Spring 2009

Spring 2009

SOUTHERN ILLINOIS UNIVERSITY CARBONDALE

perspectives

SP / 09

RESEARCH and CREATIVE ACTIVITIES

Beauty and the Beast

Dogwood trees make Eastern forests glorious in spring—but they're under threat.

ALSO INSIDE...

SIUC's Maestro / Trafficking in Transcription / Myth and Music

outlook

"May you live in interesting times" is sometimes considered a curse. While it is certain that we face many challenges, from budgetary problems to global warming, these times also present us at universities with unprecedented opportunities. To consider these, I'd like to repeat the major points from President Obama's recent speech to the National Academy of Sciences (4/27/09):

"I am here today to set this goal: we will devote more than three percent of our GDP to research and development....This work begins with an historic commitment to basic science and applied research, from the labs of renowned universities to the proving grounds of innovative companies."

"Second, in no area will innovation be more important than in the development of new technologies to produce, use, and save energy."

"Third, in order to lead in the global economy and ensure that our businesses can grow and innovate, and our families can thrive, we must address the shortcomings of our health care system."

"Fourth, we are restoring science to its rightful place."

"Fifth, since we know that the progress and prosperity of future generations will depend on what we do now to educate the next generation, today I am announcing a renewed commitment to education in mathematics and science."

All of these points present major opportunities for our faculty and students. Facing these interesting times with renewed vigor, I am confident that we as a university, working with our colleagues from around the world, can accomplish great things for society.

John A. Koropchak
Vice Chancellor for Research and Graduate Dean

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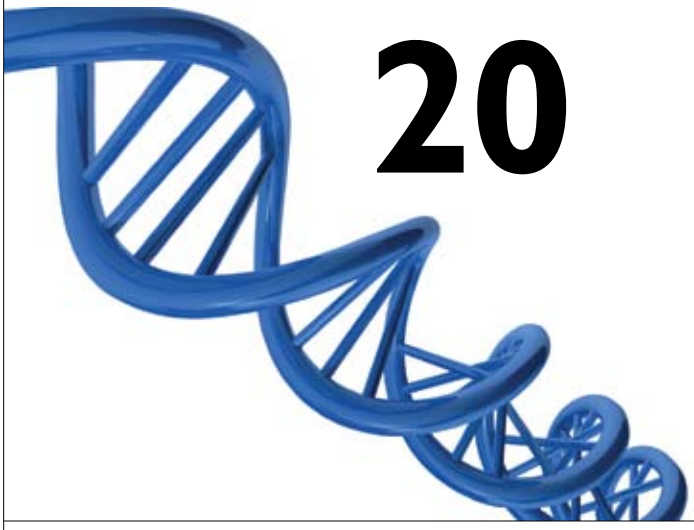


COVER STORY

FEATURES

ALGAE POWER?

You might think of algae as just the plants that give pond water its greenish tint and murky smell. But Yanna Liang, assistant professor of civil and environmental engineering, sees a possible alternative energy source in the ubiquitous organism.

Liang is working on ways to improve and extract naturally occurring substances in certain algae strains that can be used to create biodiesel fuel. The substances in the algae—lipids—are similar to those occurring in corn or other plants used to make vegetable oil, which currently is a major ingredient in the biodiesel manufacturing process.

Using algae for this purpose may hold several distinct advantages, Liang says. Algae can produce at least 30 times as much lipids per acre as corn, meaning less space could be devoted to this purpose. Also, using algae would reduce the competition for oil seeds, such as corn and soybeans, that also are used for food. In many ways, cultivating algae also could be more environmentally friendly than industrial farming.

To unlock algae's energy potential, Liang will need a varied approach. Her work combines several disciplines, including biology, chemistry, and engineering.

"It's very attractive in many ways, but it's still a ways off in making it a reality," Liang says.

Algae, extremely common photosynthetic plants that grow in water, can range from towering sea kelp "forests" to single-celled organisms. The major U.S. algae collection includes almost 300,000 specimens.

Liang is looking at the best species and most efficient environments to grow lipid-bearing algae. She's also exploring the proteins and DNA from some of these organisms, hoping to find out why they behave like they do.

Liang initially was researching algae's uptake of carbon dioxide, which it uses along with sunlight to grow. She noticed that the algae converted the CO_2 to lipids similar to vegetable oil and set about finding ways to encourage this phenomenon.

Of the huge number of algae types, Liang is focusing her research on two varieties that appear to have particular potential. One, *Chlorella vulgaris,* is relatively slow growing but produces cells with high lipid content.

The second strain—*Schizochytrium limacinum* SR21—is a seawater alga that needs a carbon source in place of CO_2. This particular strain can use glycerin, which is a byproduct—often a waste product—of biodiesel production. Liang sees a particular advantage in this, as the strain might be integrated into the production stream at some point, creating greater efficiency and less waste.

"In my mind this could be a more efficient and environmentally friendly approach," she says. "Crude glycerin has many impurities and can't be used [currently], and it's not affordable for small or mid-sized biodiesel producers to refine it."

Yanna Liang examines a beaker with an algae sample in her laboratory. Liang is working on ways to improve and extract naturally occurring substances in certain algae strains that could be used to create biodiesel fuel. ***Photo by Tim Crosby.***

Depending on its species and its environment, algae grows at different rates and can produce 30 to 70 percent lipids per cell, she says. Another advantage: *Schizochytrium limacinum* SR21 grows fast and produces up to 50 percent lipids per cell. Even though this is less than other types, the fast growth rate means it can produce more lipids than slower-growing varieties.

"Some of my research is about finding the cheapest carbon source to feed algae and grow lipids for use in biodiesel," Liang says. "To move this to the real world, we have to consider the cost and the gain."

Liang's work also will help answer questions about how best to cultivate algae, such as in outdoor ponds or more expensive photobioreactors, which are large, expensive indoor facilities where researchers or producers can closely control variables such as nutrients, temperature, and light. She also wants to examine harvesting techniques and how to scale up laboratory successes into industrial-level production.

The promise is there, but researchers need to answer important questions to bring algae's energy potential to reality.

"We have a lot of work ahead, but there could be a great benefit, both for energy and the environment," Liang says.

—Tim Crosby

For more info: Dr. Yanna Liang, liang@engr.siu.edu.

SEEING THE LIGHT

Have you ever noticed hall lights that are on even though the hall is well lit from a window or doorway? Maybe not, but Kimberly Elsenbroek probably has.

Elsenbroek, a freshman in SIUC's Department of Geography and Environmental Resources, is conducting a study of lighting usage in Faner Hall on campus. Her research will determine how often and where lights are on in Faner Hall when natural light is sufficient, and how much money the resulting unnecessary lights usage costs the University. Elsenbroek is exploring possible cost-and-energy savings measures as a conclusion to her sustainability research project.

Armed with a light meter and lighting blueprints for Faner Hall, Elsenbroek measured the natural light in hallways and doorways in Faner Hall at different times of day, at various points during the year, and in different weather conditions affecting sunshine. She found that some areas of Faner Hall are frequently well lit naturally, with no need for artificial lighting. Her research indicates the University spends approximately $2,500 a year on unnecessary lighting in Faner Hall.

Elsenbroek concluded that a light-sensor system that will automatically turn on or off artificial lighting is the best answer to address unnecessary lighting. Installing such a system is not cheap, she notes, estimating that the payback on the measure would take about 10 years. She is still working on exact numbers and projections as she concludes her research.

Elsenbroek is one of

Kimberly Elsenbroek uses a light meter in Faner Hall.

SIUC's inaugural Research Rookies. This new undergraduate research program is designed to engage freshmen in research projects.

Elsenbroek says her early involvement with an in-depth research project enhances the rest of her college curriculum.

"I'm seeing how what I learn in the classroom is applied in research," she says. "I see how I can use what I'm learning— that it has an application."

She says that, as a freshman, she felt she didn't have the experience to select a viable research project, but she knew she wanted her research to focus on an environmental issue.

"I'd heard SIUC was a good school at which to study the environment," she says, noting that the opportunity to join the University Honors Program and the Research Rookies increased her enthusiasm about her studies here.

The research project has also brought her into a working relationship with professors and professionals at an early stage in her college career. Elsenbroek worked with electrical engineer Justin Harrell, who helped her read the blueprints and, later in her research, discussed with her various lighting options and state lighting requirements. She also worked closely with Matthew Terrell, assistant professor in the geography and environmental resources department.

She already has plans for next year's project as she continues with the Research Rookies program. She will work with Sara Baer, an associate professor in plant biology, to study prairie ecology, particularly related to invasive plant species and insecticides.

—Andrea Hahn

CANE ON THE RISING

Where do you raise cane? In a cane nursery, of course, and the nation's first such cane production plant went into the ground last summer at SIUC.

