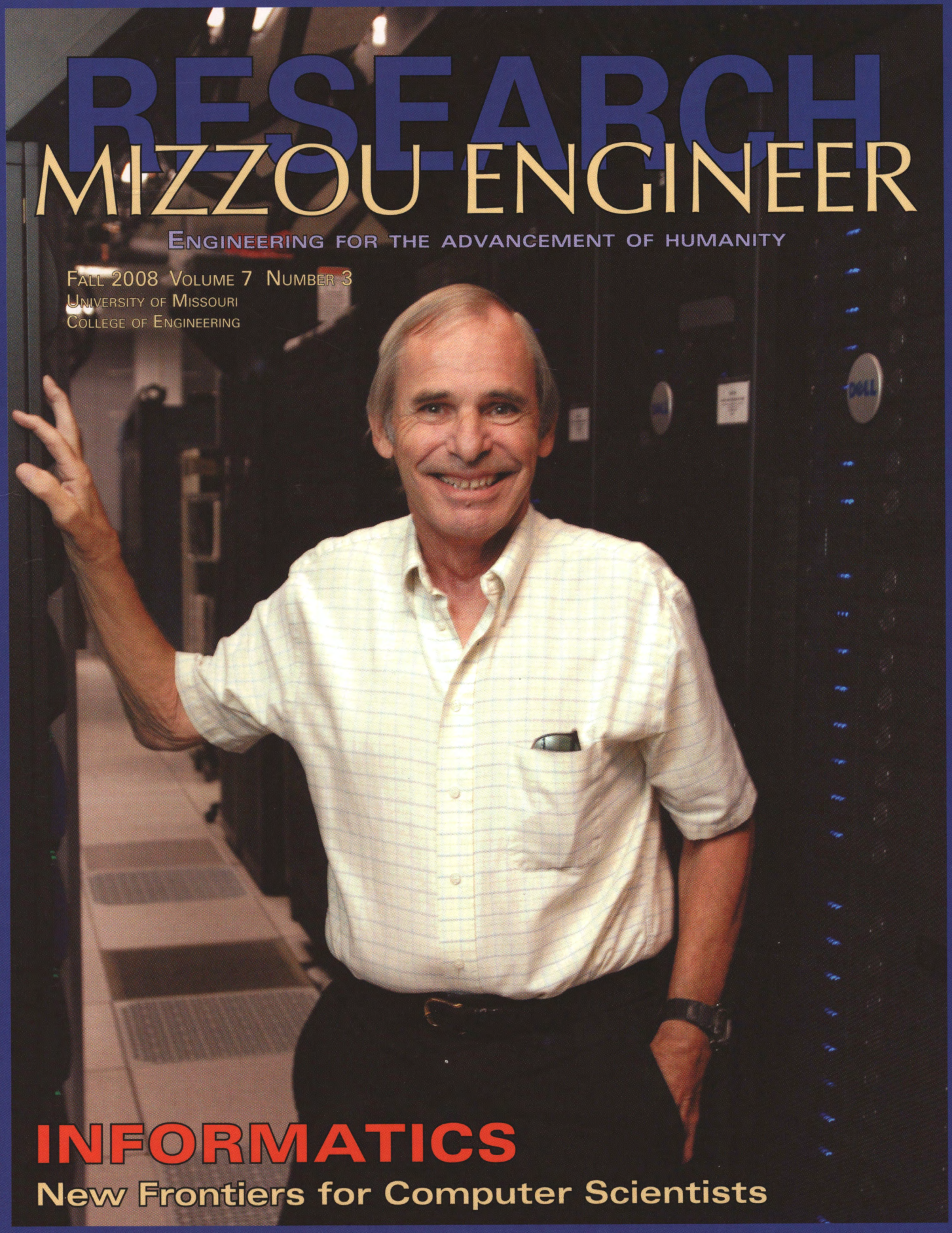

MIZZOU ENGINEER

ENGINEERING FOR THE ADVANCEMENT OF HUMANITY

FALL 2008 VOLUME 7 NUMBER 3
UNIVERSITY OF MISSOURI
COLLEGE OF ENGINEERING

INFORMATICS

New Frontiers for Computer Scientists

MIZZOU ENGINEER

Engineering for the advancement of humanity

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MIZZOU ENGINEER is a triennial alumni magazine. It is our intent to capture moments in time that communicate glimpses of the past, present and future of the MU College of Engineering. We hope it also renews old acquaintances and friendships, spawns volunteerism and encourages philanthropy.

