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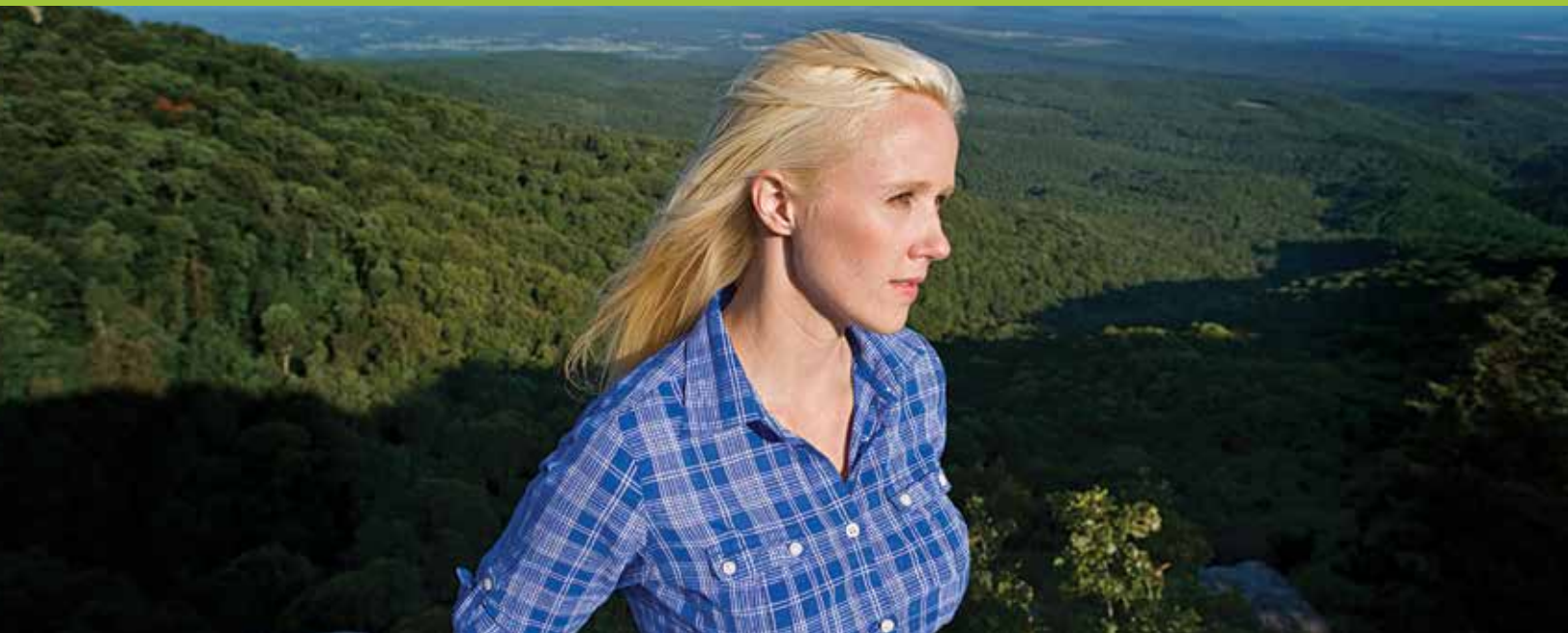
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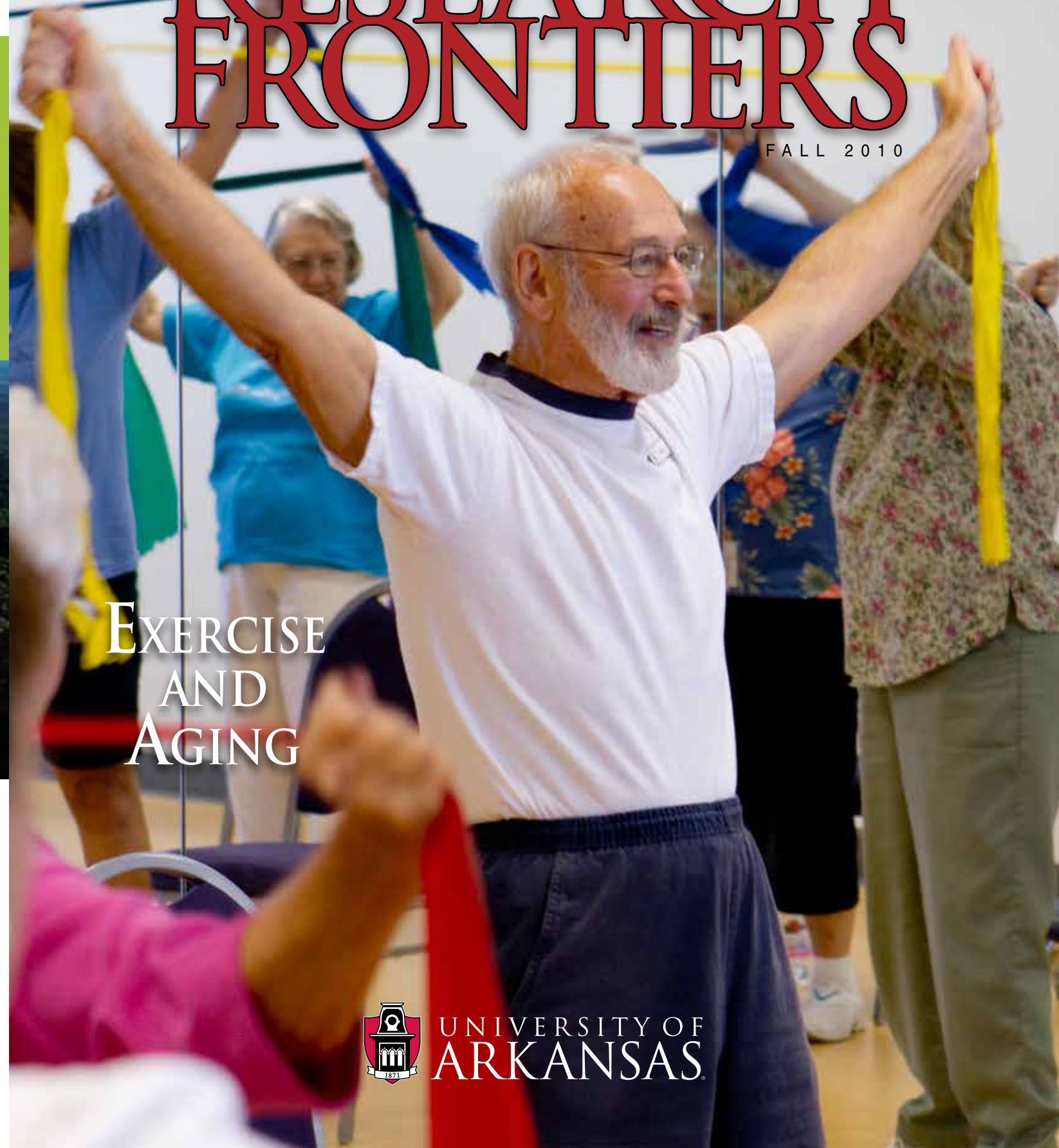
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UNIVERSITY OF ARKANSAS

RESEARCH FRONTIERS

FALL 2010



EXERCISE
AND
AGING



UNIVERSITY OF
ARKANSAS

Good Teaching Comes in Many Forms



When I think about what our faculty members are doing to support undergraduate research at the University of Arkansas I am reminded of a

line from Parker Palmer's book, *The Courage to Teach*. "Good teaching," Palmer says, "is an act of hospitality toward the young." This definition fits perfectly the act of inviting undergraduate students into the professor's own professional world of creativity and discovery. This can occur in the laboratory, a fine arts or design studio, or any other community where learners called "students" join a learner called "teacher" gathered around some great issue or subject of study. Gatherings like this take place every day on our campus and in virtually all fields of study. Here are three examples:

Professor Cindy Sagers in biological sciences recruits teams of undergraduate students to participate as a group in her laboratory alongside her Ph.D. students. While learning essential techniques for lab preparation and data collection, students develop valuable skills in teamwork which stand them in good stead as they move to higher levels in research and graduate studies. Sagers reports that students who have gone from her laboratory to do research at field stations of the Organization for Tropical Studies in Central America and South Africa typically outperform students from other leading universities.

Craig Thompson is one of many professors holding endowed chairs funded by the Walton gift, which created the Honors College, who recruit undergraduates for research. In this case, the laboratory community is both real and virtual. Thompson, in computer science and computer

engineering, has plugged into the power of 3D social networking sites like SecondLife and OpenSim to construct hospitals, schools, and other virtual environments. Students who accept the invitation jump in right away to create their own 3D avatars which interact with other "people" in complex virtual environments.

A different kind of 3D modeling brought history major Carly Squyres together with classics professor David Fredrick and his Digital Pompeii Project. Working with a revolving group of students, Frederick is digitally recreating that ancient Roman city, complete with frescoes and paintings which were removed from Pompeii's buildings long ago and are now accessible only in museums and in photographs. Carly is creating an interactive 3D model of one insula (city block) and will conduct a cultural analysis of the buildings and artwork in situ. For this project, Carly won a prestigious Student Undergraduate Research Fellowship, one of 108 SURF grants awarded to University of Arkansas students this year.

Students involved in these and other projects present their work to their peers, the campus community, and wider professional and scholarly audiences through departmental research symposia and poster sessions, and our campus's undergraduate research journal, *Inquiry*, ably edited by professor Barbara Shadden. And of course every issue of *Research Frontiers* includes stories about the research being produced by undergraduate students.

Good teaching comes in many forms at the University of Arkansas. One which makes me particularly proud begins with the hospitality of faculty mentors who invite undergraduate students to join them in the joy of discovery and creativity. The results are truly amazing.

Bob McMath
Dean of the Honors College
and Professor of History

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Special Collections, Special Delivery

By Barbara Jaquish

What do the two researchers have in common? One is a professor from a Finnish university working on his fifth book, this one about the Cold War and the rise of the Christian right. The other is a University of Arkansas undergraduate who has never worked with primary source materials and hasn't chosen a topic for an assigned paper. The short answer to their commonality: Special Collections.

Although the researchers bring different skills and needs, both end up sitting at oak tables in the basement of Mullins Library, wearing white cotton gloves to open acid-free folders, under the watchful eye of Special Collections Reading Room supervisor Geoffrey Stark.

The Finnish researcher knows what he is looking for and has corresponded with Stark before arriving in Fayetteville. The boxes of files he needs have been recalled from storage and are waiting for him. To get the student started, Andrea Cantrell, who headed research services at the time, has talked with him about his interests, helped him select a subject and introduced him to research methods in a repository.