"The ultimate goal is to be able to produce giant cane propagules (bits of the plant that will produce new plants) for riparian filter strips (land buffering creeks and streams from farm-field runoff) or habitat restoration while continuing our research on planting methods, fertilization, and biofuel potential," says James Zaczek, a professor of forestry.

Cane, a native North American bamboo, once stretched for miles across the southeastern United States in vast, nearly impenetrable stands known as canebrakes, providing fishing poles for generations of small boys and their dads, fodder for cattle, and cover for critters and birds. Today, they've largely disappeared, lost to crops, cows, and the notion that really, they're just weeds.

"Only about 2 percent of the canebrake habitat is left," Zaczek says.

These days, though, folks are taking a second look at cane.

In small-scale studies, SIUC forestry professors Jon Schoonover and Karl Williard, along with their students, have shown that planted along creeks and streams, cane's dense, fibrous roots can keep chemicals and bacteria from washing off farm fields while protecting the banks from erosion. This makes cane very attractive to farmers.

Because several endangered or threatened species, such as the Swainson's warbler, depend on canebrakes, wildlife managers have a particular interest in cane for habitat restoration. And the plant's fast, bushy growing habit could make it competitive with switchgrass as an alternative fuel if quality tests bear out.

If demand goes up, however, there won't be enough to go around. That's where the nursery comes in. After nearly a decade of forestry department research with this species, Zaczek believes he and his colleagues have the right stuff to get a giant cane nursery up and running.

"We will be trying to harvest cane as you would harvest tree seedlings in a nursery," he says. "I think if things go right, in five years we can get enough to do that.

"We're designing it more like a do-it-yourself nursery, where resource managers can use our methods and our propagules to create their own nurseries. That would give them habitat or riparian buffers and let them harvest their own rhizomes (the underground root-like stem that sends up new shoots) to plant somewhere else. It's a sustainable ecological restoration process."

In many other countries, people have grown bamboo for their own purposes for centuries. But here, says Zaczek, "There was not much known about propagation back when we started—in fact there was relatively little known about this species."

The work began with undergraduate researcher Rebecca Sexton and continued with undergraduate Dave Dalzotto, both of whom received SIUC grants to help fund the project. Dalzotto is continuing it as his thesis project.

Among their findings:

- While bamboo sprouts best from the rhizomes rather than from the above-ground shoots (or culms), rhizome pieces produce more shoots if short pieces of culm remain attached. "That gives a tremendous amount of growth," Zaczek says. "It really did grow like a weed."
- You can plant rhizomes with a tree planter and harvest them with a backhoe.
- Rhizomes can go right into the ground without any special babying. Greenhouse starts and herbicide treatments provide only slight advantages. That will help agencies strapped for funds.
- Survival is much better when rhizome collection and planting take place in the spring rather than the fall.
- Periodic burning reduces the shoots' height and diameter but increases cane density and helps the cane spread to adjacent areas.

Zaczek says the work fills a gap.

"There's not much documented research on cane's establishment, growth, and spread, and we're providing that in a very practical framework," he notes.

"Our attempts to scale up to larger acreages mean we could really have an effect on the landscape—a practical, logistical restoration of canebrakes and not just a patch of cane here and there."

—K. C. Jaehnig

For more info: Dr. James Zaczek, zaczek@siu.edu. The Illinois Council on Food and Agricultural Research has partially funded this project.

Graduate student David Dalzotto and forest ecologist James Zaczek collect data on newly planted cane.

POSTERS ON THE HILL

An SIUC zoology student traveled to Washington, D.C., this May as part of an elite group of young scholars invited to participate in the annual Posters on the Hill competition.

Andrew Dennhardt, a senior, presented his research on the peregrine falcon May 5 before lawmakers on Capitol Hill. He was one of just 60 undergraduates out of 440 applicants chosen nationally to present his research. The Council on Undergraduate Research and the U.S. Congress tapped Dennhardt for the honor after reviewing his research and application, which also included recommendations from faculty members.

Andrew Dennhardt is a two-time Goldwater Scholarship nominee at SIUC. He also received a REACH award (a grant through one of SIUC's undergraduate research programs) in 2008 to support other research.

Dennhardt's project involved peregrine falcons in the United States, and looked specifically at how the bird moves and disperses after its birth. Prior to the 1950s, Dennhardt said, the bird was well established in Southern Illinois, where it used natural cliffs as habitat.

"Peregrines were a prevalent raptor species in the area," Dennhardt said. But the use of pesticides hurt their numbers, as well as that of other raptors.

A 1982 effort, called the Midwest Peregrine Falcon Restoration Project, sought to bring the population back,

Dennhardt said. He used a database from that effort, containing information on more than 500 birds, and found 191 that had dispersed to other areas. He conducted further studies on this sample, such as details on each bird's first breeding effort, to calculate the average dispersal distance. His work supported the findings of other researchers' work, showing females disperse nearly two times as far as males.

"Other statistical components that I am hoping to add to this project include an age distribution analysis, a directional analysis, and an analysis among three different groups—female and male birds, wild birds and young birds being assisted to survive in the wild, and cliff-born and urban-born birds," Dennhardt said.

"With these results I hope to make a strong correlation between the recent population trend within the peregrine population in the Midwest and their subsequent dispersal diagnostics. Recent trends show that peregrines are nesting more frequently in urban areas throughout the United States, especially in the Midwest."

Dennhardt hopes to earn an internship through the Student Conservation Association this summer, and get involved with more raptor research elsewhere.

—Tim Crosby

Training the Trainers

An SIUC Rehabilitation Institute program that provides continuing education to rehabilitation providers in six states has reached its 25th anniversary. The U.S. Department of Education has funded the Region V Technical Assistance and Ongoing Education program for $820,000, renewable annually for up to four years. Region V comprises Illinois, Indiana, Michigan, Minnesota, Ohio, and Wisconsin.

Programs, conferences, and online services focus on increasing the professional skills of those who work in vocational and community rehabilitation programs, client assistance projects, and independent living centers. The goal? To help them assist people with disabilities in getting and keeping employment, says Region V program director David Adams.

In earlier versions of the program, Adams and his staff (including three graduate students) "have developed a blend of face-to-face and online training," he says. "We have an online program in case management that is already in use by 14 other states, and we plan to expand it. We also have a blended program on ethics, partially online and partially conference calls."

The new version of the program could reach some 4,500 professionals each year.

—K. C. Jaehnig

For more info: David Adams, dmadams@siu.edu.

CHAMELEON COATINGS

Some materials are strong, others are slick. But SIUC researchers are working on ways to combine these different materials into one that can morph as needed when the environment changes.

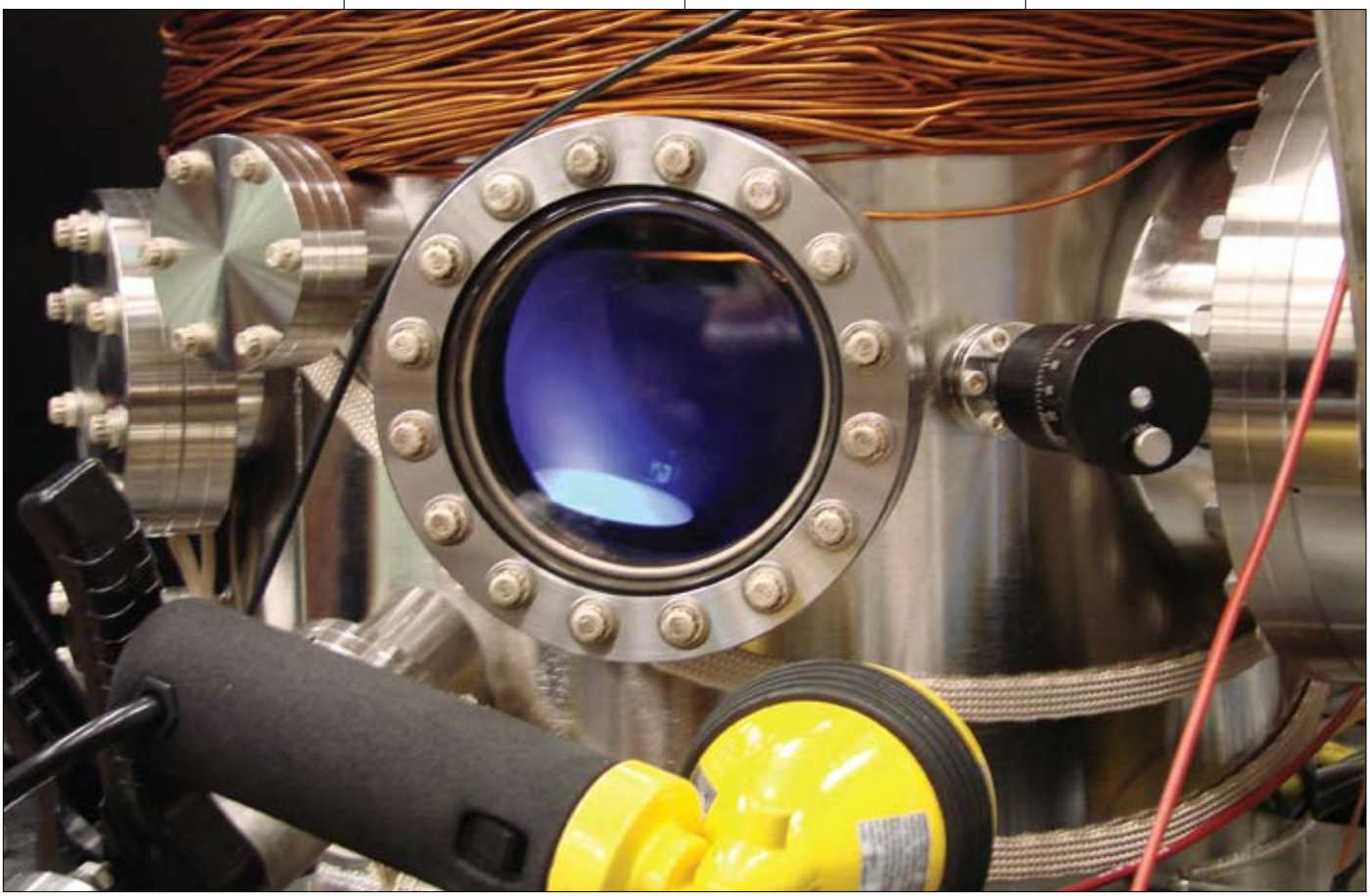
Samir Aouadi, associate professor of physics, and Qingfeng Ge, associate professor of chemistry and biochemistry, are working on so-called "chameleon" coatings based on adaptive nanocomposite technology. Like their namesake animal, such coatings change their surface or "skin" depending on the environment. In this case, they lower friction or provide strength as needed.