Questions, comments and suggestions for future articles are welcome. Please send comments to the Engineering Advancement Office at umcengrdev@missouri.edu

This magazine is funded by the Mizzou Engineering Office of Advancement.

Dear Alumni and Friends of Mizzou Engineering,

Before joining the ranks of Mizzou Engineering, I had no idea how pervasive and far reaching engineers' influence is upon our everyday world. Now I see their handiwork everywhere.

Not only do these men and women work to find answers to the riddles of how to make things better, faster, safer, more efficient, and just plain easier, but they also collaborate with research scientists in other fields to help them find solutions to the portions of their work that need a boost from problem-solving engineering minds.

This research issue of the magazine is a good place to get a little taste of a few of the projects that capture the minds and occupy the hours of faculty and students outside of the classroom.

A growing need for collaboration between computer scientists and increasingly data-rich research in the fields of biology, medicine, and health, among others, has led to the formation of the University' of Missouri's Informatics Institute. The specialization has opened doors to new possibilities and computer scientists are off and running on one of science's most promising new frontiers of discovery. From making us safer and improving our quality of life to unlocking the very secrets of life's mysteries, computational research applications are as limitless as the human mind's quest for answers.

An abundance of beautiful rivers and the exquisite landscapes that accompany and sustain them are Missouri hallmarks. The significance of workable guidelines for the care and management of the fields and forests on waterways' shoulders grows as the world becomes a smaller place. What better place for civil engineers to test best management practices than the Ozark National Scenic Riverways?

Cryopreservation, the deep-freezing of biological tissue, is a science in its infancy, with something as simple as ice crystals standing in the way of its success. The promise successful cryopreservation holds for biological research and human quality of life can only be unlocked one cell at a time and mechanical engineers are tackling the problem.

A "speed kills" national traffic campaign slogan says it all, and in response to citizen complaints about excessive neighborhood speed, the Columbia City Council has partnered with civil engineers to find answers and solutions.

From conceptional queries in genomics to routine quandaries that touch our daily lives, engineers are working to make our lives better, and I'm pleased and proud to be working along side of them.

—Jan Wiese-Fales, editor

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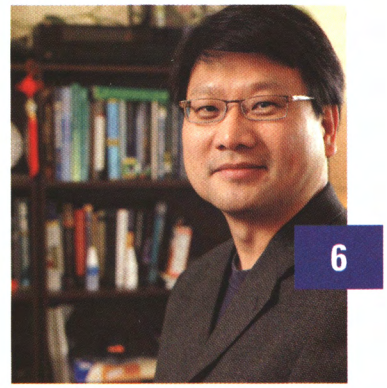
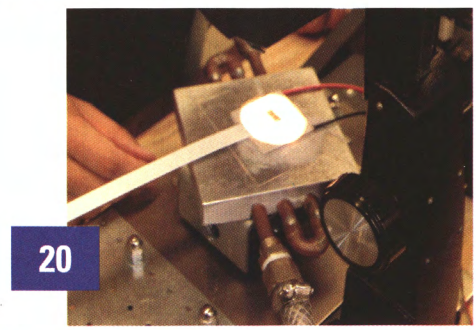


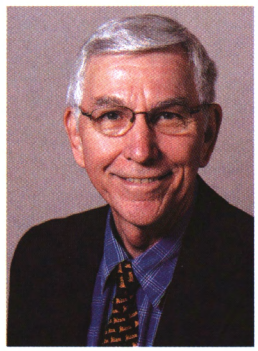


Of Note

COVER: Gordon Springer, scientific director for the University of Missouri's Bioinformatics Consortium, poses next to Lewis, one of several high performance computer banks that carry the load of informatics research. Photo by L.G. Patterson

Kiger wins lifetime achievement award

Mizzou Engineering Associate Dean for Research Sam Kiger, an internationally recognized expert in explosion effects and the design of blast-resistant structures, has received a national lifetime achievement award for his leadership in the shock and vibration field.



Kiger received the Shock and Vibration Information Analysis Center's (SAVIAC) Lifetime Achievement Award at the group's 79th Shock and Vibration Symposium on Oct. 28 in Florida. SAVIAC is a federally funded research center for blast- and shock-resistant design based in Virginia.