Special Collections was created in 1967 to promote research in the history and culture of Arkansas and the surrounding regions. Today, more than 2,000 manuscript collections fill well over two miles of shelf space. Contents range from public documents like legislative bills to the personal diaries and letters of private individuals. Besides ink on paper documents, the archive also holds maps, a large collection of photographs, and sound and video recordings in all formats, from old analog tape to digital.

Some collections are clearly about Arkansas. Others, like the papers of Sen. J. William Fulbright, have an important Arkansas connection but much of the content is of national and international origin. It is the most-used collection, Stark says, and scholars from many countries have used it to research international relations in the 20th century.

Special Collections is evolving. "A big movement in the library world is to open special collections to make holdings more readily available to educators and the general research public," says Special Collections director Tom Dillard. And, he adds, "Digitization is the main strategy."

To assist schoolteachers as well as researchers, Special Collections staff is in the process of digitizing selected sections of the papers of Arkansas congressman Brooks Hays and plans an educational component with instructional materials and lesson plans.

Index Arkansas is a searchable, online index to Arkansas-related publications from the 1930s through 1986 and offers over 100,000 entries today, with plans to extend the index to 2007. A researcher interested in the World War II Japanese relocation camps in Arkansas, for example, could use Index Arkansas to quickly uncover 28 citations.

"The digital revolution changes every conceivable aspect of archiving our collective record," Dillard says.

For example, much information is "born digital" and never sees print. That information may simply be erased and never make it to an archive. When it has been stored, there are daunting technical demands to migrate files to current technology. Special Collections maintains obsolete equipment, such as a reel-to-reel tape recorder, to play oral histories and recordings of Ozark music from the 1940s. It also keeps one old computer that can read five-and-a-quarter-inch floppy disks from the early 1980s.

More and more over time, researchers who never see the Reading Room and the boxes will be able to sit at home with a cup of coffee – in Fayetteville or Helsinki – and conduct research by consulting a detailed online index or digital records delivered electronically. Their success and the richness of the books, articles and documentaries they produce will depend on a cadre of skilled staff digitizing and organizing information and offering thoughtful assistance. ■

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RESEARCH FRONTIERS



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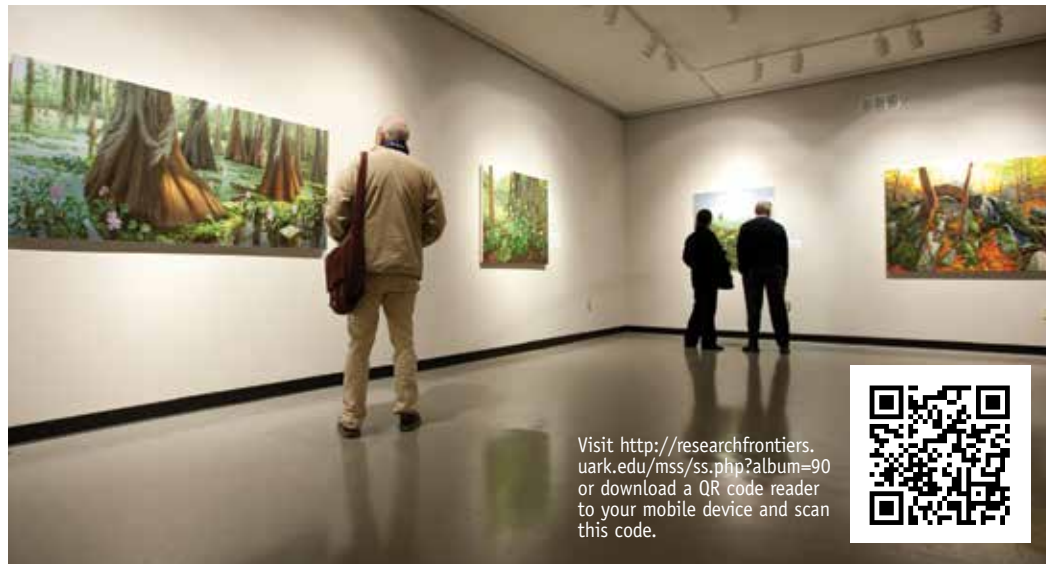
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► The Art of Nature

Click here to see a slide show of art professor Kristin Musgnug's exhibit, "Un-Natural Histories – Paintings of Invasive Species." The slide show features a series of canvases Musgnug produced after extensive research done at several locations and artists colonies, including Shenandoah National Park, Great Smoky Mountains National Park, the Blue Ridge Parkway, the Chattahoochee National Forest in Georgia, and Caddo Lake, Galveston Bay, and the Bolivar Peninsula in Texas, as well as in the Arkansas Ozarks.



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◀ A Rose is Not a Rose When...

A plant pathology student studies the mysterious deaths of roses that have plagued growers for 70 years. His research uncovers the culprit and points the way to deterring its spread.



Visit <http://www.youtube.com/watch?v=2SuYGJ7diD4> or download a QR code reader to your mobile device and scan this code.

▼ Antique Instruments

Explore physics past on the University of Arkansas campus. Professor Raj Gupta of the department of physics has collected instruments used in both teaching and research on campus since the department was founded in 1904.



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◀ Exercise for Everyone

Professors of kinesiology explain some of the moves that can help people stay mobile as they age, and a group of enthusiastic people demonstrates the moves.



Visit <http://www.youtube.com/watch?v=eA-77YDtLEI> or download a QR code reader to your mobile device and scan this code.

'Fingerprinting' Breast Cancer Cells

Engineering researchers are building a library of synthetically produced antibodies that can detect and rapidly validate proteins secreted by breast cancer cells. Their work will accelerate the process of developing a simple blood test for early detection of breast cancer.

"We want to implement a rapid screen that is sensitive – meaning highly accurate – non-invasive and inexpensive," said Shannon Servoss, assistant professor of chemical engineering. "Such a test would be easy to use – as easy as a pregnancy test – and applicable to women of all ages, races and ethnicities."

Researchers currently use specific protein binders called affinity reagents, which are molecules that interact with proteins, to recognize proteins that indicate breast cancer. But this process is tedious and problematic because there are a limited number of affinity reagents available, and techniques to develop them are slow and expensive.



Servoss's team seeks to develop a collection of synthetic, peptoid-based affinity reagents, which are inexpensive and easy to make, and will facilitate the development of techniques for protein validation. They can be designed to have desired properties, such as structural stability and specificity for a single protein. They also could be designed to detect other complex diseases.

"This technique is superior to those currently available because affitoids specific for proteins secreted by breast cancer cells can be rapidly selected from a large collection, which isn't too expensive to build," Servoss said. "The selected affitoids will be used to determine a profile – a protein fingerprint – that indicates breast cancer. Of course, all of this is happening at the cell level, before the tumor is detectable."

According to the Centers for Disease Control and Prevention, each year more than 40,000 women die due to breast cancer, and approximately 200,000 women are diagnosed with the disease. Early diagnosis leads to decreased mortality rates and more treatment options.

"It is imaginable that in this generation, a simple blood test could detect breast cancer at early stages and save thousands of lives," Servoss said. ■

Art Professor Portrays History of Underground Railroad Town

"Painting the Past Alive," an Arkansas 180 video, follows art professor John Newman as he paints a mural depicting the African Americans who crossed the Missouri River to freedom in Quindaro, Kan. Quindaro, a port community founded by Wyandotte Indians during the Civil War, was the only stop on the Underground Railroad between Missouri and Kansas.

Newman was commissioned by Kansas City Kansas Community College to paint the mural to commemorate this little-known stop on the Underground Railroad, which exists in ruins now at the edge of Kansas City, Kan. The mural's story is presented on three large panels showing fugitive slaves approaching the river on the Missouri side, making the hazardous crossing to Kansas and later living in the prosperous town of Quindaro.

The video shows the mural in place at the college and includes comments from guests at its unveiling, many of whom said the artist had brought the people and past alive.

Newman is the 2010 recipient of the American Association of Blacks in Higher Education Distinguished Cultural Award, given to those individuals whose body of work has documented the black American experience through exemplary creative or scholarly endeavors. ■



Visit http://www.youtube.com/watch?v=I-JurxTixAA&feature=player_embedded or download a QR code reader to your mobile device and scan this code.

Will Obama's Changes Open Doors to Minority Candidates?



Photo by Pete Souza

On the campaign trail, “Yes We Can” was a powerful slogan, appealing to a broad spectrum of voters of different racial backgrounds. How well has its vision and promise translated to the Oval Office? A team led by political scientist Pearl K. Ford has examined the Obama campaign’s promise of change, his administration’s progress, and the potential impact on future minority candidates.

“In the end, Obama’s administration may be judged by where his allegiance lies in the struggle between privilege and equality and the effectiveness of his presidency in ‘closing the gap’ between blacks and whites,” the researchers wrote.

Ford, Tekla A. Johnson and Angie Maxwell studied Barack Obama’s campaign strategies and voters’ expectations of his administration. The researchers asked whether the Obama administration has begun to fulfill voters’ visions and whether his presidency will open the doors to more minority candidates. The study results were published

in the *Journal of Black Studies*.

Obama came into office after a carefully balanced and technologically sophisticated presidential campaign that spoke to voters’ beliefs that he could bring important changes.

His election was based on both prospective and retrospective factors, the researchers wrote. Prospective change refers to the hopes and expectations of voters going into the election. Voters expected Obama to stop the economic slide and restore American credibility internationally. Many supporters envisioned an Obama presidency as “the first step towards a post-racial America.”

Ford cautioned that the notion of a post-racial society is premature. There have been some advances under the Obama administration, such as the reactivation of the Civil Rights Division in the Department of Justice and the confirmation of an African American as surgeon general.

Still, Ford noted, “Disparities between African Americans and whites haven’t changed, particularly with unemployment.”

Continuing disparities in jobs, health care and the criminal justice system present a challenge to future African American candidates for public office. They can benefit from the same technological advances that allowed Obama to present an unfiltered message to voters.

In conclusion, the researchers wrote, “While his election speaks to racial progress, Obama must be careful not to discount or to ignore the defining issues of structural racism, such as disparities in incarceration rates and in access to health care, that still plague America.” ■

or it may be that products from different industries simply share similar technologies.”

The researchers mapped the relationship between all products in the global trade network and specific products exported by individual countries, and found that countries whose product-specialization patterns resembled “small worlds” experienced a greater likelihood of accelerated economic growth. A small world network has many links among exported products and short average distance between their export products and other potential products in global trade. For example, South Korea, which is considered a growth-acceleration country, has exports concentrated in telecommunications, data processing, electrical machinery and automobiles.