The projects come under the heading of tribology, which is the study of interacting surfaces in relative motion, including such forces as friction and wear.

The coatings act as solid lubricants, which outperform liquid lubricants in several ways. Liquid lubricants tend to oxidize at higher temperatures and their effectiveness is vulnerable to environmental factors, such as sand. Solid lubricants, which traditionally are deposited directly on hard friction surfaces, such as an engine bearing, also can help minimize weight and complexity.

Aouadi and Ge received a $50,000 grant from the U.S. Army to explore materials that might improve the performance of small-caliber gun barrels or helicopter turbine components, or help engines run more efficiently by increasing the temperatures at which they operate. They also might come into play in futuristic electromagnetic weapons, such as "rail guns," which use a magnetic field instead of expanding gases to propel projectiles. In each of these cases, friction is a barrier to speed and efficiency.

Unfortunately, solid lubricants tend to wear down quickly. But coatings that have "multi-phase" characteristics can absorb more energy, last longer, and change their characteristics when formulated correctly. That is, they can be hard, slick, or both, depending on the environment and how they are being used. A hard phase, for instance, would provide strength, while noble metals like gold or silver can act as lubricants at higher temperatures.



This instrument, a reactive unbalanced magnetron sputtering machine, uses high voltage to create a plasma that deposits a so-called "chameleon" coating on a substrate. The coatings change the characteristics of their surface or "skin" depending on the environment, lowering friction or boosting hardness as needed. *Photo by Tim Crosby.*

The U.S. Air Force began working with such so-called chameleon coatings almost a decade ago, Aouadi says, looking into their possible use in bearings and other engine components. Typically, such materials combined metals and ceramics, with the combination creating a strong and slick material that can adapt to the changing environment. Such changes would include temperature, humidity, and load.

"These are materials that change their skin based on the environment," Aouadi says. "These are smart materials."

Much of the Air Force's earlier research focused on materials containing oxides. Aouadi's current work uses materials containing nitrides. Nitrides won't stand up to the higher temperatures sought by the Air Force, but they are less brittle and perform well in the lower 300-700 degree Celsius range needed by the Army.

Aouadi began by working with materials such as molybdenum nitride, molybdenum disulfide, and silver, each of which can play a role in bearing loads and reducing friction. The nitrides provide good load-bearing characteristics, while the disulfide is an effective lubricant at room temperatures up to 300 degrees Celsius. The silver acts as a high-temperature lubricant at temperatures of 300-500 degrees.

Above 500 degrees, however, another reaction kicks in. The sulfur begins to evaporate and is replaced by oxygen, creating silver molybdenum oxide, which is an extremely slick, or "lubricious" material.

And the materials show a lot of promise, especially at temperatures above 500 degrees, Aouadi says, as was evidenced by a test he ran this spring.

In March, he created a material using nitrides, silver, and molybdenum disulfide that set a new world record for withstanding wear. For 36 hours, he and his students subjected the sample to 500 to 700 degrees Celsius, while achieving a very low friction measurement and extremely low wear.

"It went for 300,000 cycles, and I only stopped because the student had to sleep," he says. "It has very good promise and results."

The test results helped convince the Army to award Aouadi a grant to explore more materials combinations. As part of the research, Ge will use computer modeling and simulations to explain why certain combinations work well and anticipate others that might work better. Working at the atomic level in his simulations, Ge can help narrow the list of combinations that Aouadi ultimately will create for actual testing.

"So we have a whole array of new materials that have never been made or tested that could possibly give the same or even better results," he says.

—Tim Crosby

For more info: Dr. Samir Aouadi, saouadi@siu.edu, or Dr. Qingfeng Ge, qge@chem.siu.edu.

FIRE PREVENTION

You see a lovely cedar home in the woods with rustic shake shingles and an expansive deck. Charles Ruffner sees fuel.

In Southern Illinois, where cabins, cottages, and entire subdivisions regularly sprout among groves of aging trees, he sees a lot of it.

An SIUC forestry professor and fire ecologist, Ruffner worries particularly about the fire hazard this presents for Makanda, Murphysboro, and Pomona townships in Jackson County.

"These areas have a lot of oak forest, which burns easily, along with fairly high shrub and cedar components, also very flammable, juxtaposed with wooden houses, wooden decks, and propane tanks," Ruffner says. "If—God forbid—a big fire got started and these natural and structural fuels came together on the west side of Carbondale, it could probably burn right to (U.S. Highway) 51."

Ironically, this ecosystem depends on periodic fire to clear out leaf litter, weeds, and dying or dead trees. Without it, Ruffner says, "Flames set off by chance sparks—or people—burn faster, hotter, and more destructively."

Hoping to keep a lid on the tinderbox, Ruffner obtained a $66,852 grant from the U.S. Forest Service to assist in drawing up individual community wildfire protection plans for the three townships. "The idea is that the community assesses its risk for wildfire and develops a plan by which those risks will be mitigated," he says.

The federal Healthy Forests Restoration Act of 2003 provides financial help to communities for reducing dense brush and other undergrowth once they have protection plans in place. Plans for the three townships will include maps that identify residential areas, escape routes, water supplies, and power and communication lines potentially at risk should fire break out.

In evaluating where the greatest risks lie, Ruffner's community teams will assess existing vegetation, historical data on wildfire outbreaks, the vulnerability of human structures and other areas of community importance, firefighting capacity, and emergency preparedness measures. The final component will include recommendations on reducing fire risks.

"It might say that a certain number of acres should be thinned, this area needs prescribed burns, that area needs additional access or water points," Ruffner says.

There's also an educational aspect, he adds. "One of the basic objectives will be for vulnerable homeowners to be 'firewise'—to have defensible spaces around their houses."

—K. C. Jaehnig

For more info: Dr. Charles Ruffner, ruffner@siu.edu.

FERNS AND FRIDGES

Three pioneering studies on the model fern *Ceratopteris* made up the SIU Alumni Association's Outstanding Thesis. Plant biology student Gabriel Johnson focused on the fern's embryo development and evolution, using advanced laboratory and microscopy techniques and a review of the scientific literature that went back to the 1800s.

As his advisor, plant biology professor Karen Renzaglia, explains, Johnson first described the patterns of embryonic cell division that will set the stage for the tissues and organs of the juvenile fern. He then described developmental changes in cell well constituents in the placenta, which are responsible for cell differentiation. This research was the **first of its kind in a non-seed-producing plant** and has implications for the seeds of crop plants.

Finally, Johnson evaluated the evolution of key embryonic characteristics across green plants, providing information on how plants have adapted to different environments. Studying ferns is key to this because they were among the earliest land plants to have evolved.

The *Journal of Plant Research* has already published the first section of Johnson's thesis.

The Outstanding Dissertation Award went to Mahmud Khan, a physics student now working as a postdoctoral fellow at Ames National Laboratory.