"It's a great honor to be recognized by one's peers—and members of this group are very much my peers," Kiger said.

Seeking environmental guidelines for the future

Baolin Deng, a civil and environmental engineering associate professor, and Hao Li, a mechanical and aerospace engineering assistant professor, are part of a team that has received a $399,506 Environmental Protection Agency grant to research how carbon–based nanoparticles affect aquatic life. Working with the U.S. Geological Survey, they will try to determine if the heavy metals used to make the nanomaterials or the small particles alone are toxic to aquatic life—and, if so, at what levels.

Carbon–based nanomaterials are under particular scrutiny because they can be forged into particles many times stronger than steel and are good conductors of electricity, making them potential building blocks for next–generation electronics. Researchers foresee their use in airplanes, computers, medical devices and as components in all sorts of everyday materials.

"People now are beginning to think about large–scale applications of this material," Deng said. "We need to know the impact it will have—on human health and the environment."

New manufacturing technique advanced

A. Sherif El-Gizawy, a mechanical and aerospace engineering faculty member, has received nearly $88,000 from The Boeing Co. to adapt an advanced manufacturing technique for its use in aircraft production. The manufacturing technique—known as "rapid manufacturing"—uses a single computer-guided machine instead of typical manufacturing processes that require numerous expensive tooling machines to build complex components.

"You don't use a special tool for each shape," El-Gizawy said. "The savings are tremendous here."

El-Gizawy's two-year project centers on a rapid manufacturing technique and high-temperature plastic developed by Stratasys Inc., a Minnesota-based company that produces computer-controlled manufacturing machines.

Industry observers hail rapid manufacturing techniques for their potential to cut costs and time from such standard manufacturing methods.

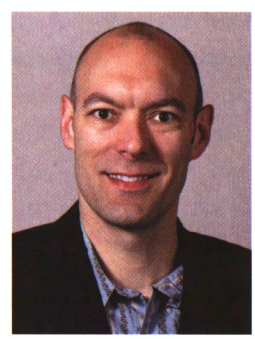
Boeing has sponsored El-Gizawy's research project—providing machines worth about $400,000 as well as material—to help determine whether Stratasys' rapid manufacturing machine and plastic can meet its design production requirements. El-Gizawy and mechanical and aerospace engineering graduate students Joseph Cardona, Brian Graybill and Joshua Arnone will work on two Stratasys machines at Boeing's Advanced Manufacturing R&D Phantom Works in St. Louis to explore the best process design to produce finished products with the required quality and cost.

Their work also involves determining the properties of the newly developed high-temperature plastic.

Additionally, El-Gizawy is investigating the possibility of using the Stratasys process to create such biomedical products as a bone implant fine-tuned enough to allow a patient's own bone to grow through and into it. The Stratasys material has much to recommend it, El-Gizawy said.

Kluever earns association recognition

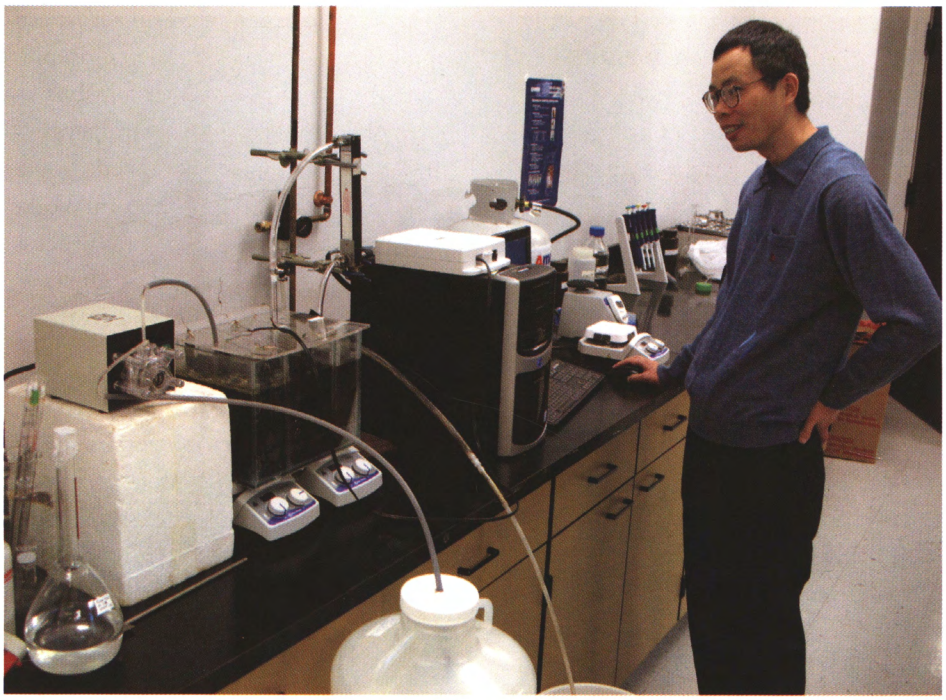
Craig Kluever, an MU mechanical and aerospace engineering professor, has been named a "fellow" of the American Astronautical Society (AAS) for his contributions to the field.



