to provide security with authentication during transmission over the internet. UNCG filed a patent application for the algorithm in 2004.

The university will receive royalties from sales of products that incorporate the algorithm and will take a small equity position in Live Cargo.

Doug Young, co-founder of Live Cargo and a UNCG alumnus, called the signing "one of those win-win-win scenarios" where the university, the business and the inventor benefit.

Bold Thinkers

The facts about North Carolina's Research Triangle Park are simple: It was founded in 1959, encompasses 7,000 acres, houses more than 100 research and development facilities, and is acknowledged as one of the largest and most successful research parks in the country.

The secret of RTP's success is another matter.

Since the early 1990s, Dr. Al Link, professor of economics, has researched the growth and implications of research parks with the support of several National Science Foundation grants. As a result of his work on research parks, Link has been invited to advise governors, university presidents, Congress — now considering legislation on research parks — and even foreign governments.

In addition to this research, he is now looking at several related topics, including the economic impact of state-based bioscience and biotechnology centers and the economics of cybersecurity and bio-security.

Over the span of 11 years, he wrote a two-volume history on the birth and evolution of RTP — "A Generosity of Spirit: The Early History of the Research Triangle Park" and "From Seed to Harvest: The Growth of the Research Triangle Park."

RTP is a university research park, founded on ideas traceable to faculty at North Carolina State University, and on administrative leadership from the University of North Carolina at Chapel Hill and Duke University. By charter, the advisory board includes presidents from the three universities as well as other university representatives.

At the moment, the United States boasts 81 research parks and 27 more are in formation. "We're going into another big growth phase," Link observed.

Link has done statistical analysis of why some university research parks are more successful than others, and the answer may lie in leadership.

"Some university administrators simply copy what other parks have done in the past. Other administrators are bold thinkers who try to perceive where the next frontiers are going to be," Link said. "The latter will create parks that will likely be long-lived."

In the case of RTP, Archie Davis, former chairman of the board of Wachovia and state senator, and Bill Friday, president emeritus of the UNC system, provided the leadership that paved the way for RTP to survive its early years and to blossom in later years.

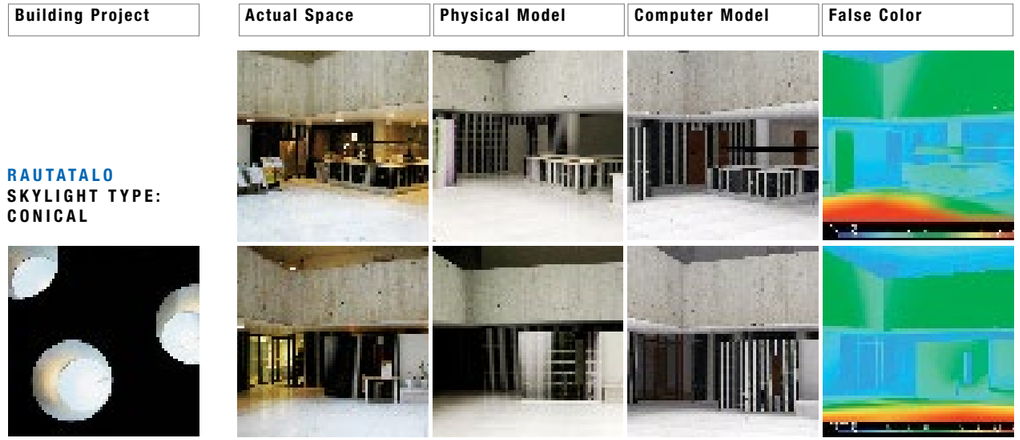
"Archie Davis acted as a catalyst for the park growth," Link said. "He took the fundraising of the park on his shoulders for nearly 40 years. That continuity of leadership characterized parks that have been the most successful. Davis and Friday were truly bold thinkers."

McIntosh, Wideman Tapped for Research Excellence

Finding the keys to health are the underlying goals for this year's research excellence winners.

DR. MIKE MCINTOSH, professor of nutrition in the School of Human Environmental Sciences, has spent time researching the role of conjugated linoleic acid (CLA), a nutrient found in dairy products and dietary supplements, in reducing fat synthesis and storage in human fat cells. CLA provides a dietary approach, as opposed to a drug approach, to managing obesity.

DR. LAURIE WIDEMAN, assistant professor of exercise and sport science in the School of Health and Human Performance, has researched the effects of exercise on growth hormone release and body composition. She also has examined the use of physical activity to reduce risk factors related to chronic diseases and obesity. In addition to her work on the growth hormone, she is a collaborator on a project investigating health disparities in the Triad.



Enlightened Design

In the Bible, God's first words are, "Let there be light."

Light is of primary importance to human designers too. As Tina Sarawgi, an assistant professor in the Department of Interior Architecture, puts it, "The way we perceive an environment is ruled by light."

Computers help designers consider different alternatives for the use of daylight. They create simulations to show what a space might look like with a particular configuration of windows. For instance, how would skylights illuminate a building's interior? How would that lighting change based on the skylights' location? Their number? Their size? How would that light interact with the color and texture of the materials used inside the building?

These are just a few of the countless questions designers grapple with. And, of course, these questions have no single answer; the answers vary with the time of day and the season of the year. The ideal software program would allow users to easily modify a design and would quickly produce an accurate simulation. Difficult and slow programs sap time and energy from the creative process.

Sarawgi evaluated design software by comparing simulations to reality. She and student assistants built scale physical models and created computer models of the central atriums of two buildings designed by renowned architect Alvar Aalto — the Academic Bookstore and the Rautatalo, both in Helsinki, Finland. They also took photographs and light readings in the two buildings. Daylight is given careful consideration when designing buildings in Helsinki; the city receives 20 hours of sun on midsummer days and six hours in midwinter.

They found that while not always "photo-realistic" the computer simulations were accurate enough to enable users to make informed design decisions. The main drawback was the length of time required to generate the simulations — several hours in the case of each atrium. In the early stages of the design process, when changes are frequent and often substantial, speed is more important than absolute accuracy, she says.

Sarawgi's interest in the effectiveness of computer simulations in design began when she was a graduate student at Miami University in Ohio, where she earned a master's degree in architecture in 2001. In the future, she wants to examine computer simulations of other elements in the design process, including airflow, acoustics and electric light.

Above left, panoramic view of the Rautatalo building at 10 a.m. on April 9, 2003. Right, panoramic view of computer model rendering.

Super Models

Two new professors are simulating molecules with stimulating research at UNCG

BY DAN NONTE, STAFF WRITER
PHOTOS BY DAVID WILSON, STAFF PHOTOGRAPHER

FOR ARCHIMEDES, IT WAS AN OVERFLOWING BATHTUB, or so legend has it. Newton is said to have been inspired by an apple falling from a tree. Dr. Phil Bowen's eureka moment involved fire ants.

Well, fire ants and a journal article. Inspiration isn't always romantic.

Fortunately for Bowen, director of UNCG's new Center for Drug Design, he wasn't stung by the ants, the scourge of picnics and golf courses throughout much of the Southeast. Instead, one of his graduate students at the University of Georgia became interested in fire ants, particularly how to prevent them from producing venom. In other words, he was looking for a way to disarm this Mongol horde of the insect world.

Bowen noticed a resemblance between the molecular structure of that venom and structures he had seen in a journal article about angiogenesis inhibitors — agents that prevent tumors from growing.

When clumps of cancer cells have grown as large as the head of a pin, they require a blood supply to grow larger, so they secrete enzymes to promote the growth of new blood vessels, or angiogenesis. By stopping the formation of new blood vessels, angiogenesis inhibitors stop tumors from growing.

Ever since, Bowen has been working on the computer-assisted design of an effective angiogenesis inhibitor based on solenopsin A — a component of ant venom. The work is part of a promising front in the war against cancer.

CENTER OF ATTENTION

Bowen's work is an example of the research happening in the university's Center for Drug Design. Established by the Board of Trustees Nov. 18, the center already boasts two chemistry professors experienced in the field — Bowen and Dr. Patti Reggio, both new at UNCG this academic year.

Bowen holds three patents and has written eight book chapters and more than 65 peer-reviewed research publications. He brings with him Dr. Haizhen Zhong, a research scientist he worked with at Georgia. Before joining UNCG, Bowen was the director of the Center for Biomolecular Structure and Dynamics at the University of Georgia at Athens.

Reggio, who has been awarded the Mary Foscue Rourk Chair in Chemistry and Biochemistry, conducts computer-based research on receptors and the molecules that bind to them, known as ligands. If receptors are like locks, then ligands are the keys.