Khan worked on so-called magnetocaloric materials that are capable of magnetic cooling at or near room temperature and could lead to **energy-efficient, environmentally friendly magnetic refrigeration.** His advisor, physics professor Naushad Ali, says that Khan designed a material, for which a patent has been filed, "extremely well suited for a realistic magnetic refrigerant... and the material is relatively cheap and easy to prepare."

Khan also discovered related materials with a high magnetocaloric effect that could be applicable in spintronics, magnetic actuators, and sensors of various kinds. He has co-published more than 20 papers in top-ranked journals and his work has been cited by the top researchers in his field.

Ali credits Khan's work with helping to attract a four-year, $700,000 Department of Energy grant and a five-year, $50,000 Research Corporation grant to his group. Khan's papers and his 17 conference presentations, Ali says, have "sprung various research groups into action" in this field.

—Marilyn Davis

More Research Winners

In 2008 there were four winners of SIUC's annual Outstanding Graduate Student Research Award.

Chemistry doctoral student Kathleen Chaffee does interdisciplinary research in nuclear magnetic resonance spectroscopy and is currently studying as a Fulbright Advanced Student Researcher at the École Normale Supérieure de Lyon, France.

Joe Khalil, a doctoral student in media studies, studies youth movements and Arab media, particularly songs, videos, graffiti, blogs, and performances from Lebanon and Saudi Arabia. As a scholar and a former executive television producer in the Middle East, Khalil has been contracted to co-author a book on Arab television industries.

Jonathan Remo, a doctoral student in environmental resources and policy, is studying hydrological sciences and the geomorphology of rivers. His work has resulted in significant advances in examining the effects of manmade changes on rivers such as the Mississippi.

Finally, James Teufel, a doctoral student in health education, developed a paradigm called Critical Humanistic Health Promotion that examines health in relation to socioeconomic differences. He has written several successful grant applications, including one for Shawnee Health Service for more than $1 million. He graduated in December and now heads SIUC's participation in the National Children's Study.

Clockwise from top left: Chaffee, Khalil, Teufel, Remo.

ETHANOL EFFECTS

Federal support for clean energy has given ethanol the jump-start it needed to become an alternative fuel. But we need to take a close look at what we gain and what we give up in making the switch, says Silvia Secchi, an agribusiness economist at SIUC.

"As biofuels become a more important energy source in our country, we need to understand their effects both on local economies and the environment, because they could go in opposite directions," says Secchi, who specializes in the science of trade-offs.

Secchi is part of a team of economists, environmental scientists, and a statistician assessing the costs and benefits of corn-based ethanol production. The group includes researchers from Iowa State University and North Carolina Agricultural and Technical State University, with total funding of $700,000 coming from the federal departments of agriculture and energy.

Using data from Illinois, Iowa, Minnesota, Missouri, and Wisconsin—home base for the bulk of the country's ethanol plants—the researchers are looking at how production affects crop prices, crop choices, land use, water quality, and regional economies.

"Much of the work looking at impacts of ethanol production has been done on a small scale," Secchi says. "This involves five states in a 'hot spot' where a lot of ethanol activity is taking place."

Her portion of the project focuses on the interrelationships between the presence of ethanol plants, the amount of corn farmers grow, and the prices they get for it. Such knowledge could help entrepreneurs decide where to build new factories since, in making that decision, they have to factor in what the raw feedstock will cost.

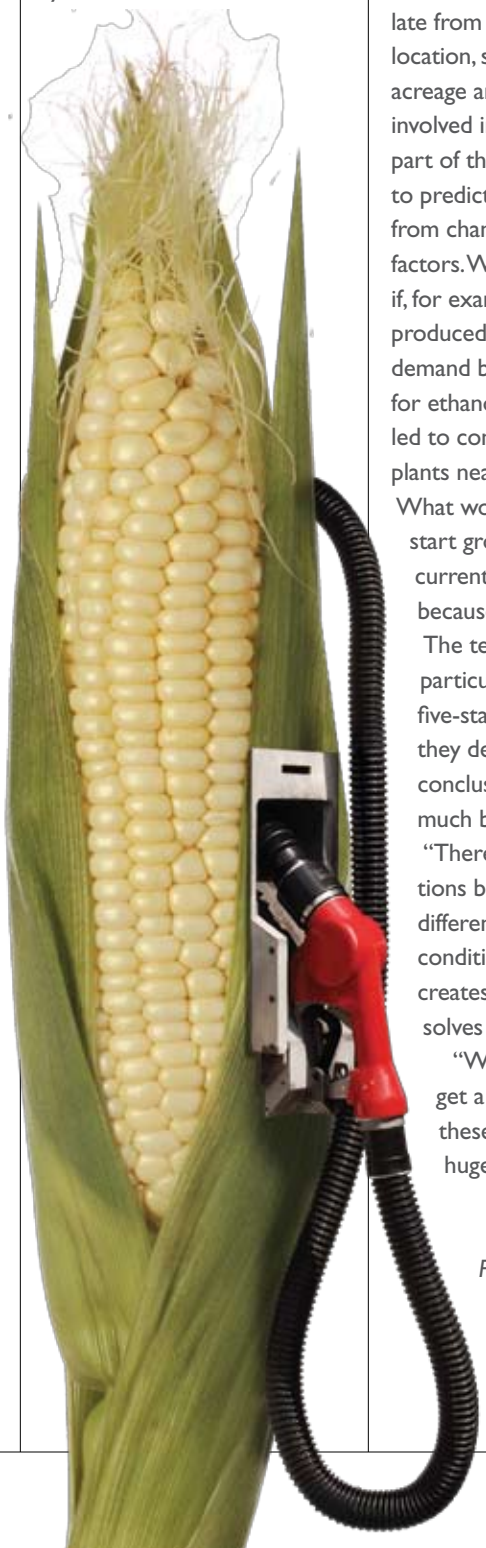
"In developing their business plan, they can't take the historical price of corn as a given, because by building a plant they're introducing something new in the landscape," Secchi says.

Because expanded corn production can have substantial environmental impacts, she also is looking at the effects of expanded corn production on water quality in the Upper Mississippi River Basin. Here she is breaking new ground. Environmental impact studies done by other researchers have focused mainly on the amount of fuel it takes to grow and harvest the corn and turn it into ethanol and on the level of greenhouse gases those activities produce.

"Water quality impacts are often neglected, but an increase in agricultural production will probably mean more nitrogen and phosphorus runoff (likely contributors to the "dead zone" in the Gulf of Mexico near the mouth of the Mississippi)," Secchi says.

Most of the project involves modeling—using a computerized simulation that attempts to predict what would happen as different factors change and interact.

"I am using both existing assessment tools and new models I have developed with my collaborators," Secchi says. As much of the official data she's using in her models dates back 10 years or more, she also is collecting newer information to yield more accurate results.



Other team members are using models to look at such things as the impact an ethanol factory has on land use and crop rotations, the factory's direct and indirect effects on its region's economy, and the amount of fossil fuel ethanol could replace in the study area.

While these studies extrapolate from known data—plant location, size, and ownership; acreage and location of farmland involved in crop production—part of the project attempts to predict outcomes resulting from changes in some of these factors. What would happen if, for example, existing plants produced more, or an increased demand by livestock producers for ethanol's edible by-products led to construction of additional plants near those customers? What would occur if farmers start growing corn on land currently out of production because of federal subsidies? The team's findings will have particular relevance for the five-state area. But the tools they develop to reach their conclusions should have much broader applications.

"There are a gazillion questions because everyone has different risks, costs, and conditions, and technology creates new problems as it solves old ones," Secchi says. "We're just starting to get a handle on some of these things. There's a huge need for research."

—K. C. Jaehnig

For more info: Dr. Silvia Secchi, ssecchi@siu.edu.

OUTSTANDING SCHOLAR

Carl Faingold, professor of pharmacology and neurology, has been named SIUC's 2009 Outstanding Scholar.

Faingold is an authority on seizure mechanisms. A longtime faculty member of the SIU School of Medicine and chair of the Department of Pharmacology since 1995, he is a leading researcher, writing almost 100 peer-reviewed articles and 23 book chapters and reviews.

His research helped establish the importance of neural networks in epileptic disorders. Researchers routinely invite him to write or edit book chapters, give presentations, or chair conferences on this subject. He broke new ground with his recent work on sudden death in epilepsy, highlighted in the journal *Science* in its July 4, 2008, edition.

Faingold has held 10 national grants, including seven from the National Institutes of Health totaling 25 years of funding. His work was cited more than 100 times a year by other researchers during the last five years.