The Virginia-based association recognized its four new "fellows" during a national conference on November 18 .

"It's just a nice honor," Kluever said. "It's nice to be recognized by your peers; I appreciate it very much."

Kluever entered the aerospace engineering field in 1986, working in Rockwell International's space shuttle program for three years. Since joining MU in 1993, Kluever has focused on aerospace guidance and control research and orbital mechanics.



Zhiqiang Hu, an assistant professor in civil and environmental engineering, surveys waste filtration equipment in his lab.

Portable recycling system to reduce sludge, produce drinking water and electricity for military

Engineering Assistant Professor Zhiqiang Hu is leading a team of engineering researchers who are developing a portable wastewater treatment system for military bases that they believe ultimately will produce water pure enough to drink.

The portable treatment system will screen the wastewater as well as disinfect it, producing reusable water that would save what often is a scarce resource as well as considerable expense, said Hu.

"We are working to devise a system that eventually will be capable of treating the wastewater sufficiently to make it usable for cooking, drinking and showering," said Research Associate Professor Robert Reed, a team member helping to develop the system's prototype. "We hope ultimately to replace an estimated 40 percent of military base water use needs with recycled water."

The Leonard Wood Institute (LWI), a non-profit research organization based in Fort Leonard Wood, Missouri, has awarded Hu's team $832,699 to develop a wastewater system prototype as well as training materials for its operation. LWI's funding, provided by the U.S. Army Research Laboratory, also supports team research into fuel cell technology that would use the treatment process to produce electricity.

Along with Hu and Reed, the Mizzou research team includes engineering's Associate Dean for Research Sam Kiger, civil and environmental engineering Professor Tom Clevenger and Assistant Professors Enos Inniss and Sarah Orton as well as soil, environmental and atmospheric sciences Associate Professor Randall Miles.

Team members are slated to deliver and demonstrate the prototype along with a draft training manual to Leonard Wood Institute next September.

While Mizzou's portable system will be a first for Army camps that typically discharge rather than reuse treated wastewater, the research team is aiming for further water treatment technology advances that would produce pure drinking water as well as energy while reducing solid wastes.

The wastewater treatment system would produce energy through the benign bacteria used to cleanse the wastewater, said Hu.

As bacteria feed and grow on foods or organics in the wastewater, they react with oxygen and release electrons. Those electrons can be channeled into fuel cell circuits that generate electricity.

The technology could cut sludge production by as much as 50 percent, significantly decreasing the Army's disposal costs, Hu said.

Biological engineering associate professor honored

Sheila Grant, associate professor in biological engineering, was presented with an award fund recognizing her achievement as a faculty woman.

The fourth annual dinner and lecture, held Oct. 20, was jointly sponsored by Women's and Gender Studies and the Chancellor's Committee on the Status of Women.

Grant was honored at the dinner along with Linda Reeder, associate professor of history.

"It is our responsibility to mentor young women and let them know they can succeed. It is nice to be a role model and be recognized," Grant said.

Center for Sustainable Energy launched

University of Missouri's College of Engineering and College of Agriculture, Food and Natural Resources are seeking campuswide participation in a new center focused on developing renewable energy resources.

The MU colleges jointly launched the Center for Sustainable Energy last spring in hopes of establishing Missouri as a leader in the nation's search for energy sustainability. Center organizers aim to support and coordinate cooperation among campus as well as statewide researchers and educators.

"We're trying to be more than the sum of our parts," said Gary Stacey, the MU center's director and a plant sciences professor. "We're really trying to catalyze and synergize."