The researchers’ finding is a step toward decoding the mystery of why some countries experience accelerated economic growth and how that growth is related to trade. The research may help countries, especially poorer ones, target or prioritize sectors of their economies in relation to broader global patterns of trade. ■

‘Small-World’ Trade Networks Lead to Economic Growth

New research by economists decodes the mystery of what transforms a network of interconnections among firms into a single organism that functions as an economic powerhouse.

Economics professors Raja Kali and Javier Reyes examined the relationship between product-clusters in international trade and their connection to accelerated economic growth at the country level. They found that the way in which a country’s exported products are connected to each other and to the other products in the global-trade network determines whether or how much a country will achieve accelerated economic growth.

“The connectedness between firms and industries could stem from a number of different sources,” Kali said. “It could be the result of production patterns that share similar inputs, infrastructure or managerial techniques. It could be that an input/output relation between industries exists,

Prevention of Workplace Violence for Nurses

When health care organizations don’t establish effective measures to prevent violence and protect nurses, the result is compromised quality of care for patients. Establishing a zero tolerance policy for violence is the first step, according to health science researcher Jean Henry.

Henry and Gregory O. Ginn of the University of Nevada, Las Vegas, lay out the issues and actions administrators can take to provide a safe and functioning health care facility in “Prevention of Workplace Violence,” a chapter in *Leadership and Nursing Care Management*, edited by Diane Huber.

“There has to be an organizational culture established that has a zero tolerance policy for violence,” Henry said.

“When it comes to protecting health care workers, administrators must make it clear that they won’t tolerate any violence – verbal or physical – against workers.”

Such a commitment sets the tone for developing policies and procedures to ensure a safe workplace. Henry and Ginn emphasize the importance of implementing a risk-management system throughout health care facilities to protect people and property from violence and prevent problems.

The goal, Henry said, is an organizational culture characterized as “caring, trusting and collaborative.”

In addition to assessing the risks and making changes in policies, procedures and physical environment to protect against violence, health care administrators need to develop procedures for responding to incidents of violence that both support the victim and lead to improvements in the workplace. ■

Scientists Tweak Soybeans to Increase Dryland Yields

Scientists at the Division of Agriculture are focusing on two soybean traits that could lead to new soybean varieties with improved drought tolerance.

Larry Purcell, crop physiologist and holder of the Alzheimer Chair for Soybean Research, said research with collaborators in plant and crop physiology, plant breeding and molecular genetics has shown that prolonged nitrogen fixation and delayed wilting are key traits for improving soybean yields under moderate drought conditions.

Nitrogen fixation, the ability of soybeans and other legumes to use nitrogen from the environment, is one of the first plant activities to cease during drought stress, Purcell said. Nitrogen is key to producing protein.

The importance of nitrogen fixation under drought was demonstrated in test plots that compared yield between soybeans with high rates of nitrogen fertilizer and those with no fertilizer. Although there was no difference in fully irrigated plants, Purcell said, yields were about 18 percent greater when nitrogen fertilizer was applied to plants under moderate drought stress.

“These results provide evidence that the sensitivity of nitrogen fixation to drought is a plausible target for increasing yield under drought conditions,” Purcell said.

Pursuing this avenue, Purcell and soybean breeder Pengyin Chen selected soybean genotypes that have prolonged nitrogen fixation under drought conditions and crossed them with Arkansas breeding lines. The result of their work has been the release of two soybean germplasm lines.

Leaf wilting is an easily recognized symptom of drought stress. In the early 1980s, a researcher first observed soybean genotypes that had delayed wilting under stress and recognized that it might be one means of increasing drought tolerance.

“Through many rounds of breeding, we’ve developed improved soybean breeding lines that delay wilting during drought,” Purcell said.

Purcell has developed genetic markers that are used to screen breeding lines for the delayed wilting trait. “We may also be able to use these markers to identify the genes that are responsible for delayed wilting,” he said.

Purcell and Chen plan to combine both traits into a single improved breeding line or variety that may be able to better withstand droughts. ■

Photo by Peggy Greb, USDA



Got Burgoni?

By Lana Hazel

Researchers Try to Prolong Shelf Life of Meat Using Fruit.

Animal science major Nathan Tapp has found that a Tahitian fruit could be the key to revolutionizing the meat packaging industry. His research shows that adding noni (*Morinda citrifolia*) pulp to ground beef patties prevents them from discoloring as quickly, which extends the shelf-life of the meat by about two days.

"This could save grocery chains millions of dollars each year," Tapp said.

Ground beef usually shows discoloring, or starts turning brown, after 36 hours, and consumers won't buy meat after it has a 30 percent discoloration, according to scientific studies. With the noni, the meat remained red after four days.

The immune-stimulating noni fruit has been considered a cure-all in Polynesia for illnesses and diseases ranging from arthritis and depression to AIDS and diabetes, and the fruit juice is sometimes consumed as a dietary supplement. In the rodeo circuit, it is used to calm horses.

In the meat, the noni acts as an antioxidant to keep the meat a bright red color. Ground beef oxidizes at a faster rate than whole muscle products, and the noni prevents the oxidation, enhancing the color stability.

Tapp grew up on a farm in Gravette, Ark., where his dad was an agriculture teacher, showing limousine cattle. He was a state FFA officer and started college intending to become a veterinarian. He became interested in meat science his freshman year, and that interest grew as he conducted two different research projects in that area.

Tapp, working with professors Jason Apple and Janeal Yancey on his undergraduate research, mixed noni pulp with coarse ground beef at concentrations of zero, two, four and six percent noni—a mixture he termed "burgoni." He used a 9.5-mm plate to grind five batches of each concentration into



113-gram patties and packaged the meat in a simulated retail display.

After four days, the six percent noni patties were still red, while the control patties were completely discolored. The two percent patties were slightly less discolored than the control, and the four percent patties were showing some discoloration but mostly red. The incorporation of the noni improved ground beef by increasing the shelf life at least one to two days, Tapp said.

However, ripe noni is considered to have a rather unpleasant taste and foul odor, and the taste test results could be the one problem with implementing the research in the industry.

"I'm confident that if consumers are notified it is a healthy product they won't find it objectionable," Apple said. "But we are lowering the concentration to five percent."

They expected the issue of taste to be the challenge the whole time, Tapp said. "I don't think it'll do the best in the U.S., but other countries that use noni more wouldn't perceive it as off-flavor as much."

Tapp, 22, was selected to present his research at the 2010 American Society of Animal Science Southern Section Meeting, and his name appears on a patent for his research, along with the professors and Tahitian Noni International, the company that donated the fruit for the research.

"I'm surprised how well it went," Tapp said. "I don't think any of us were expecting it to go that well."

Tapp graduated from the University of Arkansas with a bachelor's degree in animal science and an agribusiness minor in May. He is currently pursuing a master's degree in meat science at Texas Tech University where he received an assistantship in the department of animal science. He eventually wants to work in research and development for a food company. ■



Animal science major Nathan Tapp worked with others in the meat processing plant on campus to create hamburger patties that contained the pulp of a Tahitian fruit called noni. These "burgoni" patties, pictured here, extend the shelf life of hamburger patties by up to two days, which could save grocery stores a lot of money.

Tapp's research has gained regional and national attention. He won the southern section of the American Society of Animal Science undergraduate research competition and presented his research in February in Orlando. He also was awarded the American Meat Science Association's Undergraduate Achievement Award.



Photo Submitted



exercising
INDEPENDENCE

Exercise scientists help us learn to enjoy movement at any age

By Barbara Jaquish



Independence.

To a three-year-old child it may mean crying ‘no’ and running down the hall. In a few more years, the child may feel the joy of independence the first time he can ride his bike all the way to a friend’s house or the day she takes the subway alone.

Seventy years later, independence is no less important to the adult who wants to remain in her own home, plant his own tomatoes, carry a bag of groceries, or simply get in and out of a favorite chair. But independence can become more of a challenge as bodies and minds change with age. What does it take for an aging adult to maintain independence?

The answer depends on who’s asked. Financial planners, landscapers and interior designers can all give valuable advice. If the senior adult asked exercise scientists Ro DiBrezzo and Inza Fort what is key to maintaining independence, they would start with a one-word answer: “Mobility.”

“To be independent, you have to be somewhat mobile,” DiBrezzo said. “Mobility becomes a huge issue for people in their 70s and older.”

Fear of falling is one barrier to continued mobility for older adults, and DiBrezzo and Fort are quick to point out that it is an understandable fear.

“So many people over 70 *do* fall. The numbers are gruesome,” DiBrezzo said. “Last year alone in the United States we spent \$14 billion on osteoporotic fractures.”

Using research to develop effective fitness programs, Fort, DiBrezzo and their graduate students aim at helping aging adults surmount the barriers between them and an independent life.

Fort is a professor of kinesiology, and DiBrezzo is University Professor of kinesiology and director of the Human Performance Lab in the College of Education and Health Professions. They are also part of the Office for Studies on Aging, a cross-disciplinary program at the university.

With kinesiology graduate students, they have worked with aging adults in community centers or in university health and fitness programs, such as Fitness for Fun. They show people how to prevent falls through strengthening muscles, increasing flexibility and improving balance. Strengthening muscles also strengthens bones as the muscles pull and stress the bone, promoting bone growth and reducing the risk of fractures.

“Many falls happen because the muscles have become weak, and people lose control over their balance because of poor muscle control,” Fort said. “If we can strengthen the muscles, then we’re improving balance.”

The importance of muscle fitness in the older population has been underestimated, according to the researchers, although they are encouraged to see that more physicians are prescribing four to six weeks of physical therapy as part of the recovery process for seniors who have been ill or hospitalized. In their work with older populations, DiBrezzo and Fort have found that older adults often lack the muscle strength and endurance to succeed in any exercise program. Consequently, the university programs deemphasize cardiovascular fitness for frail adults.

Instead, the programs emphasize functional strength and balance. Aging exercisers don’t care about bench-pressing 75 pounds. They care about picking up their laundry and kitty litter or doing light housework and yard work, all the activities that will keep them in their home.

Working with the Office for Studies on Aging, DiBrezzo, Fort and their graduate students offered an exercise program three days a week at a local senior center. After only ten weeks in PUSH, the Project Urging Senior Health, participants showed significant improvements in balance, strength, upper-body flexibility, and levels of HDL, the “good” cholesterol. In subsequent studies conducted with Barbara Shadden, a professor of communication disorders and co-director of the Offices for Studies on Aging, the researchers also found improvement in cognitive function after an exercise program.