"(Faingold's) scientific work on the pharmacology and physiology of cortical-subcortical brain networks in epilepsy is superb, leading to many highly cited publications, true 'citation classics' which have led the field in terms of both methods and scientific contributions," wrote Dr. Hal Blumenfeld, director of medical studies and associate professor in the departments of neurology and neurobiology at Yale University School of Medicine, who got to know Faingold through his published research. Blumenfeld was just one of several leading researchers at top universities and schools who recommended Faingold for the honor.

Faingold pioneered ways to inhibit neurotransmitter function in the inferior colliculus, which makes up part of the brain's auditory pathway. Other researchers in this area have cited this early 1990s study more than 250 times.

He also has studied alcoholism, electrical stimulation mechanisms in the brain, and pedagogical approaches in medicine, co-editing a pharmacology textbook set for release this year.

—Tim Crosby

JAGUAR HUNTING

The Sierra Madre Occidental in Sonora, Mexico, can be a desolate place, defined by craggy rock formations and thorny scrub brush so dense in areas that it can seem almost impenetrable.

A pair of SIUC researchers—a research scientist and a graduate student—are rolling back the curtain on this challenging landscape as they seek to characterize its wildlife population and study one reclusive species of big cat in particular.

The Mexican state of Sonora lies directly south of the Arizona border. Despite its inhospitable conditions, the area is home to a surprising variety of wildlife. Foxes, skunks, a type of white-tailed deer known as Coues deer, and collared peccaries (a type of wild swine) are just a few examples of the diverse wildlife, along with pumas, also known as cougars or mountain lions.

Modern-day cowboys, or "vaqueros," are some of the few human inhabitants in the approximately 500-square-kilometer area around the Sierra Madre foothills where the researchers are concentrating their work. Vaqueros live in Spartan conditions, with little running water or electricity and no refrigeration. They know the area and its ways, including the best means of picking a trail through the hellish thorn scrub that can blind the horses and pack mules they use for transportation.

Even among these local experts, however, few have witnessed the quarry the SIUC researchers seek: the jaguar, at the northernmost reach of its range.

But Clay Nielsen, an associate scientist with SIUC's Cooperative Wildlife Research Laboratory, has an observation method not available to the local ranch hands. Nielsen, along with graduate student Steven Borrego, uses a grid of 70 motion-activated cameras to capture the carnivore on its nightly rounds.

It's all part of an effort aimed at finding ways to manage and preserve wildlife—including large carnivores like the jaguar and puma—while also protecting human interests in the area, such as livestock ranching. The researchers' role is assessing the overall wildlife ecosystem, finding out how animals interact with their environment and each other. They are using the thousands of images captured by their mobile cameras to make a series of observations that they will then use to form an analysis.

"Everything that walks by our cameras, we get a picture of," Nielsen said.

But jaguars…in a desert-like environment?

"Jaguars actually used to live in the southwest United States as well," Nielsen explained recently. But humans ran them out, killing many of them in the process. The jaguars in Sonora represent the northernmost breeding population in their distributional range, which extends to southern South America.

While slightly smaller than the more elongated puma, jaguars are fast, low to the ground, and powerful predators. In this area, a male might average 130 pounds or so, and it hunts by itself, stalking and ambushing prey.

Sometimes, the prey may include cattle or calves, which leads to friction between the big cat and local ranch owners. Although Mexican law protects the jaguars, it is difficult to enforce such restrictions in such a wide, sparsely traveled area.

"This is why we want to help fine-tune management techniques that will address these issues," Nielsen said.

Primero Conservation Outfitters, a U.S. company that charters deer hunting parties and ecotourists into the area, helped organize the research project. Money from those activities goes toward jaguar conservation in the study area, which is owned by a consortium of ranchers. The consortium is known as "Programma de conservacion del Jaguar en La Sierra Alta de Sonora." These ranchers are looking for better ways to manage the sometimes competing interests of humans and wildlife. The study will help provide that, Nielsen said.

The researchers began the project in January of last year, with Borrego spending a large amount of time in the area from August to December of 2008. He will again venture south this June and stay through December.

The project is scheduled for completion in mid- to late 2010, Nielsen said.

Borrego's life is similar to that of his vaquero hosts during his weeks in the field. He brings as many supplies—food, water, etc.—with him as possible when first arriving.

"It's rough conditions when compared to an apartment in Carbondale," Borrego joked. "It's usually an adobe house with maybe some running water. Any electricity is solar, or they hook up to a truck battery. It's five hours to the nearest ice machine, so I try to take some of that when I go and it will last a few days in a cooler. Sometimes we go for weeks like that."

His days consist of rising about 4:30 a.m. and basically riding the range on horseback with the Mexican cowpokes. Instead of wrangling cattle, though, he wrangles cameras.

The researchers set the motion-activated cameras up along suspected game trails. When an animal walks by, the camera pops a photo. Borrego leaves cameras in place for about three weeks, switching out the memory cards and downloading photos all the while, before re-positioning them at other locations.

On a good long day of riding, he can visit about nine camera sites.

"It's slow going," he said. "There are no paved roads, only gravel and rock-strewn paths."

When he positions a camera, Borrego makes a survey of the area surrounding it, noting variables such as ground cover, types of plants, distance to water or human dwellings, and other factors. When the photos start coming in, the researchers consider how the different species may relate to each other in the ecosystem.

They ultimately place all the data in a database that will help them model and analyze the entire system.

All the hardship is well worth it, Borrego said.

"I want to contribute to the conservation of these animals," he said. "Carnivores seem to often live close to humans, so the question is, how do we co-exist?"

Borrego recently received an NSF Graduate Research Fellowship. The Cougar Network, Disney Wildlife Conservation Fund, Shared Earth Foundation, SIUC, and Panthera also are funding the project.

—Tim Crosby

For more information: Dr. Clay Nielsen, kezo92@siu.edu.

A jaguar on the game trail triggers a motion-activated camera.

Beauty an

Dogwood trees make Eastern forests glorious in spring—but they're under threat.

By Tim Crosby

"We're looking at a potentially big impact on forests. It compares to Dutch Elm disease or chestnut blight."

There are few species of trees in Southern Illinois forests as beloved as the dogwood. But an invading fungus now threatens the flowering tree's future, not just here but across its range.

Researchers at SIUC who are assessing the extent of the damage say the situation appears to be another argument for using fire as a forest management tool. Eric Holzmueller, assistant professor of forestry, and David Gibson, professor of plant biology, received a $2,000 grant from the Illinois Department of Natural Resources to conduct the study.

The fungus, known as anthracnose, is an invading exotic organism that first appeared in the United States in 1978. It subsequently spread through the Appalachian Mountain range and then west, appearing in Fayette County, Ill., in 1995.

Spread by wildlife, contact, and spores, the fungus targets only dogwood trees, killing them by first attacking leaves and interfering with their ability to photosynthesize, Holzmueller says. Eventually, it spreads to twigs and trunks, where it develops cankers that can "girdle" the tree, cutting off all nutrients and killing it. Researchers estimate that up to 95 percent of infected trees eventually die.

...d the Beast

"It's attacking these flowering dogwoods, which is a very charismatic species everyone loves," says Gibson, who has done previous work on dogwoods. "Not only that, but dogwoods also have this nice red fruit in the winter that serves as a food source for wildlife. We're looking at a potentially big impact on forests. It compares to Dutch Elm disease or chestnut blight."

Holzmueller, who previously studied the fungus's impact on dogwood trees in the Great Smoky Mountains National Park in Tennessee and North Carolina, found that areas that burned 20 or 30 years ago had more and healthier dogwood trees than areas that had not. He theorized that fire helped open the forest canopy, letting more sunlight in and making the area drier and less hospitable to the fungus, resulting in a better habitat for the dogwoods.

For the current study, Holzmueller and Gibson are examining dogwood plots established in 1991 in the La Rue Pine Hills area of the Shawnee National Forest, in Union County. Forest workers burned the area in 1991 and again in 1993, making it similar to the dogwood stands Holzmueller studied in the Smokies. Holzmueller expects to see similar findings in these quarter-acre plots, where he, Gibson, and Paul Suchecki, a biology

Fire may help open the forestry canopy, letting more sunlight in and making the area drier and less hospitable to the fungus, resulting in a better habitat for the dogwoods.

SENTINEL SPECIES

A civil engineer at SIUC has a more practical interest in dogwoods. He believes that these trees, along with poplars and other plants, might someday serve as environmental sentinels, both measuring and cleaning up toxic substances in soil and groundwater.

Assistant professor Xingmao "Samuel" Ma works on remediation methods for contaminated groundwater, soil, and sediment. He is developing methods using plants to both detect and remove contaminants.

His work focuses on the thin area of soil surrounding the roots of a plant and the plant's aboveground parts. In a greenhouse west of the main campus, row upon row of dogwood and poplar cuttings growing in pots, along with various grasses, bear out this work, which could lead to more efficient environmental clean-up and monitoring methods.