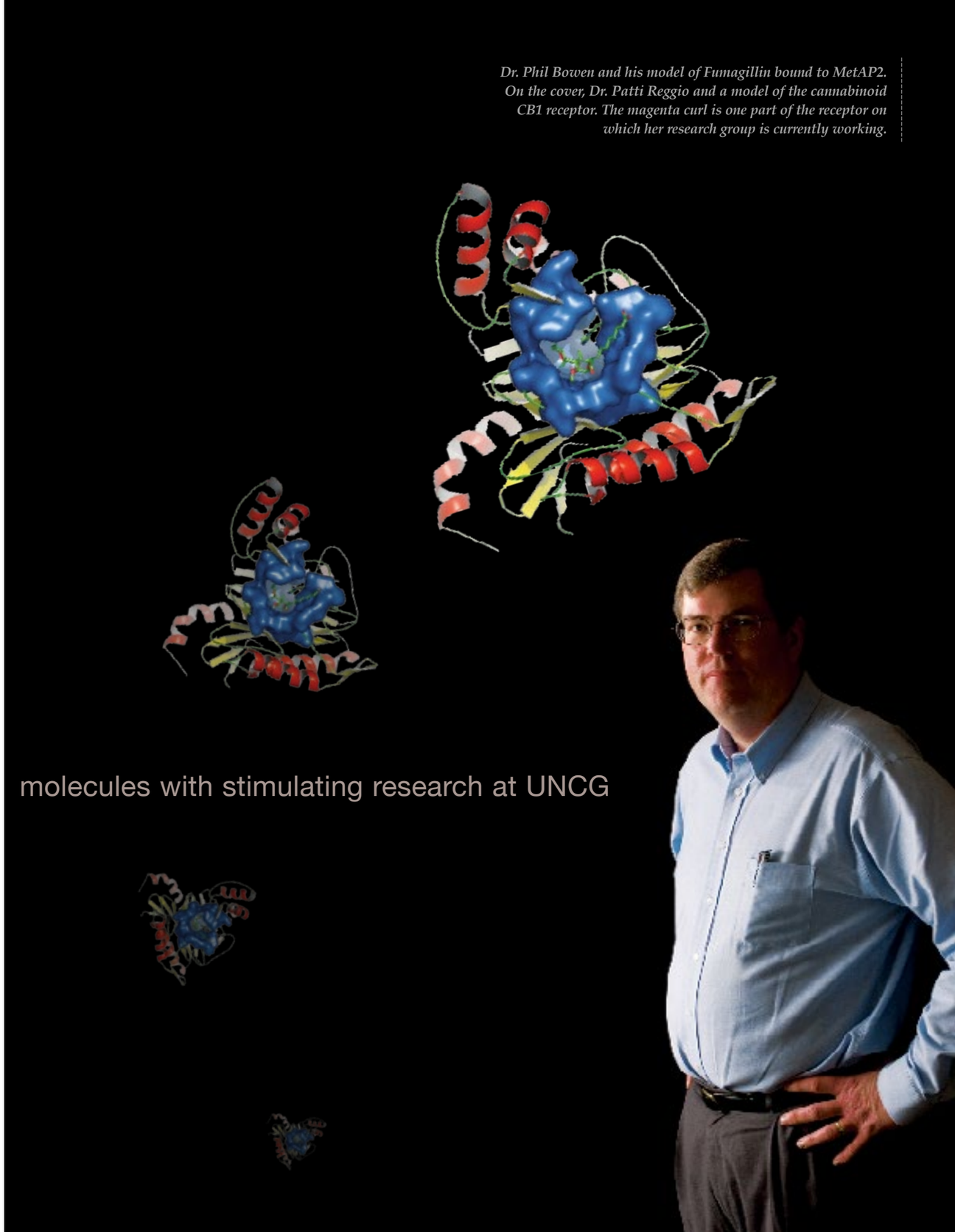
She works on a cannabinoid receptor and its ligands. The receptors, found in the brain, normally exist in equilibrium; some are activated, some are not. Smoking marijuana activates more of the receptors, causing euphoria, hunger and forgetfulness. Research has uncovered other ligands that produce some of the opposite effects, such as loss of appetite and improved memory.

She has received more than $4 million in grants for her work during the past two decades. She has published almost 50 peer-reviewed articles and served as president of the International Cannabinoid Research Society.

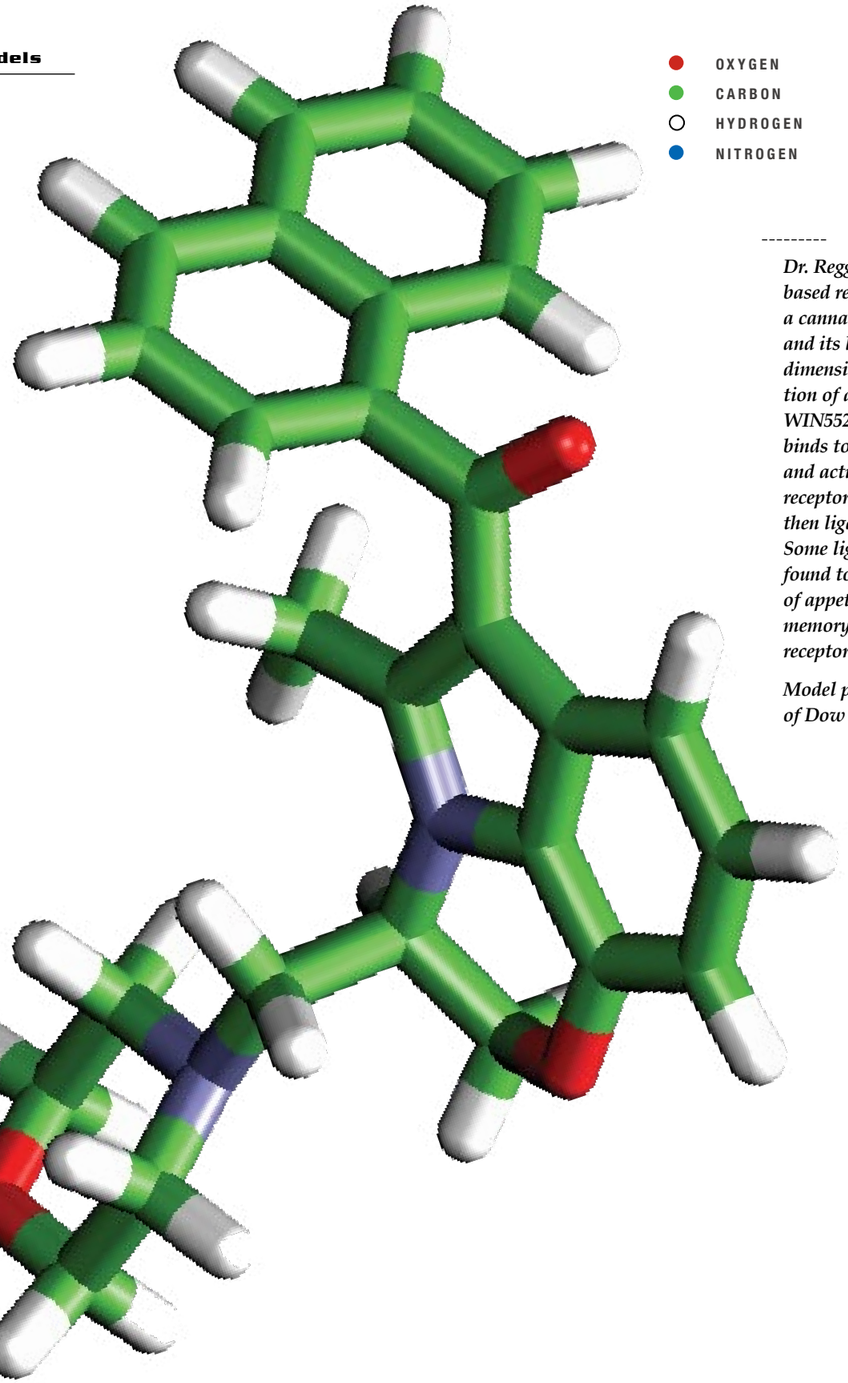
Like all centers and institutes at UNCG, the Center for Drug Design will promote collaboration among faculty members in different departments. Throughout academia, researchers frequently lack opportunities to work with those in other disciplines. Bowen hopes the center will create synergy by bringing together mathematicians, physicists, chemists, biologists and computer scientists.

"The center will use computers and theoretical approaches, all tied together with experiments, to push back the frontier of what we know about drugs," Bowen says.

Pharmaceutical companies are eager to trim the cost of putting a drug on the market — a price tag typically between $300 million and $1 billion. That's where UNCG comes in; the center will develop and apply tools to design drugs.



Dr. Phil Bowen and his model of Fumagillin bound to MetAP2. On the cover, Dr. Patti Reggio and a model of the cannabinoid CB1 receptor. The magenta curl is one part of the receptor on which her research group is currently working.



Dr. Reggio's computer-based research focuses on a cannabinoid receptor and its ligands. This three-dimensional representation of a common ligand, WIN55212-2, is one that binds to CB1 receptors and activates them. If the receptors are like locks, then ligands are the keys. Some ligands have been found to produce a loss of appetite and improved memory by turning CB1 receptors off.

Model provided courtesy of Dow Hurst.

"The Center for Drug Design will use computers and theoretical approaches, all tied together with experiments, to push back the frontier of what we know about drugs." Dr. Phil Bowen

Computers already are revolutionizing the drug discovery process. They screen models of molecules to identify the most likely candidates for a particular use. While helpful, these models remain relatively unsophisticated. Bowen marvels at the potential as science and technology evolve.

"How good are these computers?" he asks. "How accurate are these algorithms and the information that's gone into the software? I think we're still very primitive in our understanding of biology."