Center leaders sought to jump-start that cooperation during a Sept. 24 introductory meeting in which they invited MU colleagues to help develop strategies for collaboration. Organizers also have started campaigning for statewide collaboration on sustainable energy matters, proposing partnerships and sponsoring a workshop in which they sought to enlist researchers from throughout Missouri in a cooperative effort to harness the energy potential of algae microorgainsms.

The center's blueprint calls for expanding that coordinating role to cover a number of fronts.

MU's new sustainable energy center will support initiatives in research, education, public service, energy-related technology commercialization and policy and resource management, said Robert Reed, a College of Engineering research associate professor who is helping Stacey develop the center.

Campus faculty members have been working for years on energy-related initiatives, Reed said. Coordinating that work will multiply its effectiveness, center leaders believe.

A sampling of existing MU energy-related projects includes:

• Verne Kaupp's effort to create a Web-based tool capable of predicting the effects of climate change on regional weather variables—such as rain and temperature—a season or two ahead to help public and private leaders forecast energy demand and manage resources. Kaupp, an electrical and computer engineering research professor, leads an intercollegiate team that will use NASA satellite data and model forecasts to design the weather tool.

• Jinglu Tan's work to improve how Missouri uses biomass by developing a systemic model designed to enhance sustainability while minimizing environmental impacts. Tan, chair of MU's biological engineering department, also seeks to develop biomass technologies that will fit in well with state resources and constraints.

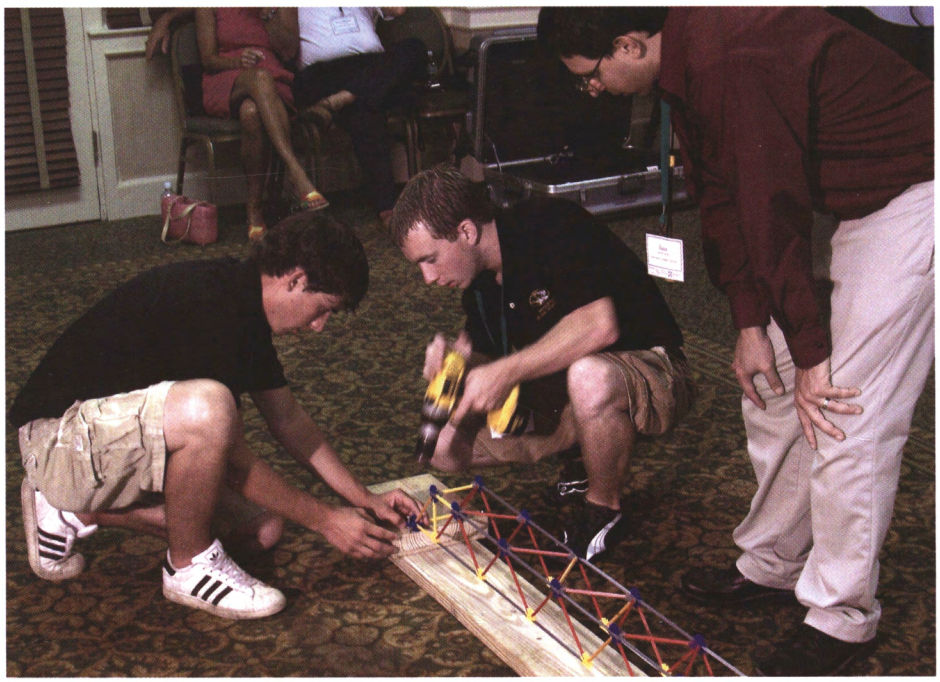
• Centers led by Bin Wu and Marie Steinwachs that help Missouri businesses and industries reduce their energy consumption and minimize their effect on the environment. Both the Industrial Assessment Center, led by Wu, and the Missouri Environmental Assistance Center, led by Steinwachs, also offer internships that provide students with experience in on-site environmental and energy assessments and research.

As they work to enhance these and other existing programs, center organizers hope to help supply a sustainable energy-savvy work force. They are proposing an energy minor for engineering students that would provide theoretical and practical training in a wide range of energy-related subjects.

"Recent employment forecasts and federal budgeting indicate a continuing increase in employment for engineers in the energy sector," Reed said. "So this minor will make our students more competitive with graduates from other universities."

Much of the center's mission involves gathering and analyzing information so that new or growing energy providers can organize effectively. Biomass, wind, thermal and solar energy producers require energy efficiency and demand data, and the University is uniquely positioned to provide it, Reed said.