Ma studies how the fatty acids and enzymes secreted by various Southern Illinois plants belowground promote bacteria in the soil, which in turn can break down certain contaminants. The substances provide the dormant bacteria with a carbon source, which can promote their growth. The bacteria then break down contaminants such as perchlorates, which occur with fertilizers and certain military applications, such as rocket propellants, as well as naturally in lower concentrations. Perchlorates are thought to interfere with proper thyroid function in humans.

"I'm trying to identify certain Southern Illinois species of plants that might mitigate this type of contamination," Ma said. "We do this by looking at how these different plants interact with bacteria in the soil."

Using plants to help clean up the environment is known as phytoremediation. In other applications, plants can be used to actually extract certain toxins from soil, sediment, or groundwater. The plants can then be removed and disposed of safely.

Ma is using that ability to "uptake" contaminants in another part of his work aimed at phytomonitoring, or using plants to look for and measure contaminants in the environment. Ma is using some of the same plants to identify a mathematical formula that will help engineers not only find the contaminated areas, but measure how much contamination is there.

To do this, Ma and his two graduate students are placing plants in pots filled with Southern Illinois soil or in solutions along with a known amount of contaminants. After the plant has grown for some time in a sealed environment, they're using gas chromatography and other techniques to measure how much contaminant is in the plant flesh in parts per million.

Ma conducted such research during his doctoral work at the University of Missouri, Rolla, using single contaminants. His work now, however, is more complex in that it uses compounds of multiple contaminants—the scenario more typically found in the real world.

Ma ultimately aims to write a formula that can establish an accurate ratio between the amount of contaminant found in a plant versus what is in the ground. The method, if perfected, could lead to faster, cheaper environmental monitoring using plants.

"The way this is done now is often to dig a well and measure the contaminants in the groundwater," he says. "But wells are expensive and they take a while to dig. Plus, you might dig a well in one spot and it finds no contamination, while nearby the groundwater is contaminated.

"With plants, you can spread them out and they can tell you where you're most likely to find contamination. And that's where you can dig the well."

For more information: Dr. Xingmao "Samuel" Ma, Dept. of Civil and Environmental Engineering, siu55444@siu.edu.

Right: Xingmao "Samuel" Ma holds a dogwood cutting growing in a sealed pot in the greenhouse. Ma is developing methods using dogwoods and other plants to both detect and remove contaminants from soil. *Photo by Tim Crosby.*

teacher from nearby Johnston City High School, measured every tree and took readings on the lay of the land, including its slope, aspect, and soil chemistry.

Holzmueller and Gibson are still analyzing the data, but preliminary findings suggest the disease is present and having a devastating effect on seedlings as well as larger trees. Every tree showed signs of infection to one degree or another, Holzmueller says, but the team is still looking at what effect the earlier prescribed burns may have had on the stand.

Most likely, the research will show that prescribed fire is an important tool for maintaining dogwood and oak/hickory forest stands. The open canopy caused by fires helps discourage the development of the anthracnose fungus attacking dogwoods and also allows more sunlight for oak and hickory seedlings.

"Fire is an important tool if you want to maintain these types of forests," Holzmueller says.

As for that favorite dogwood tree in your backyard, as long as the area is relatively dry and open to sunshine, there is less chance of the fungus thriving in that area, Holzmueller says. And if it does show up, there are a few things you can do to combat it.

"You can prune infected branches and water it, and there might be a few fungicides out there you can use," he says. "Basically, you want to relieve other stresses on the tree so that it can live a longer life."

For more information: Dr. Eric Holzmueller, Dept. of Forestry, eholzmeu@siu.edu, or Dr. David Gibson, Dept. of Plant Biology, dgibson@plant.siu.edu.

Top and bottom: Leaves of a dogwood tree in the Shawnee National Forest in Southern Illinois show signs of infection by the anthracnose fungus. *Photos provided.*

SIUC's Maestro

Edward Benyas conducts and plays—and is music director for the Southern Illinois Symphony Orchestra and the Southern Illinois Music Festival.

by Marilyn Davis

Family has played an important role in Edward Benyas's career. As a schoolboy, he chose to play the oboe because his mother urged him to—she loved its sound. And just a few years ago, he founded the summer Southern Illinois Music Festival partly because he had missed the birth of his daughter by three hours due to a longstanding professional engagement with the Des Moines Metro Opera. "I decided to focus my summer activities here," he says, "and not have to travel away from my family seven weeks a year. And I'm artistic director [of the festival], so it's more rewarding for me."

Although Benyas teaches oboe at SIUC and likes playing chamber music in particular, directing SIUC's orchestra program has become his primary work. He heads the Southern Illinois Symphony Orchestra, made up of faculty, students, area professionals, community members, and guest professionals for specific performances. He particularly cites the support with the orchestra that he's received from his string-teaching colleagues: Michael Barta, Meng-chun Chi, Eric Lenz, and Philip Brown. He also works with the Chicago Chamber Orchestra, a professional group in its 58th season whose founder and conductor has appointed him music director designate, meaning that he will be next to take over as conductor.

Benyas enjoys playing the oboe with his colleagues and with other groups. "Most instrumentalists really enjoy playing chamber music more than in a large ensemble because it gives them the best means of expressing themselves," he says. "It allows them to work with and make music with friends."

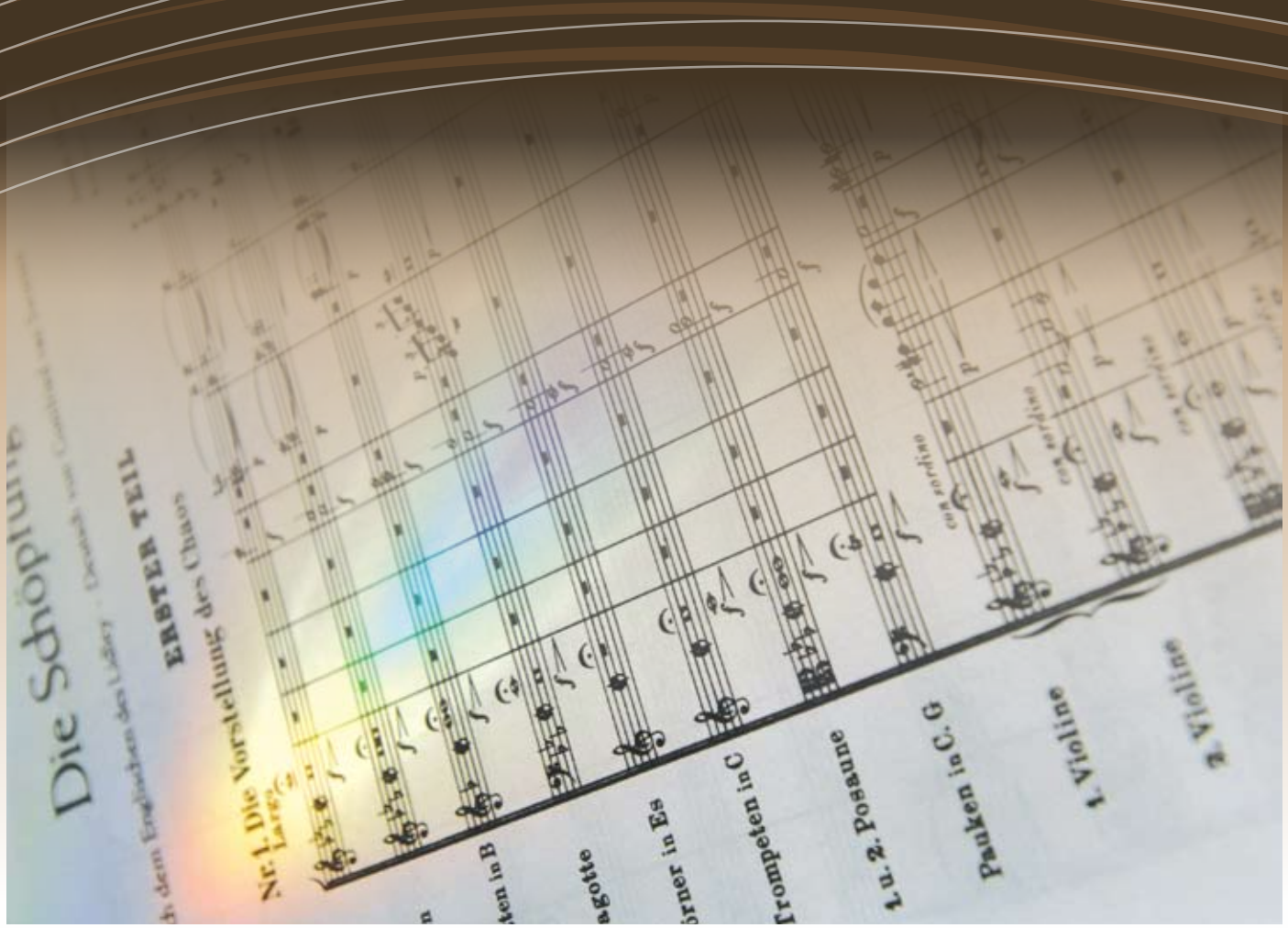
Benyas turns toward pianist Emanuel Ax during a performance. ***Photos by Bob Benyas.***

"But I've had plenty of orchestral experience too," he adds. That includes performances with the Chicago Symphony, the Lyric Opera of Chicago, and "dozens" of regional orchestras all across the nation. "My experience playing with large ensembles is crucial to my ability to run the orchestra program here," he says. "To have any credibility in front of an ensemble, it's important that you be a specialist in something. Any conductor has to be some kind of instrumentalist or vocalist [as well], generally an instrumentalist.