MODELING MOLECULES

In her second-floor lab in the Science Building, Reggio uses computers rather than test tubes and beakers to refine models of receptors and ligands. The models change in appearance with the click of a mouse. The digital representations of these sub-cellular structures can look like multicolored jumbles of jacks, clumps of bubbles or tangles of wire.

Reggio became interested in computer simulations of drug molecules while in graduate school at the University of New Orleans. Based on a tip from a colleague, she applied to the National Institute on Drug Abuse, part of the National Institutes of Health, for a grant to research the marijuana-derived cannabinoids.

Cannabinoid research was a gamble in the mid-'80s. Scientists hadn't found the receptor cannabinoids bind to and, therefore, didn't understand precisely how the substances affected the brain. Without that basic information, it was impossible to know the potential of cannabinoid research. It was possible the research would fizzle, and the grants would dry up.

Needless to say, that hasn't happened.

Reggio's early research progressed slowly. Living in Georgia, she used an acoustic modem — a shoebox-sized device with cups on top for a telephone handset — to transmit her calculations to a computer in New York. That computer was available to run her operations only at night and a single calculation could take six weeks.

In 1990, a cannabinoid receptor in the brain was discovered and named CB1. In addition to the euphoria, hunger and memory loss associated with smoking the drug, the receptor can suppress the nausea caused by chemotherapy, relieve pain and lower pressure in the eyes — the reason some glaucoma sufferers seek medical marijuana.

Researchers learned that endocannabinoids, cannabinoids that occur naturally in the brain, constantly activate some of the receptors. Endocannabinoids are similar to the better-known endorphins. Endorphins, a neurotransmitter released after lengthy, demanding exercise, act on opioid receptors to cause the euphoria known as a "runner's high." Heroin, morphine and OxyContin activate the opioid receptor in the same way marijuana activates the CB1 receptor.

Reggio continues to refine her models of the receptor and its ligands, but now she uses more powerful tools. The same problem that used to take six weeks for a computer to process, might take two hours today. When her current students complain about long delays waiting for the computers to do their work, Reggio can't help but laugh.

Soon she will have an even faster machine. With the help of Dow Hurst, her main receptor modeler and system administrator, she is assembling a cluster of 40 personal computers linked by a high-speed network to run some of her more complex computations. The cluster will offer the processing speed of a supercomputer at a fraction of the cost.

The work of Reggio and other researchers has led to rapid progress. Scientists have been able to design molecules to deactivate the receptor and produce very different effects, most notably suppressing hunger. An effective weight-loss drug is the holy grail for pharmaceutical companies. Industry analysts expect such a drug to easily surpass the $12 billion in annual sales of today's best-selling drug, the cholesterol-lowering medication Lipitor, according to a recent story in the New York Times.

JUMP STARTED

The unusual step of hiring Bowen and Reggio as fully tenured faculty members is part of UNCG's aggressive effort to boost the level of grants and contracts to $50 million by 2010. The university's record for grants and contracts is $35.6 million, set in 2001-02.

"They're the kind of faculty we need to attract to UNCG," says Provost Ed Uprichard. "We have the opportunity to change the culture of the university with senior faculty hires who can hit the ground running with new research and new opportunities."

Among the enticements UNCG offers prospective faculty is generous revenue sharing. At many universities, professors receive 40 percent or less of the revenue generated by their discoveries, and the institution takes the lion's share. UNCG offers faculty members 50 percent of that revenue.

Both professors already have taken advantage of the university's technology transfer office. Bowen has licensed his modeling software that will help researchers identify promising drug candidates to Kansas-based Semichem Inc., while Reggio has licensed her model of the CB1 receptor in a non-exclusive deal with a major drug company. Scientists with the company told Reggio her model has saved them a year's work.

Bowen and Reggio say they also were attracted to the university's science facilities. Completed in 2003, the 172,000-square-foot Science Building provides one of the finest facilities in the state to teach science and conduct research and is starting to deliver on its potential to help boost the Triad's and the state's science and technology industries.

The $40 million building is the first, largest and most expensive project paid for with UNCG's share of the $3.1 billion N.C. Higher Education Bonds. It features the latest scientific equipment, paid for with private donations. Laboratory space is being remodeled for both Bowen and Reggio. Reggio adds that she is excited to work with graduate students and alongside faculty members who are conducting groundbreaking research.

Although hiring senior faculty like Bowen and Reggio has been rare, it is a sign of things to come. The university plans to hire additional senior faculty members in the next three years.

"We're not going to get that $50 million goal if we limit ourselves to just hiring brand-new PhDs," Chancellor Patricia A. Sullivan says. "We're on the cusp of a major transformation at UNCG. We're going to be a truly great university, a student-centered research university."

The Right Track

Are the terrible twos just a phase? An eight-year longitudinal study examines what happens as children grow older and begin to control their behavior and their emotions.

STORY BY BETH ENGLISH, UNCG RESEARCH EDITOR
PHOTOGRAPHY BY CHRIS ENGLISH, PHOTOGRAPHY EDITOR

WE ALL GET ANGRY. FRUSTRATED. EXASPERATED. Yet, we know how to handle it. We've developed coping strategies. We walk away. We count to 10. We take deep breaths.

Children, on the other hand, have a lot to learn when it comes to dealing with emotions. Starting at a very young age, life starts sending them all kinds of frustrations. Someone takes away their toy. Mom or Dad won't let them have candy. Or they can't make an object do what they want. Parents of very young children quickly learn distraction techniques and other methods to soothe them. But the path from toddlerhood to kindergarten is paved with the child's learning how to handle strong emotions on his or her own.

In 1997, Dr. Susan Calkins, professor of psychology, received a $25,000 grant from the National Institute of Mental Health to begin studying children on that journey.

"We didn't know much about toddlers' emotional skills and whether they mattered for later social and academic success. Are the terrible twos just a phase that every child experiences, or are some kids likely to have ongoing problems with tantrums, anger control and oppositional behavior?" she says. "To really answer that question, we had to follow the kids and see what happened."

The result has been an eight-year longitudinal study of almost 400 children, starting when each child was 2 years old. Called the Right Track Research Project, the study seeks to answer questions such as: Does a child's difficulty with emotional regulation signal potential aggression? Does the ability to control emotions reflect positive academic achievement? What keeps kids on a positive trajectory? Or, slanted a little differently, what moves kids onto a positive trajectory?

They have found the way children regulate their emotions at age 2 does say something about the way they will interact with their peers — for example, whether or not they will share well. But, she cautions, just because a child has difficulty regulating his or her emotions at an early age doesn't mean he or she won't get there.

"We wanted to know, what's transient? What's going to disappear and what won't?"

BUILDING BLOCKS

Calkins started the project with 150 Greensboro 2-year-olds. To get the sample, she contacted parents through local childcare centers, pediatricians' offices and county health and human services facilities.

Parents completed a behavior problem questionnaire and children were selected for the study based on those scores. Some were chosen because their scores indicated they were at high risk for aggressive behavior. Others were selected precisely because their scores showed they were in the low-risk category. A control group, of sorts.

The two groups were matched on age, race and parents' marital status. In many ways, Greensboro's diversity was a plus. "We did a massive recruitment to find our first sample of children," Calkins says. "We wanted it to be an accurate representation of kids in Greensboro."

From the beginning, the assessment covered four areas. Children and their mothers were initially brought to campus to test their emotional function and temperament. These lab tests were repeated at ages 4, 5, 7 and 10. A second visit to the lab in Eberhart Building on campus covered IQ and school achievement. As a third component, the children were observed at home, with researchers watching parenting and parent/child interactions. Finally, study participants were observed at school, with close attention paid to peer relations and social skills.

Each of the initial group of children was brought into the lab and given a series of tasks that were designed to create certain emotions. For example, during a positive episode, a researcher would engage the child in a game of peek-a-boo with a puppet. In a frustration episode, the child would be asked if he wanted a snack. The experimenter would place a clear plastic container of cookies on the table, which the child was unable to open, and leave the room. As the children grew up, the tasks changed to match the age.

While the children were being monitored for emotional reactions and behaviors, they were also monitored physiologically. Each child was outfitted with three disposable pediatric electrodes in an inverted triangle pattern on the child's chest. The electrodes helped researchers determine heart rate and breathing.

"When you're upset, you have a physiological response," Calkins says. "You have to control that or the behavior suffers."

Those measurements are one of the unique aspects of the study. Another unique component is the researchers' commitment to track study participants in schools. As the children have grown older (study participants are now 7 and 10 years old) researchers have taken their observations to the schools, asking teachers to fill out questionnaires about behavior and friendships and even soliciting opinions from their classmates — Are they fun? Bossy? Do they share?

The research team — three investigators, one post-doctoral student, one full-time research assistant and eight graduate students — covers more than 60 Guilford County schools to track information on almost 400 student participants.

"The teachers have been extremely helpful in this," acknowledges co-investigator Dr. Susan Keane, professor of psychology. "We could not do this without their help. It is a great partnership."

And for those children who move away, the team follows up with questionnaires, phone calls and visits to their home.

Dr. Marion O'Brien, professor of human development and family studies and the third study investigator, says home visits give them a glimpse of the quality of the home environment. They can see what kinds of cognitive stimulation the parents offer and the emotional connections between parents and children. Each family is observed 10-12 hours every year.