Graphic: ©Italianestro | Dreamstime.com



Seismic bridge team members Jeremiah Kasinger, left, and Sean Collier, center, fasten their bridge to a testing stand under the supervision of competition organizer Juan Caicedo.

Mizzou Engineering team wins national competition

Mizzou Engineering's seismic design team has won its first outing in a national seismic design competition.

MU's three-member team won a $500 prize this summer by taking top honors in a first-time competition sponsored by the Federal Highway Administration, the Transportation Research Board, the South Carolina Department of Transportation and the Multidisciplinary Center for Earthquake Engineering Research. Four other teams from across the nation were selected to compete in the contest, held during the 6th National Seismic Conference on Bridges and Highways in Charleston, South Carolina.

Each student team competed to build the most earthquake-resistant model bridge using the fewest K'nex pieces possible. Judges scored the bridges on the amount of material used, which corresponded to construction cost, as well as on their ability to withstand weight and shaking. Construction time also played into the final score.

Team Captain Matthew Wheeler, a civil engineering sophomore, attributed Mizzou's win to the relatively small number of K'nex pieces—168—the team used to build its 6.5-foot-long bridge.

The team, which also includes civil engineering sophomores Sean Collier and Jeremiah Kasinger, plans to continue competing.

Engineers Without Borders project in Brazil

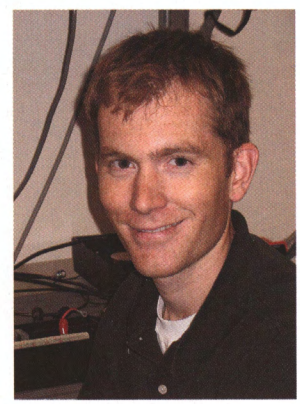
Mizzou Engineering's Engineers Without Borders Club (EWB) is working to design a project to alleviate storm water flooding at a vocational school in Santarem, a city along the Amazon River in Brazil.

Working with a Brazilian nonprofit organization called Fundacao Esperanca that runs the school, the EWB plans to send a contingent to Santarem next summer to help flood proof the site, said EWB President Cole Duckworth, a civil engineering senior.

The Santarem project represents a five- to 10-year commitment for the humanitarian Mizzou organization, launched locally in 2006 to improve the quality of life in developing nations through sustainable engineering projects.

Graduate student wins nuclear association award

Andrew Benwell, an electrical and computer engineering doctoral student, is receiving international recognition for his work to develop an engine for a portable nuclear materials detector far smaller and less costly than existing devices.



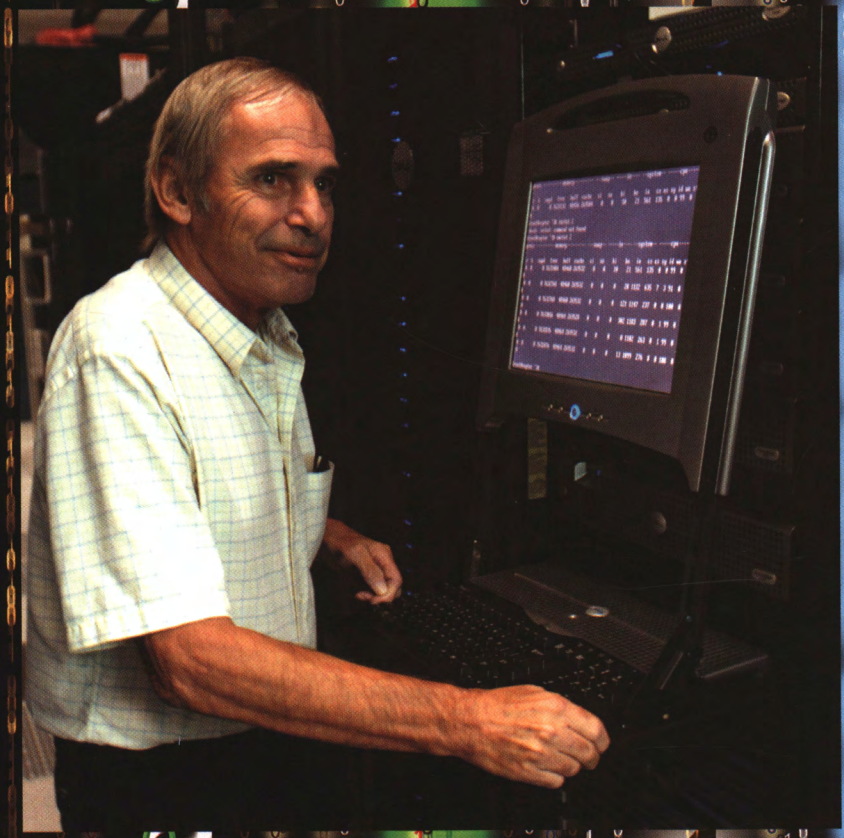
Benwell won the Institute of Nuclear Materials Management's (INMM) J. D. Williams Student Paper Award this summer. Judges working in the nuclear materials management professions selected Benwell's paper from 17 submitted by U.S. and international students.