EVERYONE IS AGING

By now, it’s generally accepted that exercise, particularly cardiovascular exercise, has a host of positive effects on health and daily living, from cutting the risk of cardiovascular disease to increasing metabolism and boosting energy levels.

On one hand, older adults face certain age-related challenges. Oxygen uptake capacity decreases with age, even for those who train regularly. Older people don’t recover as fast from illness or injury.

On the other hand, everyone is aging. Fort pointed out that that the mid to late 20s are the prime years physiologically. Flexibility, in fact, peaks at around 12 or 13 years of age. The trick in the fourth, fifth and sixth decades of life is to adjust, to find enjoyable activities, DiBrezzo said, that can be done “without pain or undue fatigue.”

Yet, less than one third of adults of all ages engage in regular physical activity. Why aren’t more people doing the things that will build strength today and for their next decade of life, like taking a brisk walk, playing softball or jumping in the pool?

photos by Russell Cothren and Eric Pipkin

Photos show members of the Adult Wellness Center in Rogers, Ark., enjoying a variety of activities.

One factor that affects who exercises is access to facilities, such as a pool, a park with tennis courts or a ball diamond, or simply a safe area in which to walk.

"We just assume that everybody has the same opportunity to exercise, and they don't," DiBrezzo said. "The research tells us that the number one reason kids participate in physical activity is opportunity. Having access to facilities is a big issue at any age."

When facilities are available, setting realistic goals for exercise is also important.

"Over half of the people who start an exercise program drop out within the first two months because they usually start out too intensely," Fort said.

With that in mind, Fitness for Fun trainers work with participants to develop realistic goals and to understand that aging bodies may need more warm-up and stretching, and muscles may take longer to recover after exercising.

"A client in her 50s will say 'I want to weigh 138 pounds, because that's what I weighed in college,'" DiBrezzo said. "And we have to tell her to let that go. It's not going to happen."

What can happen, though, with realistic goals and access to a variety of activities, is a discovery of the pleasure of movement, whether the body doing the moving is 18 or 80. In fact, DiBrezzo and Fort have found that attitudes about physical activity tend to be more a function of gender than of age.

PLAYING AND WORKING

In an essay published in the *Journal of Physical Education, Recreation and Dance*, DiBrezzo, Fort and graduate fellow A. Page Glave examined the challenges women face in doing what is necessary to get regular physical activity. Men, they write, play when they exercise and enjoy the competition of recreational sports. Women often approach exercise as work. It becomes just "one more thing they have to check off on their 'to do' list."

From a practical standpoint, Fort said, "It seems harder for women than men to schedule exercise as part of the day. Women are balancing so many things that they have to make more of a commitment to schedule exercise."

In their essay, the researchers identified self-worth as a major hurdle for women considering exercise; that is, women seem to have trouble "believing that the time spent exercising is valuable rather than a distraction from other more important responsibilities." And they ask, "How do we get women to stick with it?"

For one, DiBrezzo and Fort suggest addressing self-worth issues in the beginning of an exercise program. Research has shown that women stick with an exercise program better when they value their own quality of life and engage in "positive self-talk."

Women also respond to the social aspect of working with a partner. Working with a trainer can increase a woman's confidence, particularly working with weights, as the researchers saw in exercise programs at the University of Arkansas:

"It is amazing to see women who cowered at the thought of going into the weight room at the beginning of a 10-week exercise program morph into women who ask to 'work in' with college-age

men toward the end of the program."

Instead of emphasizing the work in workout, the researchers suggest that physical educators value "the sheer joy of moving and exploring the boundaries of how far we can bend and stretch, how fast we can move, and how gracefully we can negotiate space." They advocate that women be encouraged to play and to spend more time doing things they love to do that get them moving.

Such an attitude supports regular physical activity at any age.

EXERCISE VS. AGE

What we like to say is that exercise is the great mediator for all things," DiBrezzo said. "It will slow, it will delay, and at some level, it will actually reverse certain effects of aging."

One benefit of particular interest to older adults is the effect of exercise on cognition.

"When you talk to anybody over the age of 70, they'll tell you they want to stay mobile and want to stay sharp," DiBrezzo said. "And exercise can help do both."

Some research suggests that exercise will increase cognitive functioning, particularly in the pre-cortex, the area of the brain where executive functioning takes place. Included in executive functioning is working memory.

"We're seeing people live longer and seeing more Alzheimer's," Fort said. "I think exercise has real potential for making a contribution to living independently longer."

A new area of interest for DiBrezzo and Fort is using higher velocity training with older people, as appropriate to fitness levels. The concern is that trainers using traditional methods may be under-exercising people.

In high velocity training, DiBrezzo explained, the focus is on the speed at which the muscle is contracting. In most traditional exercise programs, trainers instruct people to go slowly, breathing in and out while stretching and contracting.

"Now we're focusing on the adaptations that happen as the muscle contracts quickly," DiBrezzo said. "In athletics, we call it explosive movement, and athletes train for explosive movement if they want to increase their vertical jump, for example. We think there may be some real benefits to older populations in training explosively. And of course, 'explosively' would be relative to their speed."

For example, older adults could be doing resistive exercises, perhaps with therapeutic resistance bands, and trainers could instruct them to lift for a count of three, and then release down in a quick, explosive movement that promotes muscle growth.

The senior center adults who participated in PUSH can testify that simple movements – lifting a hand weight, gently twisting a waist – when they are repeated day after day can lead to the strength, balance and flexibility that makes further movement a pleasure. According to DiBrezzo, it is also a key to identity: "I tell people all the time that it is virtually impossible to define who you are without having some element of movement in it. How we negotiate space is in part who we are and how we express ourselves."

Whether the prancing run of a toddler or a grandparent's stroll around the park, movement is the key to independence at any age. ■



"researchers suggest that physical educators value 'the sheer joy of moving and exploring the boundaries of how far we can bend and stretch...'"



photos by Russell Cothren and Amanda Ryan



seismic impact provides hard data

By Matt McGowan



Photos submitted

Civil engineer Brady Cox subscribes to a free notification system, offered by U.S. Geological Survey, that sends an e-mail or text message containing considerable seismic data within minutes of an earthquake anywhere in the world. Cox has set his own parameters – magnitude 6 and above for quakes outside Arkansas, magnitude 2 and above for activity inside the Natural State. While in his lab on the evening of Jan. 12, about 20 minutes after the Earth ruptured in Haiti, Cox received one of these e-mails. “I always look at the most basic information first – magnitude, depth of the hypocenter and distance from the epicenter to the nearest city,” he said. “When these basic facts sunk in – and knowing that Haiti was an impoverished country with many poorly constructed or un-engineered buildings – I knew it would be bad, very bad.”

Three weeks later, Cox, a geotechnical engineer and assistant professor of civil engineering, stood on the lawn of the Presidential Palace in Port-au-Prince. He had traveled to Haiti with nine other members of Geo-engineering Extreme Events Reconnaissance (GEER), an organization funded by the National Science Foundation to conduct reconnaissance efforts of extreme events such as earthquakes, tsunamis and hurricanes. GEER missions augment researchers’ understanding of the effect of earthquakes in general but also provide hard data that will aid the design of new earthquake-resistant structures that limit damage to buildings and could save human lives.

In Haiti, Cox and his GEER colleagues documented the geotechnical and structural impact of the earthquake by mapping and surveying damaged areas. They examined damage patterns, port facilities and coastal infrastructure. Specifically, the researchers studied examples of liquefaction – solid ground turning into liquid – including lateral spreading, surface faulting, coastal uplift, road-fill performance and landslides.

As an expert in soil dynamics, earthquake loading and nondestructive material characterization using stress waves, Cox contributed to several of these areas, although he focused on damage

patterns, the category with the greatest impact on human life. Cox wrote the section on damage patterns in the organization’s nearly 100-page mission report.

Mosaic of Destruction

For six days, Cox and other GEER researchers raked Port-au-Prince, Haiti’s capital and the focus of most of the property damage and casualties. What they found was, to use his expression, “some weird stuff,” which is typical for damage caused by major earthquakes.

Some of the worst destruction occurred in a multi-block area immediately north and west of the well-documented Presidential Palace, which itself suffered major damage. Many buildings and in some cases whole blocks of structures within this section collapsed entirely or crumbled down to their foundations. Yet some structures within this area had only minimal damage or none at all.

Another section of the city, a mostly residential area near the



Researchers tested soil stiffness and layering on the grounds of the Presidential Palace, which was near a large area that suffered widespread destruction.

heavily damaged zone, experienced only minor damage to a handful of structures. While this is surprising, most of the buildings in this lightly damaged area were smaller, densely spaced shanties with tin roofs, while most of the badly damaged buildings had been large, multi-story, reinforced-concrete structures.

In other areas of the city, namely the foothills where the effects of topography came into play, damage seemed to run along distinct boundaries. Cox also observed sections in the foothills that experienced severe damage, while other, nearby sections at the same elevation suffered little or no damage.

These observations – virtually unscathed buildings in areas of heavy damage, relatively unharmed neighborhoods adjacent to destroyed areas, and damage according to seemingly arbitrary boundaries – make it difficult to determine exactly what forces caused the damage, which is a critical part of Cox's job. Before he can identify and explain damage patterns, before any kind of rigorous analysis can occur and long before he can begin to understand the “weird stuff,” Cox must consider these critical factors:

- the distance of the damage from the fault rupture,
- the direction of the rupture,
- the building construction type and quality,
- the topography,
- and, perhaps most importantly, local soil conditions, including age, strength and stiffness of the foundation soil as well as its depth to the bedrock.

“So there are many factors that affect and really determine damage patterns during earthquakes,” he says. “And what we often find is that multiple factors combine to create a complicated mosaic of destruction.”

Shear Wave Velocity Profiles

Earthquakes produce three types of waves: compression, shear and surface. They may be thought of as cars on a train, with compression waves as the engine and surface waves as the caboose.

Energy released by the initial, violent rupture creates compression waves, which travel quickly through the earth and arrive first at the ground surface. Shear waves follow compression waves.



Above: In a heavily damaged area of Port-au-Prince, Cox found standing wood-framed structures next to reinforced concrete structures that collapsed.

They move slower and have larger amplification, which causes horizontal or side-to-side shaking. Surface waves arrive last and typically have smaller amplification than shear waves. Surface waves produce rolling-type motions similar to waves produced by a rock thrown into a pond. While all seismic waves can cause damage, shear waves are predominantly responsible for the violent shaking that damages man-made structures.