"Toddlers are emerging as independent people," O'Brien says. "How parents react to that is very important."

GETTING IT UNDER CONTROL

Ultimately, Calkins, Keane and O'Brien are looking for the processes that help children shift from relying on other people to control their behavior to controlling their own behavior.

The ongoing study results have produced research papers on such topics as: *Physiological and behavioral regulation in 2-year-old children with aggressive/destructive behavior problems; Developmental trajectories of early behavior problems: Implications for kindergarten social status; Predicting stability and change in toddler behavior problems: Contributions of maternal behavior and child gender; Does aversive behavior during toddlerhood matter? The effects of difficult temperament on maternal perceptions and behavior.* And the list goes on.

"From 2 to 4, we saw a lot of change," Calkins says. After kindergarten, the changes lessened.

Those who exhibited behavior problems sometimes became bullies, developed ADHD, or became shy and depressed.

"When they have a bad first year, they may be set on a trajectory. They may get a reputation that is hard to change," O'Brien says.

Behavioral regulation also has implications for academic success. In the paper "Regulator Contributors to Children's Kindergarten Achievement" written by Calkins, Keane and others, they found that children's ability to regulate their behavior has a direct impact on their achievement in school. The ability to control emotions is also a factor. In fact, emotion regulation and behavior regulation are related.

Learning how to handle positive and negative emotions is part of the journey from toddlerhood to kindergarten. These children, who are not study participants, illustrate behaviors that are common among preschoolers.

Harkening back to their earlier study, they report that young children who show early signs of difficulty with emotion regulation may be at risk for achievement problems.

Many today are placing emphasis on academic skills for school, Calkins said. However, the research shows other factors are just as important. "Emphasis on cognitive readiness becomes irrelevant if a child can't control his emotions or sit down in the classroom," she says.

While their work is extensive and does not seem to have an immediate end date (their five-year grant was just extended for an additional five years and Calkins received a Research Scientist Development Award from NIMH), they are careful to note that they are not creating applications or interventions. That is for those who come after them.

"We're doing basic science," Calkins says. "We're saying here's how we think it works."

POETIC JUSTICE

A. Van Jordan brings to light the forgotten story of a young girl who meets her nemesis in "M-A-C-N-O-L-I-A"

STORY BY SEAN OLSON, STAFF WRITER

PHOTOGRAPHY BY CHRIS ENGLISH, PHOTOGRAPHY EDITOR
AND DAVID WILSON, STAFF PHOTOGRAPHER

MACNOLIA COX. THE NAME DOESN'T MEAN MUCH to most people, even in her native Akron, Ohio. She was fading into the nameless void of history: a woman who married, who worked, who had a son and troubles here and there. She died.

MacNolia Cox Montiere, of 189 W. North St., died Sept. 12 at St. Thomas Hospital. Born in Kenmore, she had been a lifetime resident of Akron. She was a member of Livingston Baptist Church. She won the Beacon Journal Akron Spelling Bee in 1936...
(Obituary, Akron Beacon Journal, Sept. 14, 1976)

There seemed to be little story there until UNCG assistant professor and poet A. Van Jordan came along.

While visiting his brother in Ohio for a basketball game, Jordan read a piece by columnist Mark J. Price called "This Place, This Time" in the Akron Beacon Journal — one of those history columns that consider historic or significant events in the community. Jordan, 39, is one of those people who compulsively clip things: cutting and saving newspaper stories or magazine articles that catch his eye. Questioned about it, he recalls Russian novelist Fyodor Dostoyevsky clipped and collected little scraps of paper to jog his memory or help move his stories along.

The story Price wrote about was anything but ordinary.

I learned the word **chiaroscuro**
By rolling it on my tongue

Like cotton candy the color
Of day and night.

On the radio,
I heard Orson Welles

Say **Let's surge ahead,**
And blood rushed up

My legs like a bad boy's eyes
And I kept saying

Surge . . . surge *. . . in a whisper,*
Pursing my lips

As if I were about to taste
My first kiss.
(MacNolia)

Growing up in 1930s Akron, MacNolia Cox wanted to be a doctor. She was a bright young girl by all accounts. Moreover, she was a spelling master. That's what mattered.

She was so good that, in 1936, she went on to the national spelling bee finals. "I'm glad I won," the 13-year-old Cox said after winning the state competition, "and I hope I win in Washington."

She did well in Washington, making it into the final five. But, in the final leg of the national competition, the judges gave Cox the word "nemesis," a word that was not on the predetermined list that was to be used in the contest.

Cox was black. Unfortunately, that mattered more.

I spelled those white kids into tears. I could spell whatever they
threw at me: felicitation —
f-e-l-i-c-i-t-a-t-i-o-n,
which is what I got. Apoplexy — A-p-o-p-l-e-x-y, which is what
they had
when I got into the final five. But they would have that no more
than they would have me to win. They pulled a word not on
the list,
the goddess of vengeance: Nemesis — N-e-m-e-s-i-s — I couldn't
spell it, then.
(MacNolia)

MacNolia was crushed by a defeat that was manufactured, that seemed to fly out of the hollow eye of Jim Crow. She staggered away from the contest, winning fifth place — an accomplishment to be sure, but not the first place she should and very likely would have won.

"MacNolia placed fifth in the nation and won a $75 prize," the Akron Beacon Journal notes in its May 21, 2000, edition. "Although it couldn't be proved, it was rumored that the judges 'set out to knock MacNolia from the bee' by choosing an unapproved word, 'nemesis.' Jean Trowbridge won the bee on the word 'interning.'"

Nevertheless, she came home to an adoring crowd who admired her, not only for her intellect, but also for her perseverance through a difficult and prejudiced contest. But that was little solace, Jordan believes. He thinks the defeat snuffed out her belief that she could go further.

She married and had a child. She never became that doctor; instead, she became a domestic in a doctor's house.

All of our neighbors are jealous:
MacNolia, with a mop
Or a broom, a washboard or iron,
Is a magician.
Come over next week and bring
Some laundry — we'll show you
What she can do. She can spell
Any word you can pretty much
Think of; although — at least,
I'm not sure — I don't believe
She knows what they all mean.
(Dr. Wittenberg)

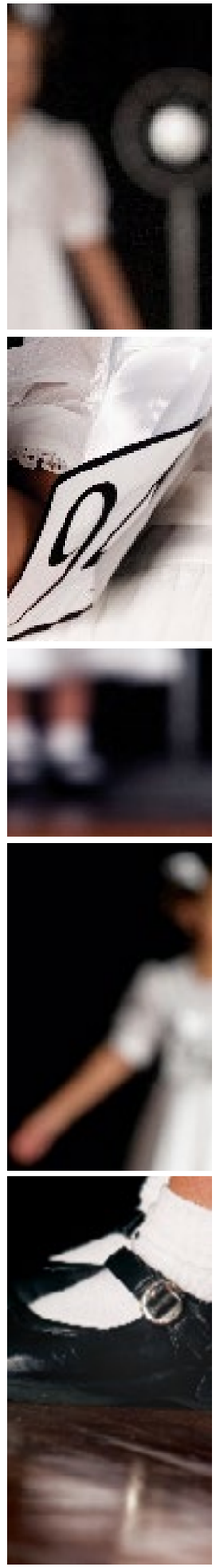
The tragedies seemed to pile up. She had her share of financial difficulties. She had a difficult marriage. Her son, after a tour in Vietnam, was killed in a car accident.

Cox lived her life — a difficult one — and died in 1976 at the age of 53.

While the clipping perked Jordan's interest and inspired a handful of poems, he didn't think he had the feel of Cox's experiences, and so he kept researching. His first find in this direction was the work of Akron Beacon Journal reporter Mable Norris, who covered MacNolia as she worked spelling bee wonders all the way to nationals and even protested when Cox was given the word "nemesis."

"Norris ends up traveling with MacNolia and writing this story about the discrimination that she's facing," Jordan said. "That builds this wave of sympathy for her in Akron and, when MacNolia comes home in fifth place, the people there throw her a ticker-tape parade."

He had the column. He had the reports of Mable Norris. To get a sense of the atmosphere and tension of high-stakes spelling bees, Jordan watched "Spellbound," a 2002 documentary that takes a behind-the-scenes view of the tense and difficult intellectual contests.



Yet, Jordan's understanding of MacNolia's story was still skeletal. He admits he still had very little to work with, and that the true sense and rhythm of her life seemed to elude him still.

"Then I went through her obit, and I saw there was a survivor. I looked her up and she was right there in the phone book," Jordan said. "I met her niece on New Year's day in 2001."

The meeting with Georgia Gay, Cox's niece, was a lucky one. Gay still has MacNolia's mother's diary. While she would not let Jordan see the entire journal, she allowed him to see excerpts. It was the breakthrough for which Jordan was searching.

"That was invaluable; it was essentially how I got an understanding of how she was viewed by herself and by adults," Jordan said. "It certainly gave me a sense of personality."

What Jordan came up with is "M-A-C-N-O-L-I-A," an award-winning, compelling group of poems about a young girl of great talent who faces the dark and seedy prejudices of our history and who, tragically, does not survive well.