Benwell's paper details engineering theory behind a component of a compact nuclear detection device that aims to fill gaps in America's nuclear detection effort caused by the large number and variety of entry points into the United States.

Working with Assistant Professor Scott Kovaleski, Benwell devised the device to employ "active interrogation" screenings that would stimulate a detectable reaction in nuclear materials rather than try to pick up on the low levels of radioactivity those materials naturally emit.

Informatics: a computational dive into some of life's mysteries

Story/Profiles by Jan Wiese-Fales



Gordon Springer is a man who thinks big about lots of minute bits of information.

As Scientific Director for the University of Missouri's Bioinformatics Consortium, Springer is in charge of developing and supporting electronic systems that will do the high- performance computing required by MU medical and bioinformatics researchers and the University's new Informatics Institute (MUII).

Just one of the several computing clusters that Springer oversees—a bank of 512 CPUs nicknamed Lewis—exerts a teraflop of computational power every second—one trillion computations. To put that in perspective, one trillion seconds is equal to 31,689 years.

As scientists decode life's intricate genetic mechanisms, the computational ability to analyze massive amounts of minute data has become an integral component of biological and medical research.

"Biological scientists know very little about the computational side of things," said Springer. "They need a mechanism to organize and collect data, and we can develop tools and resources to help them. Without the use of computers, there is no hope that we can ever make sense out of all the data being generated."

In the blink of an eye, computers like Lewis make connections and generate original data. Resulting computations open doors to additional research opportunities, and collaborations between researchers in life sciences and computer scientists grow increasingly inevitable. That makes the field of bioinformatics a shining scientific frontier.

To address this scientific partnership and the need for an informatics-savvy curriculum, faculty researchers from the School of Medicine, College of Engineering and the Bond Life Sciences Center spent years poring over related issues. The diverse group hammered out details to facilitate collaborative research and to create a doctoral degree program in bioinformatics and health informatics at MU.

In January 2008, Chi-Ren Shyu, computer science's Paul K. and Diane Shumaker associate professor in informatics, was appointed as MUII's director, spearheading curriculum development and faculty recruitment. Soon after, MU's Graduate Faculty Senate approved the new informatics curriculum that forms the backbone of the program.

Gordon Springer, scientific director for MU's Bioinformatics Consortium, is charged with developing and supporting systems to do the necessary computational heavy work.
Photo by L.G. Patterson

"This entire area of work is blooming," said Shyu, pleased with the chain of events. "With MUII, we can streamline our system-wide interdisciplinary research and build upon it."

The institute's mission is three-pronged. In addition to supporting informatics research throughout the UM system and providing doctoral programs in both health informatics and bioinformatics, an outreach initiative is geared toward partnerships and the sharing of computational resources and research expertise with other educational institutions and the tech industry.

Fifteen doctoral students were admitted to the program in the fall, seven in the health informatics track, and eight in bioinformatics.

Bin Pang, one of the first students in program, has been on the lookout for just such an opportunity. Pang had completed his engineering doctorate in China when he heard about a new bioinformatics degree that was to be offered at MU.

"I had read some papers on genomics and protein structuring and sequencing and became very interested in bioinformatics," said Pang, who believes that the field holds a bright future. "The University of Missouri's program is very good."

Offices and lab space for teaching and research are in three locations: the Clinical Support and Education Building, Bond Life Sciences Center, and Engineering Building West, where the College of Engineering's Center for Computational Biology and Medicine (CCBM) has been established.

MUII's core faculty members hail from various departments, ranging from animal, biological and computer sciences, to health management and informatics, pathology and anatomical science and physics. Additionally, more than 40 affiliate faculty members from the University system are participating.