The reason for amplification, Cox explains, has to do with soil stiffness and layering. When fast-moving and focused shear waves traveling through rock hit soft soil layers, they immediately slow down and create a vibrating effect known as impedance contrast. In other words, the different layers of soil impede and amplify waves, very much like the effect of a hard-thrown baseball upon impact with an aluminum bat. In fact Major League Baseball players cannot use aluminum bats because the high impedance contrast between the ball and the aluminum would result in too many home runs and more injuries to infielders.

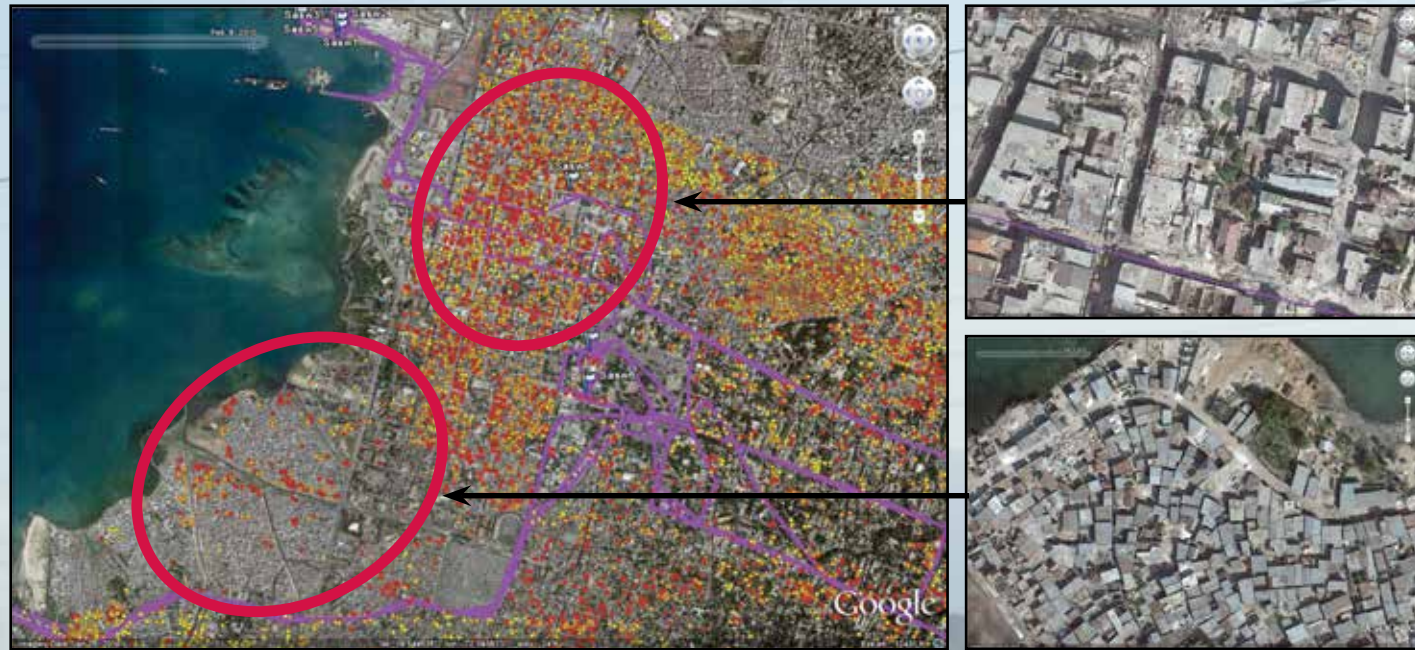
Specific characteristics of the Haiti earthquake – distance from the fault and direction of rupture propagation westward and away from Port-au-Prince – compelled Cox to focus on construction quality, topography and especially soil conditions as the best sources for explaining damage patterns. With severe time constraints and limited mobility because of widespread damage throughout the city, Cox and other researchers kept GPS track logs and identified the best possible locations to conduct spectral analysis of surface waves tests. This is a geophysical technique in which seismometers – special sensors placed on the ground surface – measure the speed of seismic waves that are manually sent through the ground by striking the surface with a sledgehammer. The technique allows researchers to obtain quantitative evidence of soil stiffness and layering.

Cox conducted several of these tests at the port, three within the heavily damaged downtown area, including two tests on the grounds of the Presidential Palace, and several more at liquefaction-failure sites along the coast west of Port-au-Prince. Although information gleaned from these tests was helpful, Cox knew they did not tell him enough about the ground under Port-au-Prince. With spectral analysis testing only, he could not thoroughly evaluate potential amplification of the seismic shaking that may have



Above and right: In the same area of intense damage and destruction, some structures, probably built with features included in the International Building Code, suffered little or no damage.





contributed to the damage patterns. Rough and suspect geologic maps of the area only complicated the picture. Cox knew that more information would be needed to properly characterize the city for rebuilding according to seismic design codes.

In late April, Cox, doctoral student Clint Wood and several other researchers returned to Haiti to collect more seismic data that may be used in rebuilding efforts. Although not an official GEER mission, the second trip was also sponsored by the National Science Foundation. This time Cox schlepped more equipment and conducted multi-channel analysis of surface waves testing, which, as the name suggests, uses multiple seismometers, or geophones, to sense surface waves propagating through the ground.

The multi-channel analysis tests allowed Cox to develop shear wave velocity profiles, a term geotechnical engineers use to define and classify soil stiffness and the expected performance of a given tract of land during shaking or vibration caused by an earthquake. The profiles tell how fast earthquake-generated shear waves travel from hard bedrock up to the ground surface. Changes in the speed of wave propagation caused by alternating layers of hard and soft soil can cause either amplification or attenuation of ground shaking. The profiles also help engineers estimate site resonances, or natural frequencies, that can cause extreme shaking at the ground surface.

Seismic Micro-zonation

Considering the basic information – poor building construction, magnitude, proximity of epicenter to population center, depth of the hypocenter – it is easy to understand why so many buildings collapsed and so many people died. Simply put, the Haiti earthquake was a powerful and shallow event less than 20 miles from a major city. But this understanding is superficial. Almost every expert will argue that the destruction did not have to be so extreme, and lives could have been spared.

How so? At the risk of directly comparing earthquakes, which rankles geologists, seismologists and geotechnical engineers almost as much as predicting earthquakes, much can be learned from the 1994 Northridge, Calif., earthquake. It too was a powerful (magnitude 6.7) and shallow event that occurred very near a large population center. Despite the similarities, the Northridge earthquake killed only 61 people.

Of course, there are many variables and subtle differences that distinguish Haiti from Northridge, but one thing is certain: Many more people would have died in Southern California in 1994 if buildings had not met the specifications of the International Building Code. While emphasizing that he is not a structural engineer, Cox said that most failed buildings he observed in

Port-au-Prince did not appear to have features required in the building code.

It takes money to build to code, which is something the Haitian government will have to contend with, but Cox's work will enable the country to make informed choices when rebuilding. With information supplied by the multi-channel analysis tests and shear-wave velocity profiles, Cox is developing what he calls a "seismic micro-zonation" of Port-au-Prince. The system will provide specific and detailed recommendations for seismic design of structures on a site-by-site or tract-by-tract basis throughout the entire city. The recommendations will be based on site classifications – A for "hard rock" through F for "liquefiable" soils – and other profiles specified in the International Building Code.

"The classifications correspond to design features that must be included to resist forces in an earthquake," Cox says. "Haiti can use the system to determine structural design parameters based on soil conditions."

Saving Lives

Cox isn't ready to say exactly which factors – or combination of factors – caused the most damage, but it is apparent that some areas of Port-au-Prince suffered from amplification due to soil layering. However, the effect of amplification alone on damage patterns may not be as great as expected. His initial findings show that soil under the city is mostly "competent," meaning dense and stiff.

Other parts of the city, such as those at higher elevations, clearly experienced topographical effects. Cox said it is possible that shear waves channeled themselves through valleys or ran along ridges, which might explain the arbitrary boundaries between heavily damaged areas and adjacent areas that experienced little or no effects.

And then there's building type and quality of construction. Why, in the middle of zones that experienced massive destruction, did some buildings survive with only a scratch? And why, especially in areas that experienced the effects of amplification, were whole neighborhoods spared while adjacent areas were heavily damaged? Without committing definitively, Cox attributed these outcomes to the effects of building type and construction quality.

"Evidence of this was apparent on blocks where heavy, steel-reinforced concrete buildings collapsed while right next to them, wood-frame structures held up just fine," he says.

Cox will continue going wherever GEER sends him. The research, he says, is meaningful on a personal level.

"I love my work, but if it saves even one life in future earthquakes, it will be even more gratifying," he said. ■

Left: Large tent villages sprung up after widespread destruction to large residential areas left thousands of Haitians homeless. **Inset images:** A multi-blocked section, top circle, of downtown Port-au-Prince suffered intense damage or destruction on a wide scale, while a nearby residential area, bottom circle, experienced only minor damage to a handful of structures.



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FEDERAL 'STIMULUS' DOLLARS FUND UNIVERSITY RESEARCH

*Projects create jobs; studies range
from cell proteins to power grids*

By Steve Voorhies

University of Arkansas researchers have been awarded more than \$9 million in federal funding for the fiscal years 2009 and 2010 through the American Recovery and Reinvestment Act. The "stimulus funds" were primarily intended to provide a short-term boost to the American economy by creating or preserving jobs and improving the nation's infrastructure.

University researchers say their ARRA grants, mainly from the National Science Foundation and National Institutes of Health, did create jobs. However they expect the real impact of these grants will be felt in the results of their research in a broad range of areas.

Several of these projects target the causes and ultimately treatment or cures for serious diseases.



Photos by Russell Cothren



Photos by Russell Cothran

Above: Paul Adams, assistant professor of chemistry and biochemistry, studies proteins that may play a role in cancer. **Far right:** Frank Millett, Distinguished Professor of chemistry and biochemistry and director of the university's Center for Protein Structure and Function, and his colleagues examine ways to develop antiviral drugs that can be used to treat the flu and prevent its spread. **Top inset:** The Arkansas Industrial Energy Clearinghouse, led by Darin Nutter, associate professor of mechanical engineering, working with Arkansas Manufacturing Solutions, will lead to energy savings and greenhouse gas reductions. **Bottom inset:** The National Center for Reliable Electric Power Transmission, led by Alan Mantooth, professor of electrical engineering, seeks ways to make the nation's power grid more efficient.

Paul Adams, assistant professor of chemistry and biochemistry, received a \$108,000 grant to study mutant proteins involved in cell growth regulation that may play a role in cancer.

"One of the hallmarks of cancer cells is that they do not turn off; they keep growing," said Adams. "Our goal is to understand the molecular details of this activity so that we can find ways to eradicate this behavior."