"As a professional you develop certain standards that you have to live up to, in order to play a solo, to play in a chamber setting, to play in an orchestra setting. Those standards—in terms of tone quality, intonation, musicianship—all those things come into play when you're standing in front of an ensemble [as a conductor]."

Being a music director of an orchestra involves more than just learning a piece and rehearsing the ensemble. You must choose a repertoire suitable for your orchestra and your audience. You have to study what you've chosen ("You can always glean something else from the music," Benyas says.) You have to have a

"You have to have a vision of the music you're trying to get across to the public, and you have to convey that to the ensemble."



thorough knowledge of the period, style, and conventions of the type of music you're playing. In short, Benyas says, "You have to have a vision of the music you're trying to get across to the public, and you have to convey that to the ensemble."

Benyas notes that the instrumentalists have the same responsibility to research the period and have a solid understanding of the music—not just practicing it, but listening to recordings of it. "My job is to synthesize all of that as it comes together," he says. "We work on intonation (getting all members of the group at the center of the pitch), phrasing, dynamics (changes in volume and emphasis). And we must rehearse efficiently. You have to find the parts that need work, and balance that with playing through the whole thing.

"That also comes from developing skill as an instrumentalist. One thing I tell my students is that you can't just keep playing from start to finish and assume the rough spots will work themselves out. You have to isolate parts you're having difficulty with."

When choosing a program or series of programs, Benyas likes to mix it up with a balance of genres, from baroque music to contemporary music. His favorite music to conduct, however, is 19th-century French and Italian opera.

The music he finds "most challenging and rewarding" to conduct is Romantic and modern music—Romantic because its variations in tempo and other qualities leave "a lot of room for interpretation"; modern because it's the music he's least comfortable with. "I'm not the greatest exponent of modern music," he says, "but I think it's important to play the music of our contemporaries and recent contemporaries."

With the help of graduate and undergraduate students, Benyas oversees everything having to do with the Southern Illinois Symphony Orchestra and the Southern Illinois Music Festival—from auditions to fundraising and publicity. The orchestra, because it involves University and community people, professionals and nonprofessionals, "constitutes teaching, creative activity, and service—all three of the areas I'm involved in. It has more of an educational component than the festival," Benyas says. The latter is an all-professional ensemble funded in part by the Illinois Arts Council's ArtsTour program. (The orchestra also receives funds from the Illinois Arts Council, and both receive support from SIUC and donations from community supporters.)

The festival ensemble comprises players from the Chicago Chamber Orchestra, along with local professionals

and top student musicians, who find themselves working with some well-known instrumentalists and vocalists from across the country. The event is a three-week marathon: each musician may take part in two dozen performances, with about three rehearsals for each. ("We're cutting back this year, from 51 events to 36," Benyas notes. "Last year we worked our people too hard.") The repertoire includes orchestral music, chamber music, opera, ballet, and even jazz—the New Arts Jazztet gets involved every year too.

"We're able to share creative activities with the community, and I'm proud that the community has embraced us and been so supportive."

Performances take place not just in Carbondale, but in towns around the region. "It's important for us to take our show on the road—to perform chamber music, ballet, orchestral programs, opera, in small communities that don't ordinarily get that kind of exposure to professional music," Benyas says. Many of the performances are free, and aside from evening performances there are always programs for children. (The same is true of the symphony orchestra during the academic year.)

Much research done at the University is very technical. So Benyas finds the festival outreach especially satisfying: "We're able to share creative activities with the community," he says, "and I'm proud that the community has embraced us and been so supportive."

Despite the fact that conducting takes up the majority of his time, two of Benyas's career highlights came as an instrumentalist. In 1992 he played with the Chicago Symphony under Daniel Barenboim, touring the East Coast and Europe. And in 1996 he played Wagner's Ring Cycle with the Lyric Opera of Chicago under Zubin Mehta. "As a conductor, I found him really inspiring—his grasp of the music, his ear for the ensemble, his technique. He's one of the greatest conductors in the world and he's my favorite," Benyas says.

Festival concerts in 2008 with opera singer Christine Brewer and violinist David Kim were conducting highlights for him, as were several Puccini operas done here with theater department colleague Tim Fink.

And then there was conducting famed pianist Emanuel Ax playing Beethoven's "*Emperor" Concerto* with the Southern Illinois Symphony Orchestra. "You don't want to screw that up," Benyas says, acknowledging he was a little nervous. "But I get more nervous if I have to play a big solo on the oboe," he says. "Your reed can break, you can have water in the key, your mouth can get dry—any number of things can happen."

What does Benyas prefer, playing or conducting? It's a closer call than you might think.

"I love making sound on my oboe," he says. "When you're conducting, you're not producing any sound. But commanding a big mass of sound…when that works, it's very rewarding too."

For more info: Edward Benyas, School of Music, benyas@siu.edu. For more about the Southern Illinois Music Festival: SIFest.com.

Benyas congratulates opera singer Christine Brewer after a music festival performance. ***Photo by Bob Benyas.***

TRAFFICKING IN TRANSCRIPTION

Dissecting the intricacies of DNA transcription and transcription repair is likely to be key to treating many cancers and other diseases.

by Marilyn Davis

Sukesh Bhaumik prepares a solution for inserting genes inside cells.

All multicelled creatures rely on transcription for life. It's the process by which DNA in the cell's nucleus is copied into strands of RNA. Those RNA strands then must move out of the nucleus to be translated into proteins critical for cell activities.

For the cells in our various organs to function properly, certain genes must be transcribed at certain times. Each gene has a promoter sequence that signals where the gene begins, an "active" sequence that is copied, and a sequence that says where to stop copying. Start, go, stop. It's like traveling from green light to red light.

But traffic isn't so simple, and neither is transcription. DNA gets damaged in the cell by all sorts of things, from sunlight to mutation-producing chemicals. That damage jams the transcription machinery. Down the line, the result can be various types of cancer or degenerative diseases. "No RNA, no protein," says Sukesh Bhaumik, an assistant professor of biochemistry and molecular biology. "The cell can transform into a diseased cell because it lacks a particular protein."

Fortunately, cells can fix a gene's problem—most of the time. When the repair system fails, however, cells become abnormal.

Bhaumik and his students study these intricate cellular processes. It's an exciting, intriguing area of research that will lead to new disease treatments, he says.

To get transcription going, an activator protein binds to the promoter. That protein attracts other proteins, which then attract an enzyme called RNA polymerase II. The

polymerase starts moving down the gene, copying one of the strands as it goes.

The active parts of genes are wrapped around proteins called histone complexes, like beads on a string. As the RNA polymerase moves busily along, it recruits enzymes to put chemical groups on the histones and unwrap sections of the DNA so that it can be accessed and copied. But if the RNA polymerase runs into damaged DNA, it's like a wrench thrown into the works. The process stalls.

Luckily, the cell has a trick up its sleeve: In a process called transcription-coupled repair (TCR), other proteins repair the damage. This protein assemblage travels along with the RNA polymerase.

Bhaumik's lab has discovered that when RNA polymerase hits a snag, its largest component degrades. This somehow triggers disassembly of the entire polymerase complex, clearing the way for the TCR proteins to quickly fix the damaged site. Then a new cycle of transcription begins at the promoter, this time without the snag.

So the cell can't afford to do without its editor—its TCR mechanism. When TCR doesn't work right, it can lead to disease, such as various cancers, Parkinson's disease, and other diseases of aging. The defect in the repair system is likely to be present in multiple cells, and it's known that mutations in certain genes, such as the BRCA-1 breast cancer gene, cause defects in TCR.

What regulates the traffic that controls transcription-coupled repair? A whole network of proteins and enzymes is involved, much of it unknown.

"My lab is trying to understand the DNA factors (repair proteins) involved," Bhaumik says. "We know only a few. How are they recruited to the site? How do they interact and cross-talk? What happens first, second, third? Our lab has identified some of the factors, but we don't know all the players."