"M-A-C-N-O-L-I-A" charts her life, starting with her death and working back into history and then toward her day at the spelling bee. Rather than writing the poems from the point of view of an objective narrator, Jordan tells her story from different and subjective perspectives: her husband, the doctor who employed her as a servant in his house, her mother, other spelling bee contestants.

The crowd has come to see our minds contort
Sounds into syllables, syllables into letters
And all without the benefit of meaning;
You know, no one cares what the words
Mean, just the spelling, for which I am thankful.
Lord, what could bring more pressure?
It's not like I mind losing to a girl, but a Negro...
I've been told that I can't lose to a Negro;
No one ever has. Now I know how the pressure
Of competition raises the blood. I am thankful
This is the final round; these spotlights hang like swords
(John Huddleston, Round 35)

And Cox's isn't the only story told here; like all good stories, this one is filled with numerous, round characters. There are other lives. There is Mable Norris, who fights sexism at the paper much like Cox battles racism on the stage. There is Alberta Cox, who wants the best for her daughter but is haunted by the difficulties she'll face as a black girl. There is John Montiere, MacNolia's often-difficult husband.

There is some sense that Jordan has saved Cox from the vacuity of history: some sense that Cox was headed for the anonymity that death affords us all until Jordan unearthed her story.

"[T]his book captures an important figure who has too long been obscure, and at its best, the poems are both memorable and haunting," Rochelle Ratner wrote in the April 1, 2004, Library Journal.

In addition to rescuing her story from history, he captures the drama and creates a broader understanding of Cox so that in some sense we can all relate to her, that her story becomes ours. That's good poetry.

Other people think so, too. National Public Radio Reporter Susan Stamberg called "M-A-C-N-O-L-I-A" a "slim and well-reviewed book." In The Washington Post, Edward Hirsch wrote that "M-A-C-N-O-L-I-A is a deeply humane and highly imaginative sequence that combines the tragic poignancy of the blues with the cinematic sweep of documentary. It is a necessary work."

On the heels of such praise, and recognizing the beauty of "M-A-C-N-O-L-I-A," the Whiting Foundation in New York awarded Jordan one of its prestigious, $35,000 Whiting Writer's awards. Jordan's in good company with this crowd of writers, which includes past winners like Jonathan Franzen, Jeffery Eugenides and Mary Karr. Most recently, the Cleveland Foundation awarded Jordan the 2005 Anisfield-Wolf Book Award for fiction, noting that it and the other winners of the award are "outstanding works that contribute to society's understanding of racism."

Jordan said he didn't anticipate the critical response that the book received. His first book, "Rise," which is about transience through music, did not receive this reception, so he didn't expect anything more for "M-A-C-N-O-L-I-A."

"I don't think anyone writing poetry anticipates any response," he said.

But he did have some goals.

"I certainly want to write poems that in some way connect with people outside of the academy or with people other than poets. I wouldn't want to write a poem that it would take an MFA degree to understand. I want to write something that someone who worked in a plant with my father can understand ... that seems to hold more truth for me than any artifice."

To put it another way, Jordan believes contemporary poetry is too self-indulgent.

"I feel we have to move beyond ourselves and talk about the culture we are inhabiting. That's what I hope I've done, and I feel like, with every book, I get a little bit closer to that."

All italicized text comes from
A. Van Jordan's "M-A-C-N-O-L-I-A"

STORY BY MARSHALL ELLIS

PHOTOGRAPHY BY CHRIS ENGLISH,
PHOTOGRAPHY EDITOR

WILD LIFE

Dr. Matina Kalcounis-Rüppell confronts biology on the front lines, showing that even the smallest creatures can have an impact on the big picture

ALDO LEOPOLD, THE AMERICAN CONSERVAtionist whose early 20th century essays have shaped nearly three generations of ecological thought, once observed, "The outstanding scientific discovery of the 20th century is not television, or radio, but rather the complexity of the land. Only those who know the most about it can appreciate how little we know about it."

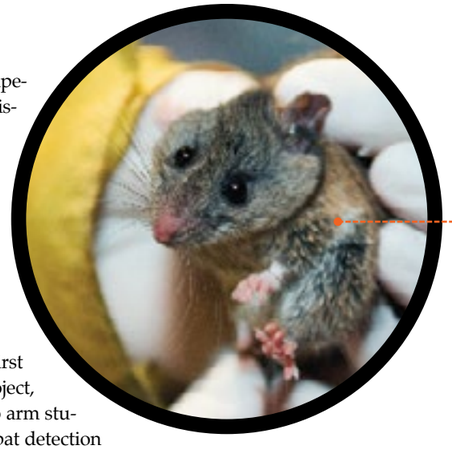
In their search to unravel that complexity, biologists who have followed Leopold's call for an "ecological education" fall generally into two types. The first type almost never encounters nature in the field, preferring instead to tease apart its complexity piecemeal in the laboratory, where the confounding variables can be manipulated. The second type almost never encounters nature in the lab, preferring instead to engage it intact, on its home turf, where the confounding variables are at their height.

To be sure, scientists of both persuasions can be found at UNCG. When you search for Leopold's successors, you'll find Dr. Matina Kalcounis-Rüppell, assistant professor in the Department of Biology, and your boots and rain coat had best be close at hand.

Having learned her trade by deciphering the mysteries of small mammal ecology in the forests of Canada and California before arriving at UNCG in 2003, her research program has one simple but

defining rule: "Everything is done in the wild." It's a philosophy that underlies the need to understand the natural world at a population and ecosystem level and to get at what Kalcounis-Rüppell calls "a mix of population ecology and natural history."

Students who knock on her door — and a lot do — are expected to follow suit. In fact, says Kalcounis-Rüppell, an interest in field research is not only desirable, "It's a deal breaker. I can teach them almost everything else, but they have to want to be out there."



Simply put: If you're going to reap the benefits of Kalcounis-Rüppell's tutelage, then you can expect to slap a few mosquitoes, dodge some poison ivy, and pull some long hours.

For the students who have signed on to go out in the wild with Kalcounis-Rüppell, the result has been a far-flung research program that to date has included rodent research in the oak woodland of northern California and gamelands of the Piedmont, and bat research in habitats as varied as urban Piedmont streams, the rugged interior of the Uwharrie Mountains, and Canadian aspen groves. As a measure of the program's quality, consider that it has been featured in media outlets ranging from scientific journals to the Charlotte Observer to an appearance on CNN. Toss in public outreach events such as last year's inaugural "Night Prowl" at the Pee Dee National Wildlife Refuge in Anson County and "Boo Bash" at Greensboro's Natural Science Center, and it's clear that this is not your father's college biology course.

LISTENING TO THE ANIMALS

When you look at Kalcounis-Rüppell's research program, it's hard to know where to start since, by her own admission, there is a lot going on. By way of a unifying thread, studies on population ecology — the nuts and bolts of animal distribution and abundance — are everywhere. Central to these studies are questions about mammal populations and the energetic costs of maintaining them. These are not obvious questions to most people, but because about 60 percent of the mammals on Earth are either rodents or bats, the answers have far-reaching ecological ramifications. These small-scale components hold larger ecosystems together; dismantle enough of them, and eventually, entire ecosystems threaten to unravel. Left intact, all is right with the world. And if you know where to look, reliable predictors of problems in the human world can be found in the unlikeliest places. Case in point: bats.

Bats provided the impetus for much of Kalcounis-Rüppell's graduate research, and on arriving at UNCG she says she was astonished at how little was known about Piedmont bats. Basic questions about what species are present in the Piedmont still exist. Her first research project, then, was to arm students with bat detection gear and mist-nets and set them to work characterizing the local bat scene. As it happens, bats feed almost exclusively on water-borne insects or insects associated with vegetation around streams, meaning that bat and stream ecologies are inextricably linked. To understand one requires that you understand the other. The group set up shop on North Buffalo and South Buffalo creeks in Guilford County, and in the end, they documented nine resident bat species.

Why should we care about bat ecology? Because today, thanks to the group's work integrating data on bat foraging, insect diversity, and water quality, we know that the fate of Piedmont bats is tied directly to the fate of the insects on which they feed. The insects' fate is tied directly to the fate of the local water supply. The fate of the local water supply is tied directly to how well we manage our environment. As goes bat habitat quality, then, so goes ours.

The research on bats and stream ecology was highlighted in August 2004 by the group's participation in the Southeastern Bat Diversity Network's third annual Bat Blitz, held in North Carolina's Uwharrie National Forest. Over three nights, the blitzers caught 77 bats. In another nod to understanding the big picture, Kalcounis-Rüppell's students are conducting comparative studies on bat ecology along streams in the national forest and in Greensboro, with an eye toward bat diversity and diets, insect diversity, migration patterns and evolutionary relationships.