Adam's research concentrates on a specific member of the Ras family of proteins. His lab will learn more about how this protein works by engineering chemical differences in different parts of the protein. Ultimately, researchers will use this information to help design drugs that target this particular protein.

In terms of job creation, Adams' grant has allowed him to hire a second post-doctoral associate and a master's level laboratory assistant in the near future.

A protein found in the influenza virus is the subject of research being done by five university scientists. Frank Millett, director of the university's Center for Protein Structure and Function, is working with Suresh Kumar, assistant professor of chemistry and biochemistry and his colleagues in biological sciences, assistant professors Yu-Chun Du and Robyn Goforth and professor Ralph Henry. The team is working to develop antiviral drugs that can be used to treat influenza and prevent it from spreading. To do that they first need to understand the way the influenza virus infection works on a molecular level. This involves intensive study of a specific protein related to the virus, NS1, first, to learn how it infects and disrupts healthy cells. The next step is developing a three-dimensional "picture" of the protein's structure to find ways to inhibit it.

The \$855,000, two-year grant enabled the researchers to employ two full-time

technicians and five graduate students; it also paid half the salaries of two senior researchers.

Jeanine Durdik, professor of biological sciences received a \$142,000 grant to continue her work on ways to make vaccines more effective for elderly people.

"Once we reach 50 years old or beyond, our immune systems are not as effective as they were in our youth," she explained. "We are looking for drugs that we can add to a vaccine to boost its effectiveness in preventing a disease as people get older."

The grant enabled Durdik to employ a post-doctoral student on a half-time basis.

Burt Bluhm, assistant professor of plant pathology is also looking for a way to fight disease, but in his case his \$500,000 ARRA grant funds research into a common and widespread fungal disease that attacks corn crops. As with the protein research projects, Bluhm is looking at the way the fungus works on a molecular level, with the long term goal of finding ways to block it. The research could save farmers millions of dollars by giving them new strategies to manage the disease.

The stimulus funds are paying the full-

time salaries of a post-doctoral researcher and a graduate student, as well as the hourly wages of two part-time undergraduate assistants for a three-year period.

Moving from the molecular to the macro scale, two of the university research projects address energy conservation and efficiency.

Alan Mantooth, professor of electrical engineering, is principle investigator for two NSF grants totaling \$783,000 that established the GRid-connected Advanced Power Electronic Systems (GRAPES). The center is a partnership with the University of South Carolina and 16 companies ranging from electrical utilities to equipment manufacturing firms. The member companies each contribute \$40,000 a year to the center, nearly doubling the research funds available in the first year alone. Researchers are using those funds to investigate ways to improve the efficiency, economy and reliability of the nation's electric power grid. They are developing, testing and implementing elements of what is known as the "smart grid," which includes new devices to help prevent blackouts and integrate electricity from such renewable sources as

wind and solar energy. Only one job was directly created by the project, but the "seed money" provided to start this center of excellence will provide a long-term economic benefit for consumers, in the form of cheaper, cleaner and more dependable electric energy.

An energy-related project in applied research is being funded by a \$773,000 federal grant provided through the Arkansas Energy Office. Darin Nutter, associate professor of mechanical engineering, working with the Energy Office and Arkansas Manufacturing Solutions, created the Arkansas Industrial Energy Clearinghouse, designed to help Arkansas industry save energy. The Clearinghouse, which includes a website, brings together and will continually update the most current information about energy conservation and make that information instantly available to all industries in Arkansas. State industries can contact the Clearinghouse directly for free advice, assistance, and technical resources. Companies can also use the website for guidance on how to conduct their own energy assessments and find answers to specific technical questions.

"The Clearinghouse should lead to sig-



nificant energy savings and greenhouse gas reductions,” said Nutter. “It should also increase the competitive advantage of the manufacturing base in Arkansas.”

One full-time staff engineer has been hired to run the day-to-day operations of the Clearinghouse.

In addition to research projects taking place in Arkansas, some of the stimulus money has funded projects outside the United States. Brady Cox, assistant professor of civil engineering, received a \$177,000 ARRA grant through the NSF to study the 8.0 magnitude earthquake that struck Pisco, Peru in Aug., 2007, killing more than 400 people. Cox and his multinational, multidisciplinary team will add to information already gathered in the aftermath of the earthquake. They will use a combination of satellite imaging, state of the art remote sensing equipment, seismic surface wave testing and on-site “boots on the ground” observation to create a comprehensive, searchable archive detailing the effects of the earthquake on a 1,000-square kilometer area. This region varies from coastal plains to a mountain range, and the earthquake effects included everything from soil liquefaction to massive avalanches. The multinational project will

provide extensive information for future researchers, but it also will be useful for the general public and policy makers worldwide, helping them understand how to plan for an earthquake in order to limit damage and save lives.

The stimulus grant also pays for the creation of two graduate research assistant positions during the study, enabling the graduate students to work while completing their master’s degrees.

In northern Thailand researchers are using a \$150,000 grant to study mushrooms and other fungi in a project directed by Steve Stephenson, research professor in biological sciences.

“There is no question that fungi are immensely important in the functioning and maintenance of ecological processes in nature, but our knowledge of their biodiversity is far from being complete,” said Stephenson. “Tropical forests are thought to have the greatest variety of fungi, but a major portion of this biodiversity has yet to be documented. Our purpose is to develop a more complete understanding of the role that fungi play in tropical forest ecosystems, to help better understand our entire earth ecosystem.”

The project creates knowledge, rather

than jobs, although the grant will pay for at least four student researchers, undergraduate or graduate, to spend a month in Thailand carrying out biodiversity studies of fungi and fungus-like organisms for each of three summers.

“This is an extraordinary opportunity for the students,” said Stephenson. “They will be doing joint field work at study sites in northern Thailand, sharing the same accommodations as their student counterparts from Thai universities, and working together in the lab to process and analyze their samples and data.”

Another two stimulus grants will provide students with research experience, but on the Fayetteville campus.

One of the grants, \$274,000 over three years, will provide funding for the NSF’s Research Experience for Undergraduates. The program, administered by Julia Kennefick, assistant professor of physics, brings 10-12 students to the university’s Arkansas Center for Space and Planetary Sciences for an intensive 10-week research program. The students receive stipends that allow them to conduct research in such areas as astronomy, astrobiology, planetary geology, and instrument and mission design.

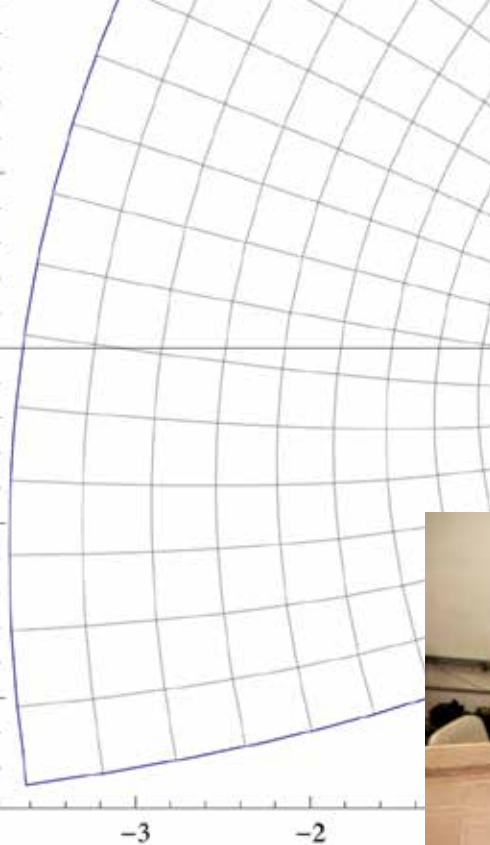


Image submitted

Another grant, \$656,000 for two years, is stimulus money distributed through the National Institute of Health’s Center of Biomedical Research Excellence, and administered by Frank Millett, Distinguished Professor of chemistry and biochemistry. The grant brings undergraduate students and science teachers from both high school and small colleges to the university’s Center for Protein Structure and Function. The students and teachers will get experience working on one of five research projects being conducted at the center, while furthering the center’s study of the structure and function of biomedically important proteins.

In 2009 the grant provided 30 summer jobs for undergraduate students, two for college teachers and one for a high school teacher; in 2010 another 43 summer jobs have been created for undergraduate students and 7 for college and high school teachers.

Two additional grants were awarded to Andrew Raich and Phil Harrington, assistant professors of mathematics, for what can be considered “pure” research related to a particular type of mathematical equation.

Raich received a \$96,000 grant to investigate the regularity theory of tangential



Photos by Russell Cothran

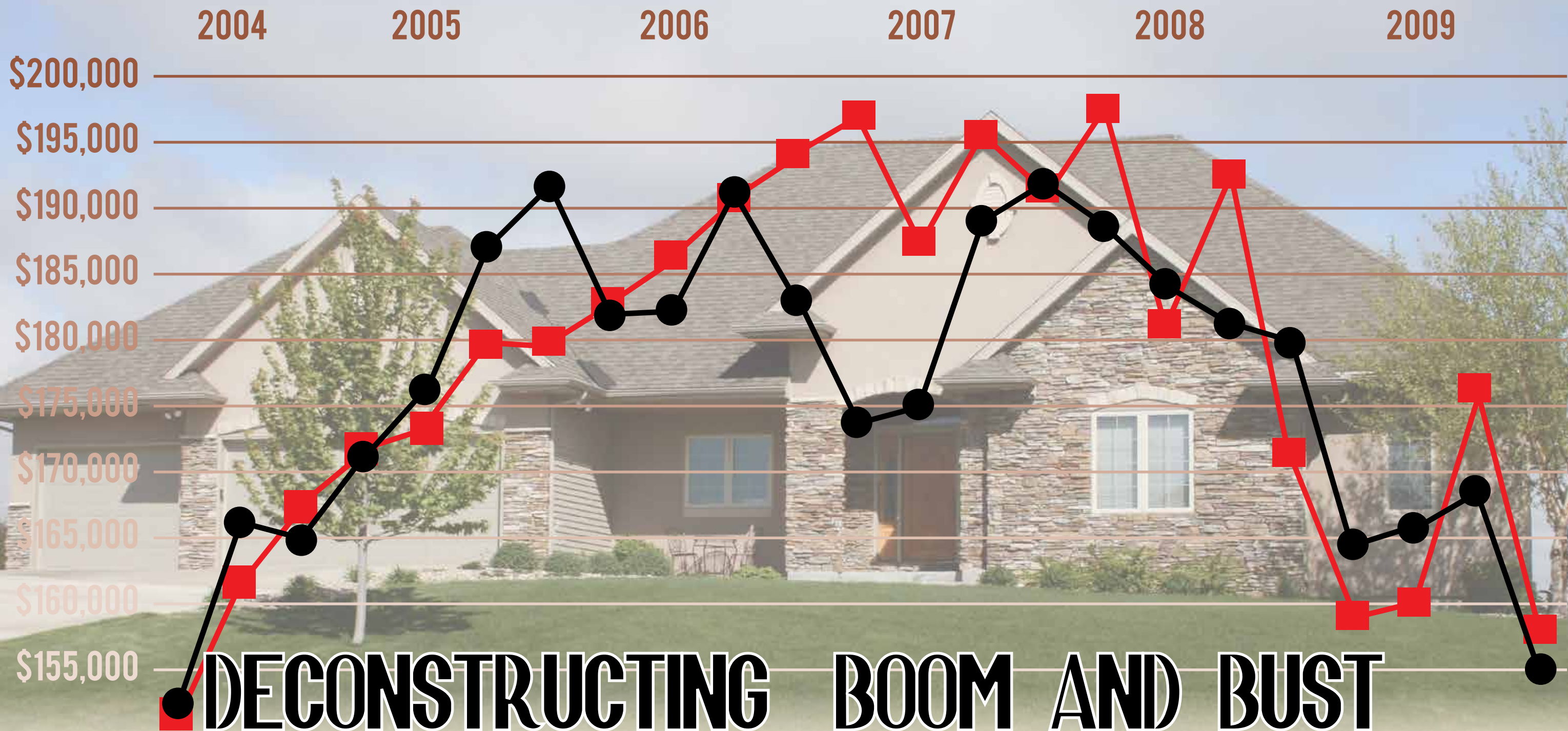
Cauchy-Riemann equations. Harrington is using his \$85,000 grant to study boundary value problems related to the Cauchy-Riemann equations on non-smooth domains. Although this research may sound abstract, mathematics is fundamental to science and even obscure mathematical discoveries have a history of leading to breakthroughs in “mainstream” science in unpredictable ways.