Most researchers in this area work with proteins and DNA in test tubes, Bhaumik says. "But we are doing this in the living cell. It's much more difficult, but it gives us a much more real picture of what's going on.

"Answers would help [researchers] design drugs to treat diseases caused by defective TCR. If someone has defective TCR [leading to cancer], you could convert cancerous cells to normal cells by [fixing] transcription-coupled repair."

Bhaumik's lab has discovered certain DNA factors involved in transcription and transcription-coupled repair. These discoveries and others like them may eventually lead to scientists being able to tailor drug treatments that target only cancer cells.

If TCR doesn't do its job, something is amiss with one of the proteins involved in the repair mechanism. To find what's wrong, Bhaumik's lab induces multiple mutations in proteins known to be involved in repair, then sees how that affects things down the line. If no repair takes place, they can hone in on the protein mutation that's the culprit. The idea is that eventually other scientists can use that information to develop drug therapies.

Bhaumik and his students are looking not just at transcription-coupled repair, but at how histone modification goes wrong, which also can lead to cancer. In treating prostate cancer and multiple myeloma, researchers combining histone modification drugs with conventional cancer drugs are getting much better results than with the conventional drugs alone, Bhaumik says. This so-called combinatorial therapy may be the wave of the future in treating cancer and other diseases.

"It will have a huge impact," he says.

For more information: Dr. Sukesh Bhaumik, sbhaumik@siumed.edu. Work in Bhaumik's lab is funded by the Mallinckrodt Foundation, the American Cancer Society, and the American Heart Association. Abhijit Shukla, a doctoral student of Bhaumik's who is now a postdoctoral fellow at Harvard Medical School, also had funding from the AHA and was named co–Outstanding Graduate Student Researcher in 2007.

Bhaumik with his lab team: graduate students Priyasri Chaurasia, Abhijit Shukla, Geetha Durairaj, Shweta Lahudkar, and Shivani Malik.

MYTH AN

Máwi flutes.

Music, dance, and myth cycles are interwoven in Wakuénai culture. ***Photos by Jonathan Hill.***

Jonathan Hill started out as a music major and wound up in anthropology—a happy circumstance that led to his recently published book, *Made-from-Bone.*

Hill, an anthropology professor, has worked for decades with native peoples in Amazonia. *Made-from-Bone: Trickster Myths, Music and History from the Amazon,* covers, among other things, shamanism, catfish trumpets, creation stories, and of course Made-from-Bone himself. The book is part of the "Interpretations of Culture in the New Millennium" series produced by the University of Illinois Press. It is the first English translation of stories and myths from the indigenous Wakuénai people living along the Amazon River in southern Venezuela.

"Made-from-Bone" is the anglicized name for the Trickster figure in Amazonian myth cycles. Trickster is the name given by folklorists and ethnographers to a character appearing in various guises and forms in myth cycles, particularly in Native American (both hemispheres) stories. He (or she) is often personified as a smaller, weaker creature, but one endowed with extreme intelligence, cleverness, and a sort of clairvoyance enabling him to turn a disadvantageous situation into one increasing his power and mastery. Trickster figures often contribute to creating the world and to sharing creation with human beings.

For example, in the story of "The Origin of Peach-Palm Fruits," Made-from-Bone uses a combination of force, persuasion, and clairvoyance to obtain some of the fruits, seeds, and cultivation secrets from Grandfather Anaconda. During this adventure, a seed erupts into a tree that scrapes his back, which, according to the story, is why "people today have a groove in the center of their backs."

Other stories in the book explain the origin of ceremonial and cultural practices, including "The Origin of Cooking with Hot Peppers" and "The Origin of Bocachico-Fish Dances." Other origin stories are darker, such as

...D MUSIC

by Andrea Hahn

Playing a catfish trumpet.

"The Origin of Death," and "The Origin of Malaria."

The research has been a decades-long labor of love. The narrative of Hill's research adventures makes his book, though scholarly, also thoroughly readable and entertaining. He worked with a storyteller, Horacio, and later Horacio's son and others, to collect three myth cycles, all of them featuring Made-from-Bone as a central figure.

Hill's book includes what he calls an "ethnomusical interlude"—an explanation of Wakuénai music and how it relates to the story cycles and to the culture of the people. While in Venezuela, Hill put his background in music to good use and learned to play the máwi flute, an important part of ceremonial dance. His interest contributed to a revival of the traditional "catfish trumpets," delicate instruments woven of plant material, protected with resin, and decorated with painted designs and feathers. The trumpet, Hill said, is so named because "it sounds like a river filled with fish that are migrating upriver to spawn."

He described a ceremony using both catfish trumpets and flutes during which people from neighboring villages leave the immediate area, still playing.

"The sound as the music fades from the 'center of the world' is something you have to hear," Hill says. "The music and the instruments they use are part of how the Wakuénai interact with their environment."

Hill's research preserves the uniqueness of both the storyteller's art and the beauty of the ceremonial music. He made recordings while he was with the Wakuénai people, and left his tape recorder when he was not. His recordings are part of the Archive of the Indigenous Languages of Latin America, an ambitious digital archive of recordings and texts maintained by the University of Texas at Austin. To hear some of the recordings, visit http://www.ailla.utexas.org/site/welcome.html.

Perspectives follow-up: We first featured Jonathan Hill's work in 1994.

kudos

The School of Law is one of two law schools in the United States selected to host a nationally recognized pre-law summer institute for students of color and economically disadvantaged students. The Council on Legal Education Opportunity (CLEO) chose the SIU law school and the University of Pittsburgh School of Law to host the organization's regional institutes, intense six-week programs that approximate the first six weeks of law school. CLEO is a nonprofit project of the American Bar Association Fund for Justice and Education.

Cade Bursell, assistant professor of cinema, was awarded a four-week National Endowment for the Arts International Digital Filmmaker Residency last fall at Squeaky Wheel, Buffalo's Media Arts Center. In addition, a recent film of hers, "Heron Pond: Boardwalk View," was chosen to be shown at the ninth annual Planet in Focus International Environmental Film and Video Festival in Toronto last fall.

Patricia Elmore, professor of educational psychology and special education and now interim associate provost for academic affairs, is serving as lead editor of *Educational Researcher,* the education field's premier journal, with more than 28,000 subscribers worldwide. She also was recently named a fellow of the journal's parent organization, the American Educational Research Association.

Linda Toth, professor of phamacology and associate dean for research and faculty affairs at the SIU School of Medicine in Springfield, has been awarded a five-year, $1.9 million grant from the National Institutes of Health to study the mechanisms of fatigue in chronic viral disease, such as Epstein-Barr virus, mononucleosis, and viral hepatitis.

Yoginder "Paul" Chugh has been named to the China Council Task Force on Sustainable Use of Coal. The task force will provide policy recommendations to the Chinese government.

Josh Woods, an MFA student in creative writing, is the editor of a new anthology, expected this summer from Press 53. All the stories, poems, and other works in *The Versus Anthology* oppose "two iconic and incompatible forces," whether they be historical figures, characters, or concepts. Woods not only edited the anthology, he contributed a story and designed the cover.

Marshall Kapp, Garwin Distinguished Professor of Law and Medicine and co-director of the law school's Center for Health Law and Policy, received the American College of Legal Medicine's Gold Medal in February. The medal is the organization's highest award for service and professionalism. Kapp is the third faculty member in the law school to receive the prestigious award in the last four years. The others were Theodore LeBlang and W. Eugene Basanta.

Jacob Podber (Radio-TV) was awarded a spring 2009 residency with the Berea College (Ky.) Appalachian Music Fellowship Program to conduct research on radio and Appalachia. His book on the subject, *The Electronic Front Porch,* won the 2009 Browne Literary Book Award for the Best Focused Study in Popular and American Culture, given by the Popular Culture/American Culture Association.

For a second straight year, the all-student crew of "alt. news 26:46" can claim the best collegiate television magazine show in the nation. The half-hour alternative series captured another national student Emmy in March in Los Angeles.

Leslie Duram, chair of geography, received a Fulbright Scholar Award to do research at the National University of Ireland, Galway. She specializes in organic food production and rural land use.

Salt of the Earth

Photo by James Ewing

This past winter, award-winning documentary maker Jan Thompson, a faculty member in radio/television, took a crew to India to make another film for television. The radio-TV Documentary Unit arranged for two seniors, Sean Brown and Tim Wilkerson, to accompany the group to serve as the second camera crew.

The documentary-in-progress, *Water Pressures*, covers the crisis of water shortages and poor water quality in the region of Jodhpur, India. The portrait here, taken by crew member James Ewing, is of a 98-year-old village woman who has been drinking saline water all of her life.

The documentary will most likely be shown nationally in spring 2010 in connection with World Water Day, March 22.

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