Helping the public to understand that the natural world has important things to tell them if they will only listen is, of course, the end game. So whether it be in California, Canada, or along Greensboro's creeks, the need to understand the local ecological neighborhood is why Kalcounis-Rüppell stresses that "students work on very local problems." Apparently, it's a message that resonates at UNCG, as the work on local problems has now grown to include eight students puzzling

In the oak woodland of California, Dr. Matina Kalcounis-Rüpell and graduate student Jackie Metheny weigh and record reproductive information on the California deer mouse (Peromyscus californicus) *seen at left. While Kalcounis-Rüpell started her studies with bats, she added studies on mice because they are relatively short-lived and easy to recapture.*

***Below, Kalcounis-Rüpell and** Metheny set up bat echolocation detection equipment at ground level to see if they can record ultrasound emitted by mice. It was the first time anyone had attempted to record ultrasound from these nocturnal mouse species.*

over the biological requirements of ecosystem maintenance.

THE MICE THAT ROARED

Like all good science, the bat research has generated entirely unanticipated opportunities elsewhere. Such opportunities are the stuff of Louis Pasteur's famous axiom that "chance favors the prepared mind," and Kalcounis-Rüppell's chance arrived when she applied bat detection technology to rodent populations. The switch to mice was largely practical: bats are hard to recapture; mice aren't. "I needed an easier research model," she says. The search for that easier model led to northern California, where she spent several winters looking for answers about the population ecology of two species of mice. It was there that an extraordinary discovery occurred.

It's no secret that bats navigate and track prey on the wing by generating rapid pulses of ultrasound for use in echolocation, in much the same manner as say, sonar is used by submariners. It's also no secret that many other mammals generate ultrasound, among them shrews, mice, dolphins and toothed whales. Squirrels, for instance, use ultrasound to broadcast warnings about predators lurking about. Kalcounis-Rüppell says that it's possible that a large percent of all mammals use ultrasound in one form or another. The primary difference between species is that bats use short bursts of ultrasound for echolocation, while many other mammals use long whistle-like sounds for communication. What's not known is how most small rodents use ultrasound and echolocation, especially in the wild. Communication seems the most likely purpose since, as Kalcounis-Rüppell notes, "You can't echolocate an acorn."

It is unusual for humans to detect ultrasound, but it happens that Kalcounis-Rüppell is one of those unusual people. Sitting in the forest amongst her mice in California, "I thought that I could hear something," she says. "I decided to take my fancy bat echolocation detection equipment and put it where the mice were."

So with funding from UNCG, Kalcounis-Rüppell returned to California last December, placed her bat detectors on the ground among the mice, crossed her fingers and waited. The result was electrifying.

"The mice were screaming at each other with ultrasound," she says.

Over the course of six nights, Kalcounis-Rüppell and her students recorded 100 instances of these animals using ultrasound and eight different types of calls, including clear evidence of a call and response. It was, she says, "very cool." It was also very baffling. "We have no idea who is making them, or why. They could be communications between parents and offspring, or they could be indications of mating readiness, or they could be warnings of territorial defense."

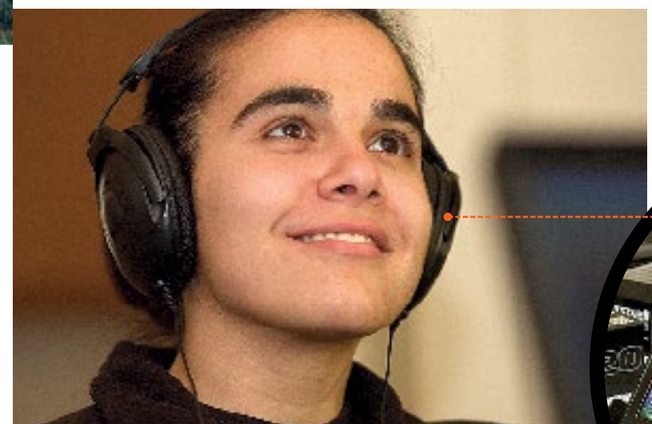
What she does know is that these are the first ever recordings of ultrasound by nocturnal mice in the wild. Recording ultrasound at night, at ground level is a tricky business, and she feels lucky to have been the first. A return to the California site is already planned for this summer, and she recently submitted a grant proposal to the National Science Foundation to underwrite a three year project to identify the function of the calls and to understand their significance.

SAVING THE PIECES

In many ways, the attempt to quantify complex ecosystems without resorting to laboratory manipulation is the hard way home, and as with all high-caliber research, Kalcounis-Rüppell's studies have

revealed much that is not yet understood. Skeptics will doubtless wonder about the value of listening to mice chattering in some far away California canyon, but the wisdom of Aldo Leopold warns that we ignore such challenges at our peril: "The last word in ignorance is the man who says of an animal or plant: 'What good is it?' If the biota, in the course of eons, has built something we like but do not understand, then who but a fool would discard seemingly useless parts? To keep every cog and wheel is the first precaution of intelligent tinkering."

Knowing that we drink the same water and breathe the same air as the bats and mice, then the sort of tinkering being done by Kalcounis-Rüppell and her students on the cogs and wheels of small mammal population ecology is, in many ways, an investigation of our own population ecology writ small. And at the end of the day, even if some of the revelations are baffling, and even though we may know little about some of the parts, the sum of those parts may very well provide us with otherwise unobtainable insights into how things work.



On the opposite page, early in the morning Dr. Matina Kalcounis-Rüpell and graduate student Jackie Metheny collect the echolocation detection equipment set up the previous night. After they return to their cabin, they take the data from the equipment and download it into a laptop. Above, Kalcounis-Rüpell smiles as she hears the first ultrasound recordings of mice. The computer screen at right shows the recorded sonogram.

STORY BY DANA DAMICO
PHOTOGRAPHY BY JIM HILL

WHO CAN FORGET THE GHASTLY IMAGES OF THE TSUNAMI THAT devastated Asia days before the New Year?

Anguished mothers who wailed over the bodies of their lifeless children; passenger rail cars swallowed by muddy waves; groups of people swept beneath the sea as they struggled to hold on to floating debris; dirt pits filled with crudely wrapped victims; orphaned children; decimated cities, villages, businesses and homes; wrecked lives.

The world saw profound grief and watched slack-jawed as the death toll climbed: 20,000 ... 50,000 ... 75,000 ... The final reports of more than 165,000 deaths left most silent and stunned.

Dr. Arthur Murphy, professor and head of the anthropology department, watched in horror like most. But where many saw the immediate carnage, Murphy, who has studied the cultural and psychological effects of natural disasters, saw years of anguish.

"The real issue from my perspective is what's going to be happening one, two, three and four years from now," he says. "In the moment of shock, (people) get together and help each other and get things done and are amazingly good at surviving those things. Then the reality hits. ... The real critical recovery issue is the social support that people have. So many people died. So many social networks were shattered. People are going to have to recover those and recreate those and that takes a good deal of time."

Murphy's knowledge of natural disasters and their harm to victims stems from research on the survivors of widespread flooding and mudslides that followed a tropical depression in Mexico in October 1999. The storm and its aftermath killed more than 400 people and left at least 200,000 homeless.

Murphy and Dr. Fran Norris, the principal investigator and a research professor in the Department of Psychiatry at Dartmouth Medical School, focused on victims in two communities: Villahermosa, the capital of the coastal state of Tobasco, and Teziutlan, a smaller city in the mountainous state of Puebla. Residents of the two cities experienced the disaster differently. Flooding was worse in Villahermosa but the

Natural disasters cause a ripple effect of loss — people lose their homes, their friends and loved ones, and even the social networks that make up a community

devastating mudslides in Teziutlan caused more deaths and property losses. Hillside communities were condemned and families were relocated to a separate, geographically isolated city.

The study included interviews with more than 600 victims — ages 18 to 80 — conducted six, 12, 18 and 24 months after the disaster.

Murphy and Norris found that victims commonly develop post-traumatic stress disorder and to a lesser extent depression following disasters. Their study suggests that the international health community should prepare for outbreaks of PTSD when disasters strike and provide mental health care especially in developing countries where such care is often lacking.

For instance, six months after the disaster in Teziutlan, 46 percent of respondents suffered post-traumatic stress disorder while 14 percent of those in Villahermosa had PTSD (compared to a 2-percent base rate of PTSD in Mexico). By the end of the study, the PTSD rates had fallen to 19 percent in Teziutlan and 8 percent in Villahermosa.

Murphy attributes the elevated levels of distress in Teziutlan in part to the sweeping relocation of victims. Relocation, while necessary sometimes, may not be the best remedy, he says.

"Resettlement is a favorite response by governments to these kinds of disasters: create new communities and put people in them," he says. "What we're thinking is that may not be a good response. ... Very often this results in people, rightly or wrongly, who don't trust each other, being put in the same community."

Murphy recalls a man in Teziutlan who broke down emotionally each time Murphy talked to him. The mudslides killed his children, his parents, his wife and her parents. He survived merely because he had gone to the store for tortillas when the disaster struck.

"He came back and his house was gone and his whole family," Murphy says. "He was just totally devastated. ... The government response was to build a new community for these people."

The man remarried but because of that, he was shunned by his remaining family. Additionally, he knew no one in his new neighborhood. "So he's basically all alone," Murphy says. "He has himself, his work and his wife."

The study also found that women's mental health suffered more than men's following the disaster.

Indeed, 64 percent of women who lost their homes still experienced elevated levels of mental distress two years after the disaster. Not all women, however. The next question for Murphy and Norris is why.