“The breadth and depth of the research being conducted by University of Arkansas faculty never fails to impress me,” said Sharon Gaber, provost and vice chancellor for academic affairs. “The fact that so many students are also involved is a mark of the quality of the education they are receiving. Most of the attention the federal stimulus program has received has focused on the short-term impact on the economy. However, the government was wise to take a long-term approach as well and add significant new funding for scientific research. The work being done here, and at other universities, will not only provide a foundation for the future growth of this country but it will also improve the lives of people all over the world.” ■

Far Left: Brady Cox, assistant professor of civil engineering, is studying the 8.0 magnitude earthquake that struck Pisco, Peru, in 2007 to provide useful information for the public and policy makers worldwide, help limit damage and save lives. **Left page:** Steve Stephenson, professor of biological sciences, surveyed and characterized the biodiversity of fungi and fungus-like organisms in Thailand as part of a worldwide biodiversity survey. **Above left:** Undergraduate students in the Arkansas Center for Space and Planetary Sciences spent an intensive 10-week period doing in astronomy, astrobiology, planetary geology, and instrument and mission design in a program led by Julia Kennefick, assistant professor of physics. **Above right:** Undergraduate students and teachers from high schools and small colleges worked in laboratories to further biomedical research as part of a program led by Distinguished Professor of chemistry and biochemistry Frank Millett. **Illustration:** Phil Harrington and Andrew Raich, professors of mathematics, will be studying aspects of Cauchy-Riemann equations, which are used to understand physical properties. This illustrates the temperature near a heated wedge. The curves radiating out from the wedge represent the direction of heat flow, while the curves perpendicular to these represent constant temperatures. Harrington studies problems in pure mathematics that are analogous to the equations modeling temperature distributions, to understand the behavior of these equations near the tip of the wedge.



Photos submitted



DECONSTRUCTING BOOM AND BUST

Bankruptcies filed by local developers demonstrate the national crisis

By Matt McGowan

“At the end of every seven-year period you shall have a relaxation of debts, which shall be observed as follows. Every creditor shall relax his claim on what he has loaned his neighbor; he must not press his neighbor, his kinsman, because a relaxation in honor of the LORD has been proclaimed.”

– Deuteronomy 15:1/2

Table above: Housing Sales in Benton and Washington County

In 2005, when the economy hummed like Dallas traffic and citizens argued about how tall Fayetteville should grow, Kathy Deck, director of the Center for Business and Economic Research in the Sam M. Walton College of Business, ran into a contractor working on a building that had sparked the skyscraper debate. She told him that she had qualms about the financial viability of the project. Fayetteville didn't seem capable of supporting it.

“From my perspective,” Deck says, “Fayetteville just didn't have the income or population density to support that kind of mixed-

use, high-end development. I told him this, that I just didn't see how the cash flows, and he said, ‘Well, it better. Do you know how many livelihoods depend on these projects?’”

But that's not how it works. Unfortunately, dependency of this sort does not ensure success. It does not fill up condominiums. Ultimately, the building's developer, Brandon Barber, crashed, a victim of excess and the collapse of a housing market that seemed invincible through most of the 1990s and 2000s.

After many months of personal and business tumult, including the bankruptcy filing of his company, Lynnkohn LLC, in 2008,

Barber petitioned for personal bankruptcy in 2009. His chapter 7 petition listed zero assets, 50 creditors and \$63 million of debt. More than a third of the debt was owed to several Arkansas banks, including \$9.9 million to Legacy National Bank and \$9.73 million to First State Bank of Northwest Arkansas. He also owed millions of dollars to local home centers and lumber companies.

Less than a year later, another high-profile chapter 7 landed in U.S. Bankruptcy Court. In a petition filed in late February 2010, John David Lindsey, real-estate developer and principal broker of Lindsey & Associates Real Estate, the highly successful firm started by Lindsey's father Jim more than 30 years ago, claimed assets of \$9.99 million and liabilities of \$169.6 million, including more than \$19 million to Liberty Bank and more than \$18 million to Bank of Fayetteville.

The Lindsey filing listed six personal businesses, 25 co-debtors and interest in 24 other Northwest Arkansas partnerships and companies. Assets included 226 single-family houses, 410 lots, 227 acres of land and three multi-family complexes. In May, the federal trustee for Lindsey's estate assigned much of this property to several creditors, including First Security Bank, which claimed 56 single-family residential dwellings and one two-family dwelling for unpaid loans totaling approximately \$7.1 million. Further court hearings will settle additional property.

Despite the dollar figures – virtually unfathomable to the average wage earner – and the complexity of the cases in terms of property holdings and partnerships, both of the above bankruptcies were personal filings, even though a majority of the debt was business-related. How is this possible? How can an individual claim business-related debt in a personal bankruptcy filing?

The practice is not unusual, says Tim Tarvin, assistant professor of law and supervising attorney in the Federal Practice Clinic. Under Tarvin's direction, law students in the federal clinic handle bankruptcy cases for low-income individuals. Tarvin has practiced bankruptcy law for more than 30 years. He says individual chapter 7, which is the liquidation of a debtor's non-exempt assets for the purpose of selling the assets so the proceeds can be distrib-

CHAPTER 7 BANKRUPTCY: the sale of a debtor's nonexempt property and the distribution of the proceeds to creditors.

uted to creditors, is the conventional way of handling bankruptcies such as Lindsey's and Barber's.

Tarvin emphasizes that human beings run businesses, so when these individuals personally guarantee business loans, they become personally liable. The liability becomes personal because the business owner backs the loans with personal collateral. When all business entities become insolvent, as was the case with Lindsey, the individual backing the entities can file one bankruptcy rather than many separate business filings. This route is critical because it provides immediate protection from creditors, eventual cancellation of personal liability and protection of exempt property that will give the debtor an opportunity to start over.

"It's as if the debtor is calling in all artillery on himself," Tarvin says. "The business owner is admitting that the venture has proven unsuccessful, and the

time has come for reckoning. And once the creditors get everything from the business entities, there's nothing left."

But Lindsey will be left with something. That's the reason for bankruptcy, Tarvin says, to give people an opportunity to start over, to leave them with something, usually a home and a vehicle, after all other assets have been liquidated and sold, and all debts paid or discharged.

"In our culture, there's a strong stigma associated with bankruptcy," Tarvin says. "I'm not trying to excuse people who've been greedy or financially reckless, but really bankruptcy should be viewed as one form of debt collection. It is a process of examining the financial health of an individual and trying to restore that individual to productive capacity while treating creditors fairly."

Tarvin says it's unfair to place all the blame squarely at the feet of John David Lindsey. He was simply doing business as usual, based on about 30 years or more of strong, steady growth in Northwest Arkansas. There's no way Lindsey could have predicted the regional and national real-estate bubble bursting, and, furthermore, it wasn't like he was begging banks for money with no demand for housing in Benton and Washington counties.

The banks, which Tarvin sees as partners in Lindsey's business ventures, have some responsibility – they should not be regarded as helpless victims. They wanted in on the deal, Tarvin says. The general attitude was that if one bank didn't make the loan, another would. They had many experts analyzing the economy and real-estate market, and still continued to invest in real estate.

But the banks should not be a scapegoat either, Tarvin says. Their actions reflected what was happening all over the country. Their lending practices stemmed from the real-estate boom, and if the Federal Reserve and dozens of federal regulatory agencies could not have predicted the housing and mortgage crises, then it's unrealistic to expect local banks to have anticipated them.

Deck agrees. She says Northwest Arkansas' longstanding and steady growth had become perceived as a normal state of being. Washington County's population alone more than doubled between 1970 (77,370) and 2000 (157,715). So for more than a generation, developers and banks contributed to and benefitted from this growth. For many of the people who ran these companies, especially those born after 1970, growth was all they knew. There had been temporary lulls, but for the most part, since 1970 and probably before, Northwest Arkansas had not experienced anything close to economic stagnation.

"Calling that moment when growth will slow down is difficult and dangerous," Deck says.

In part, that's the charge of the Center for Business and Economic Research, to provide economic data, both local and national, that Arkansas businesses can use to make informed decisions. But because it is dangerous – livelihoods and sometimes the viability of companies depend on economic predictions – Deck avoids strong statements about what the economy will or won't do. She does the research and lets the facts speak for themselves.

Trends emerge in the Skyline Report, a quarterly analysis of the Northwest Arkansas' real-estate market. Since 2004, the report has

tracked commercial, multi-family residential and single-family residential units. It focuses on important factors such as sales, vacancy rates, building permits and plat approvals to provide a comprehensive picture of the current local real-estate market.