To answer that, the two plan a more thorough examination of women who experience high levels of trauma after a disaster. They have proposed a study to interview women in Teziutlan from three groups: those still severely traumatized by the mudslides, those who have recovered from stress, and the sisters of those in the first two groups who did not experience any trauma.

Murphy predicts that the three groups have different social networks and that the study may find that the women with continued stress suffer from broken social networks.

"The women are really impacted much more than we had anticipated," he says. "We think that's due to a breakdown in the social networks women have created. Women's social networks are more dependent on place."

Men, however, tend to focus more on work than women do, even working women, he says. When something happens to the home and home environment, men have something to fall back on but women lack the same safety net, he says.

Murphy, a fluent Spanish speaker, has nurtured a life-long interest in Mexico and Latin America. When he was just 6 months old, his family moved to Mexico where he lived until he was 5. He spent the next four years in Chile and after earning his bachelor's degree at the University of Texas at Austin worked in Oaxaca, Mexico.

Murphy returned to Oaxaca numerous times as he continued his academic study, and he also worked as a consultant for the Mexican housing department.

Murphy was teaching at Georgia State University when Norris asked him to work on the disaster study. Norris, also at Georgia State at the time, found

After a mudslide devastated the people of Teziutlan, Mexico, survivors were relocated to a separate, geographically isolated city. Two years after the disaster, 19 percent of the victims studied were still suffering from post-traumatic stress disorder. Murphy attributes the high level of the disorder to the resettlement.

strong cultural differences between Americans' and Latinos' reactions to Hurricane Andrew in 1992. She wanted to explore the differences by studying the reactions of Mexicans to disasters in their own country.

"It raised my interest in understanding how culture intersected with the experience of trauma and how people would both respond emotionally and attempt to cope with it," she says. "I knew that Art had been doing research in Mexico for quite some time. I essentially just kind of emailed him blind. I did not know him at all. ...

"He was the perfect collaborator for a study like this," she says. "I brought the background in disaster research and mental health, and he brought a really deep understanding of the cultural and economic background of Mexico.

"Art is just sort of a master in the field ... making contacts. I think he just never met a stranger. He knew someone who knew someone who knew someone who got us into the community, so we were collecting data in the community within six months." That speed is remarkable, she says.

Murphy and Norris say their study is relevant to the tsunami disaster despite the obvious cultural and religious differences between Mexico and Asia. The devastation in Mexico wasn't as extensive but it did cause numerous casualties and wide displacement.

"We saw such serious, pervasive effects that I hope people notice the study," Norris says. Relief groups and local governments would be wise to consider repairing more than the conspicuous losses.

"They don't always realize how much damage has been done to social networks," Norris says. "People have been lost. Relationships have been damaged. More attention to how people can retain the relationships they do have and form new ones would be really helpful."

Research Unearths Real-Life Scandal Behind Mozart Opera

> "While I was reading the original documents I was shaking. Through pamphlets and letters, history speaks so vividly that facts of two and a half centuries ago seem to be going on right now." Dr. Pierpaolo Polzonetti

A cheating wife, a scheming husband, two rival composers and the politics of pre-Revolutionary France. It was a volatile combination of true events in 18th century France that led to the creation of one of the world's most revered operas.

Dr. Pierpaolo Polzonetti, assistant professor of musicology, unraveled the historical connections and was recognized by the American Musicological Society with the prestigious Alfred Einstein Award for his resulting article, "Mesmerizing Adultery: Così fan tutte and the Kornman Scandal." Published last year in Cambridge Opera Journal, the article reveals the real-life episode that likely inspired the plot of Mozart's controversial opera, "Così fan tutte."

In Mozart's opera, two young men enter into a wager over whether their girlfriends will be faithful if tempted. Each disguises himself and attempts to seduce the other's lover.

In France in the 1780s, Guillaume Kornman was a wealthy banker who followed the medical theories of Anton Mesmer, and gave name to the so-called Kornman Group, which asserted that magnetism regulated the relationships between people, and those relationships could be gauged and manipulated scientifically. It is suspected that Kornman tested the theory on his young wife, Catherine, by encouraging a friend to seduce her while he was away. When the unsuspecting woman fell for her husband's plan, Kornman threw her in jail for adultery.

Beaumarchais, the famed playwright of "The Marriage of Figaro," purloined the letters between Kornman and his friend, proving Catherine was seduced with her husband's approval and furthermore, theorizing all women would have behaved similarly under the circumstances. This convinced King Louis XVI to release Kornman's wife. Soon a pamphlet war broke out between Beaumarchais and Kornman. The public become engrossed in the scandal, and radical politicians jumped on the opportunity to characterize the aristocracy as lacking in moral values.

"Like the Clinton scandal, the Kornman scandal had a big impact on public opinion and was heavily charged with political implications," said Polzonetti.

The facts involved in the scandal have long been known, but until recently no one had connected the dots between Kornman and Mozart's last comic opera. Many believed the presence of "animal magnetism" in Mozart's "Così fan tutte" was inspired by Franz Anton Mesmer, the founder of Mesmerism who was later discredited. Polzonetti began to see the bigger picture while looking through memoirs and historical pamphlets at Cornell University.

"In the past, musicologists have interpreted the references to mesmerism in 'Così fan tutte' on the basis that Mesmer was a family friend of the Mozarts in Vienna. One problem is that he helped Mozart financially, so it didn't make sense for Mozart to make fun of him as a quack scientist. Mesmer is not the target of the satire in Così; the real targets are his enemies: Kornman and the French Mesmerists, who altered and politicized Mesmer's theories and whom Mesmer expelled from the society. It is significant that the early manuscripts, printed score and libretto all spelled Guglielmo (comic character in Così) as Guillelmo, recalling the French spelling of the name: Guillaume, like Guillaume Kornman, a detail that has remained a complete mystery until my article was published."

So what is the link between Mozart in Vienna and Beaumarchais and Korman in Paris? Mozart and his rival composer Antonio Salieri shared the same librettist, Lorenzo Da Ponte. "Così fan tutte" was originally written for Salieri, a friend of Beaumarchais, but was abandoned as potentially too politically charged. Mozart was ideologically aligned with Beaumarchais, had successfully worked with him on "The Marriage of Figaro," and was in financial need. With Mozart's vision, the true story was transformed into a fictional masterpiece.

"On the surface, 'Così fan tutte' seems innocent, yet it has a serious political agenda that keeps it relevant to audiences of today," Polzonetti said.

The spirit of a place

What, exactly, is the spirit of a place?

In late December, Ericka Hedgecock, assistant professor in the Department of Interior Architecture, took 10 days to examine that idea.

As one of 24 international artists invited to participate in the International Artist in Residency Program, she was given lodging, a studio and free time to work in Budapest, Hungary.

She found an intriguing site — the Ministry of Justice building — and asked herself a few questions: "What is it that gives a place meaning? What do people bring to it that gives it meaning?"

With degrees in fine arts and interior architecture, Hedgecock examined the space through two lenses. Her fine arts background propelled her to ask "What do I feel here?" But the designer in her prompted her to consider building codes and standards specific to Hungary.

By the end of her stay, she had worked with two spaces in the building — a winding spiral staircase and an interior courtyard.

In the stairwell she "laced the space" with black fishing line giving it curve and contours. "I created a volume that was, in essence, already there," she said.

She used a similar approach with the indoor courtyard, lacing translucent lines from the third floor to the ground.

"The lines formed planes that appeared as you moved through the space. It was difficult to document, because they would move in out of perception depending on location and time of day."

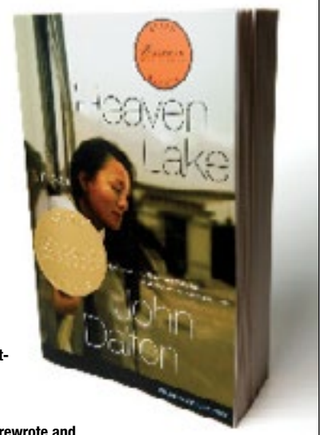
Before she left Budapest, she took down her exhibition from the courtyard but left the stairwell work intact.

"It's a way to get people to engage in a space they would not ordinarily interact with," she said.

To see more of Ericka's work, go to *www.uncg.edu/~emhedgec* and click on "exhibition design."

"Heaven Lake"

By John Dalton
Scribner



A graduation gift opened up the world to John Dalton.

When his brother gave him a plane ticket to travel the globe, he took off for an adventure. He found that Australia was "very America-like" and Europe seemed familiar. But when he reached Asia, all bets were off.

"You could walk down the street and be amazed," said Dalton, a visiting professor in the MFA creative writing program. "Everything was hugely different."

That began a love affair with the culture that has stayed with him. He returned to Taiwan to teach English and, years later, published his first novel, "Heaven Lake," to much acclaim. Winner of the Barnes and Noble 2004 Discover Great New Writers Award and the Sue Kaufman Prize for First Fiction from the American Academy of Arts and Letters, the novel is set in Taiwan and China and follows the journey of Vincent Saunders, a Christian volunteer who teaches English and Bible classes.

Nuggets of the book originated with experiences he had while in Taiwan, such as an outrageous proposal from a Chinese businessman to travel to the mainland, marry a woman under false pretenses and bring her to Taiwan so that she could be his wife.

Dalton was also intrigued by the Morman missionaries he saw there.

"The missionaries spoke Mandarin very well, and I sensed a yearning to understand and mix in the culture. But they were not allowed," he said. "I have always been interested in repressed characters."

While the plot of the book follows Vincent and his journey to a remote city in China, at its heart, the story is about the journey from belief to faith, Dalton said.

"He's in way over his head. He finds himself discarding notions of what God is. Maybe it's a much greater mystery than he thought at first."

Writing the novel took eight years. Along the way, he wrote and rewrote and scrapped more than 100 pages and started over. It was an ambitious first novel, he said. In addition to crafting scenes and dialogue, Dalton also read a lot of non-fiction travelogues to get details such as hotels and street names right.

Receiving the Barnes and Noble award pleases him in ways he never anticipated.

"I didn't even allow myself to fantasize about it being published," he said. "What matters most to me is to have readers. This award means most of my readers will be discovering 'Heaven Lake' in the coming months. I feel very fortunate."

Cultural Movement

As a 2003 Fulbright Scholar in Finland, Dr. Jill Green encountered the creative blending of influences, modern and classical in dance pedagogy.

On the invitation of Finnish colleague Soili Hämäläinen, Green applied for — and received — a Fulbright grant for fall semester 2003. In Finland, she taught and conducted research at the Theatre Academy of Finland, in Helsinki. Her classes included research methods, body studies and dance pedagogy. She also investigated body issues, such as eating disorders, and the influence of culture on teaching bodily movement in another country.

"The Finnish have struggled with their identity as a country and it is reflected in their division of dance," she said.

Finland has been colonized by both Sweden and Russia, and the styles of dance tend to reflect the influences of these two countries. The Swedish influence is contemporary dance, while the Russian influence is ballet.

Many innovative techniques were taught at the Theatre Academy, Green said, including the merging of dance and theatre. The dancers incorporated improvisational techniques, as well as many wellness practices, such as breathing exercises, in their rehearsals. They also paid close attention to body awareness. Traditionally, Western dancers often take a more objectified view of themselves, studying their own movement in a mirror. In Finland, although influenced by western movement forms, the dancers concentrated on feeling body movement from the inside out. This is a growing trend in Finland, as well as other Western countries, including the United States. In Finland, however, attention to body awareness was particularly stressed in technique classes.

Green said overall the dancers seem to have a more positive body view than their American counterparts.

"I saw a lot of performances with people of different body types. They seem to have a different take that is healthier."

Early in her visit, Green experienced Finnish academic culture intimately when she served as an opponent on a doctoral dissertation defense of a faculty member. After Green engaged in three hours of questioning with the candidate, a huge party with 150 guests was held.

"Here we go through all of this trial and when it's over, we ask 'now what?' There's a depression," she said. "There they have a whole celebration, like a wedding."

For Mariam Aziza Stephan, every one of her paintings is a conversation piece. Not something to be talked about, something to talk with.

That's how her work should be approached, the first-year art department faculty member says, and how it's created. She brings questions as well as paint to the canvas.

"Does it feel crowded? Does it feel isolated? The only way to answer those questions is by making marks. If a mark answers the question, then it can stay. If it doesn't, then it has to change.

"If you're not having a dialogue, you're just talking to yourself. And there's another thing involved in this conversation. Ultimately, it needs to stand on its own."

In many cases, the dialogue continues for months as she juggles multiple paintings. She often works at night, when it's quiet, on paintings that range from 3x5 inches — what she calls "head space" — to 5x6 feet — "body space."

"Part anatomical, part landscape in reference, her paintings use unspecified shapes to suggest a state of becoming or metamorphosis," a reviewer wrote in the Seattle Times.

A native of Pittsburgh, Stephan studied at that city's Carnegie Museum of Art, the Minneapolis College of Art and Design, and the University of Washington in Seattle. She studied abroad at L'Accademia di Belle Arti in Florence and, after graduate school, lived for a year in Berlin.

This summer, she will work on a project she's titled "Fight, Flee or Freeze: Conversations with Goya" based on Francisco Goya's "Disasters of the War" etchings. In his series of 80 etchings, Goya bore witness to the atrocities committed by both sides in the war between France and Spain early in the 19th century.

Why Goya?

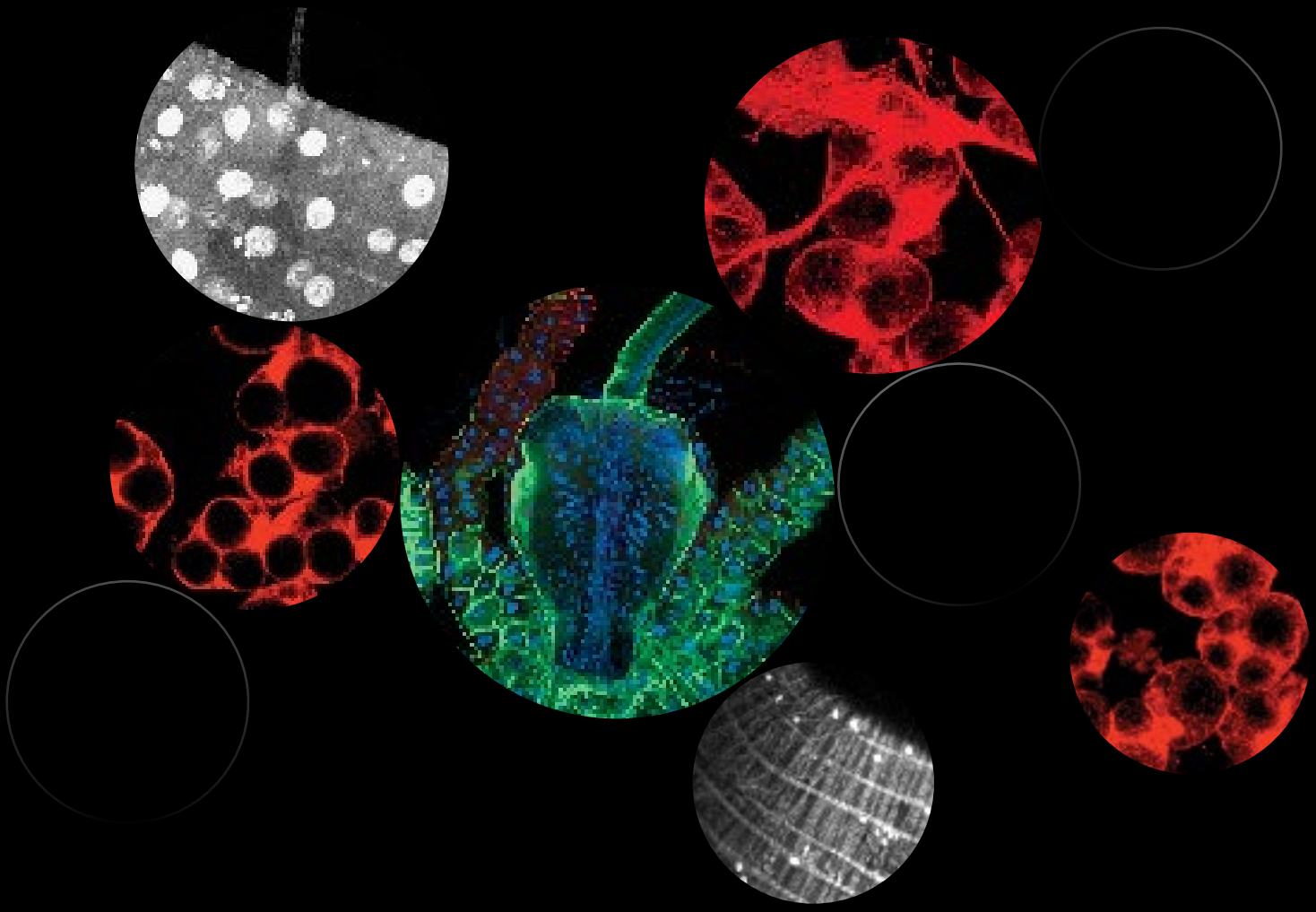
"Why do any of us continue to carry on a dialogue with anyone? It is rare that we find someone that can keep us engaged over the years, and that the conversation continues to become more interesting. They continue to intrigue us, they challenge us, and they force us to stake our ground."

Asked to elaborate on her plans for the grant, she demurs. That's between her and Goya. Some conversations are private.

"The more I talk and write about it, the more it stuffs a sock down the throat of the artistic process."

> "Does it feel crowded? Does it feel isolated? The only way to answer those questions is by making marks. If a mark answers the question, then it can stay. If it doesn't, then it has to change." — Mariam Aziza Stephan

SHOWN ABOVE: UNTITLED 2003; 8 1/4 X 5"; GAUCHE, CHARCOAL, AND INK ON PAPER



Confocal Focus

Above are slides from UNCG's new confocal microscope which produces clear images at different depths in thick samples. Looking at the same samples through a traditional microscope would be like holding a stack of photographic slides up to a light. None of the slides could be seen clearly because the images would obscure each other. A confocal microscope allows the viewer to see the slides one at a time. The confocal microscope also can create three-dimensional images by recording slices of a sample at multiple levels. The two-dimensional images are then stacked together like playing cards to create a three-dimensional image.

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