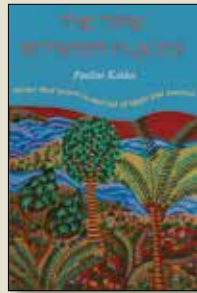
When asked how the Lindsey bankruptcy will affect the local market, Deck points to a graph of median housing prices and inventories for Washington and Benton counties. The graph shows that home prices have declined from \$175,000 to \$160,000 since June of 2009, which reflects the nature of the market in general. In fact, since Lindsey filed for bankruptcy, median housing prices have remained steady. However, since the bankruptcy filing, the number of houses listed for sale by realtors has risen steadily from about 5,200 to 5,700.

It's difficult to know for sure, but Deck suspects this increase may be attributed to the Lindsey bankruptcy. As more homes are returned to banks, many of these homes will go on the market and be sold for much less than what was owed on them. The industry calls this a "short sell." Deck will not be surprised if housing prices dip further. If – or when – this happens, the local market and economy will suffer. Lower list prices will drive down the market value of neighboring homes, and this dynamic could then transfer from subdivision to subdivision and community to community.

"This power of transitivity affects home prices all through the region," she says. "Suddenly, if Bentonville's been smashed by foreclosures and is now selling cheap, then Rogers has to compete with Bentonville, and this spreads all the way out to Prairie Grove and Pea Ridge. Overall, there will be hits to capital available to do anything good."

Today, five years after his comments to Deck, the contractor's words have a prophetic ring. ■

FORECLOSURE



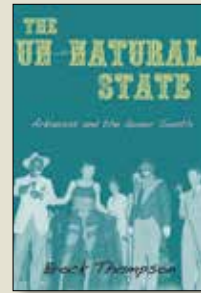
The Time Between Places: Stories that Weave In and Out of Egypt and Africa

Pauline Kaldas
University of Arkansas Press

This collection of 20 stories delves into the lives of Egyptian characters, from those living in Egypt to those who have immigrated to the United States. We meet people who are tempted by the possibilities of America and others who are tempted by the desire to return home. Some are re-creating themselves in the new world, while others seem embedded in the loss of their homeland. Many of these characters, whether physically located in the United States or Egypt, have lives that embrace both cultures.

“A Game of Chance” follows the actions of a young man when he wins the immigration lottery and then must decide whether or not to change his life. “Cumin and Coriander” takes the reader inside a woman’s thoughts as she tries to come to terms with the path her life has taken while working as a cook for American expatriates in Egypt. These compelling stories pull the reader into the lives of many different characters and offer striking insights into the Arab American experience.

Kaldas was born in Egypt and immigrated to the United States in 1992. She is a professor of English at Hollins University.

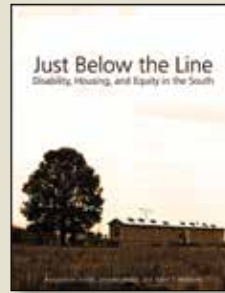


The Un-Natural State: Arkansas and the Queer South

Brock Thompson
University of Arkansas Press

The Un-Natural State is a one-of-a-kind study of gay and lesbian life in Arkansas in the 20th century. Thompson analyzes the meaning of rural drag shows, including a description of a 1930s seasonal beauty pageant in Wilson, Ark., where white men in drag shared the stage with other white men in blackface, a mingling that went to the core of both racial transgression and sexual disobedience. These small town entertainments put on in churches and schools emerged decades later in gay bars across the state as a business practice and a means of community expression, while in the same period the state’s sodomy law was rewritten to condemn sexual acts between those of the same sex in language similar to that used to denounce interracial sex.

Through this exploration of identity formation, group articulation, political mobilization and cultural visibility within the context of historical episodes such as World War II, the civil rights movement and the AIDS epidemic, *The Un-Natural State* contributes to the understanding of gay and lesbian history and to the understanding of the South.



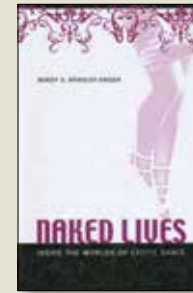
Just Below the Line: Disability, Housing, and Equity in the South

Korydon H. Smith, Jennifer Webb
and Brent T. Williams
University of Arkansas Press

Interdisciplinary research by three professors — Korydon Smith, Jennifer Webb and Brent Williams — reveals social disparities in housing that will become increasingly evident as the first wave of baby-boomers enters retirement. The professors redefine conventional concepts of aging, disability and housing and offer ideas that could lead to change.

Disability should be considered an aspect of human existence that exists along a continuum. Design can enable or disable daily functioning. Out-of-date housing is a hurdle, especially in the South, where reverence for tradition makes change slow. Good housing design addresses everyone’s needs, even as those needs evolve. Housing solutions outlined in the book maximize adaptability and efficiency.

The authors recommend changes in mindset, policy and practice. These housing solutions could allow people to live in their homes longer and reduce the more than \$150 billion per year spent by taxpayers on nursing home care by providing more accessible retirement living options.



Naked Lives: Inside the Worlds of Exotic Dance

Mindy S. Bradley-Engen
State University of
New York Press, Albany

In her book, sociologist Mindy Bradley-Engen reveals how the organization of an exotic dance establishment affects how the women who work there perceive their jobs.

In sociological research into working life, there has been limited study of sex work. Two main streams of thought dominate sex work research. Former show-club dancers tend to portray exotic dance as a positive, pro-sex occupation. Feminists tend to find exotic dance exploitative and degrading.

Bradley-Engen’s research revealed patterns of behavior and organization among dance clubs. She identified three basic types of establishments, each with its own culture and working conditions: the hustle club, the show club and the social club.

Each club offers customers a different female stereotype. Women in hustle clubs are treated as sexual objects. Dancers in show clubs appear as flawless goddesses and “above” the customer. In social clubs, women are like mothers or the girl next door.



The Kingdom Fungi: The Biology of Mushrooms, Molds, and Lichens

Steven L. Stephenson
Timber Press

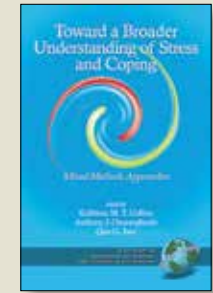
Fungi fuel hungry humans, cure infections and have changed the course of history, says a biology professor in his new book on this little examined kingdom.

Steven L. Stephenson’s book offers a comprehensive overview of these living organisms that are neither plant nor animal. He discusses what fungi are, what forms they take, their role in nature and their influence on humans.

Fungi decompose plant material and recycle nutrients back into the soil, which allows more plant growth. Without them, forests and grasslands would die. Fungi are essential to the production of penicillin, bread, beer and wine.

Fungi also cause problems. The chestnut blight fungus eliminated the chestnut tree from forests in the eastern United States in less than 50 years. And the fungus behind the potato blight in Europe caused people to immigrate to foreign countries.

Despite the influence of fungi on human culture, these organisms remain understudied. Estimates suggest there may be 1.5 million species of fungi, but only about 100,000 have been formally described. Most remain unknown to science.



Toward a Broader Understanding of Stress and Coping: Mixed Methods Approaches

Edited by Kathleen Collins, Anthony J.
Onuegbuzie and Qun G. Jiao
Information Age Publishing

Special education professor Kathleen Collins has co-edited a book that offers guidance to researchers about the application of both quantitative and qualitative approaches to the study of stress and coping.

The book is the fifth volume the series *Research on Stress and Coping in Education*. Co-editors are Anthony J. Onuegbuzie of Sam Houston State University and Qun G. Jiao of City University of New York.

The book is intended for stress and coping researchers, and for social and behavioral science researchers at various levels — students, instructors and advisers — as well as applied researchers, research methodologists, and theorists. The 15 chapters are divided into three sections. Section I focuses on conceptual and theoretical mixed methods research perspectives. Section II addresses mixed methodological perspectives as applied to topics relevant to stress and coping. Section III presents five empirical studies of mixed methods research as applied to the field of stress and coping.

What Causes Stuttering?

Joseph Agan, visiting assistant professor of communication disorders in the College of Education and Health Professions, replies:

Developmental stuttering is characterized by an abnormally high frequency and/or duration of stoppages in the fluent, forward flow of speech. These disfluencies typically take the form of repetition of sounds, syllables or one-syllable words; prolongation of sounds (i.e., sssssip); or blocks of airflow or voicing in speech. Researchers estimate that a minute of speech involves between 10,000 to 15,000 neuromuscular events. It is amazing that most speakers are able to focus on what they are saying and not how they are saying it.

Developmental stuttering often emerges between the ages of two to five, when children's spoken language skills become both increasingly linguistically complex and socially sophisticated. Of those children who stutter, about 75 percent will recover fluent speech without intervention within a few months of onset. An estimated 1 percent of the population develops a chronic or persistent fluency disorder that we typically think of as "stuttering." Chronic stuttering evolves over time to include increased muscular tension and struggle. Stutterers learn escape and avoidance behaviors to avoid stuttering moments that result in negative social responses.

But what causes stuttering? Multiple factors may cause stuttering in children who have a neurophysiological predisposition for stuttering. Different constitutional factors may be present in people who become persistent stutterers. A dys-synchrony in the neural substrate for speech and language production is thought to affect children predisposed to stutter. In people who stutter chronically,

researchers have proposed that a reactive temperament makes these individuals more likely to associate negative past speaking experiences with certain speaking situations. They then employ strategies that result in more frequent and severe stuttering episodes.

The physiological mechanisms suspected of being compromised in stuttering remain a mystery. However, evidence suggests that stuttering has a genetic basis. Recently, Denis Drayna of the National Stuttering Foundation and a researcher with the National Institute on Deafness and Other Communication Disorders has discovered three genes linked to stuttering. Mutations in two of the genes have been linked to a rare metabolic disorder. Stuttering may result from a glitch in the process of recycling cellular components in key areas of the brain essential for fluent speech. Understanding how these metabolic defects affect fluent speech could lead to new treatment approaches for stuttering.

More information on stuttering can be obtained from the National Stuttering Foundation Web site: www.stutteringhelp.org.

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What is this Brown, Lumpy Thing I Found on My Oak Tree?

Sherrie Smith, plant diagnostician for the Plant Health Clinic in the University of Arkansas Division of Agriculture, replies:

What you have there is an oak apple gall. Galls are abnormal growths of plant tissue. Many things can cause galls, including bacteria, fungi, parasites and insects. In this case, the gall was caused by a species of small wasp, which laid its eggs on a leaf stem on the oak. This creates a chemical reaction, which causes the plant tissue to swell. The resulting gall is a safe place for the larvae to eat and grow. When the larvae reach the adult stage, they poke a hole in the gall and leave it behind.

The oak apple gall will not harm the tree. ■