Broad informatics applications have led to collaborations with the College of Engineering's Industrial and Manufacturing Systems Engineering Department and their healthcare systems research thrust, Shyu said.

"We also work with the Geography Department to establish a new emphasis area in geospatial informatics which has GIS-enabled research components," he added.

"We appreciate the visionary friends who initiated the planning of the informatics doctoral program almost five years ago. Today, we are fortunate to have many colleagues who share the same vision to move the program forward," said Shyu.

DNA's double helix was first proposed in 1953; the first integrated circuit was constructed in 1958; and in 2008 the informatic union of the two have come together as curriculum on the MU campus.

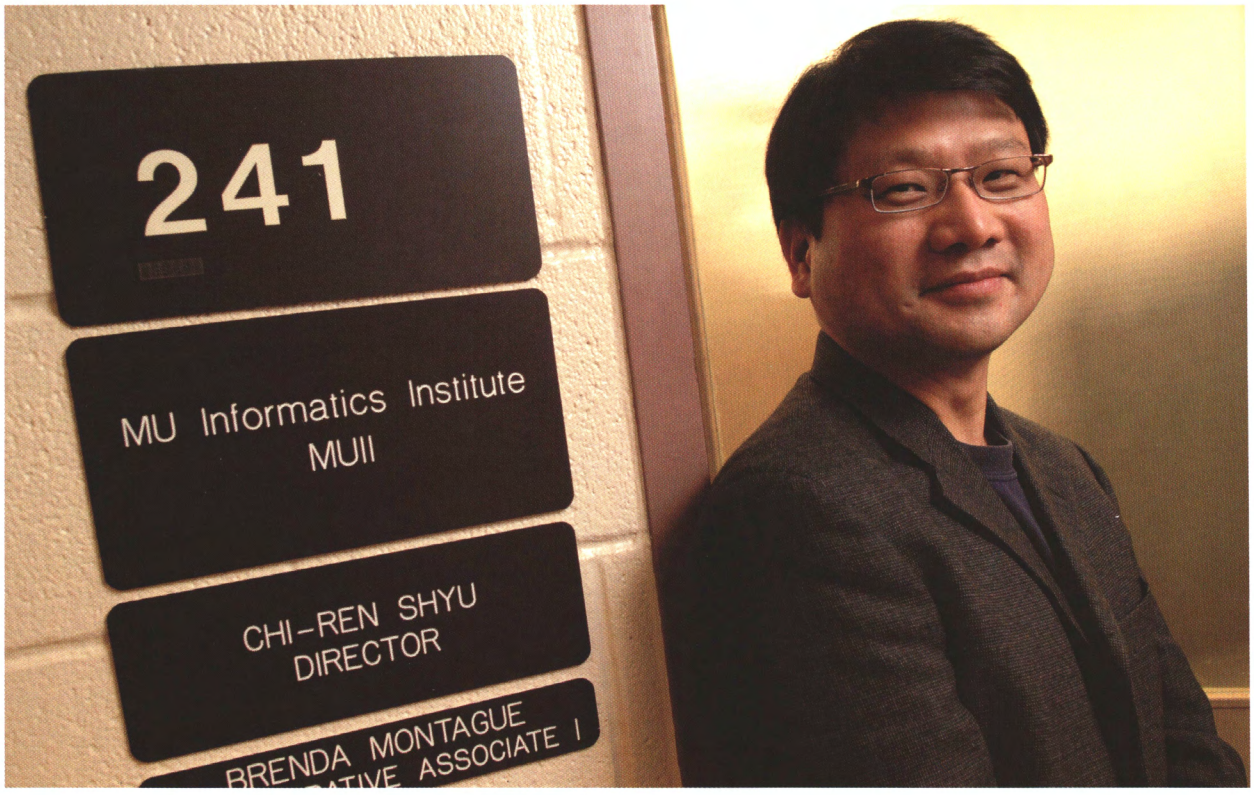


Photo by L.G. Patterson

Head of Informatics Institute works to build next generation searchable databases

"I came to the University of Missouri because of the opportunities for research with corporations, the University Medical School, Life Sciences, and other disciplines," said Chi-Ren Shyu, who, in addition to heading University of Missouri Informatics Institute, is the founding director of the College of Engineering's Medical and Biological Digital Library Research Lab.

Shyu's current five-year National Science Foundation (NSF) CAREER award project is a collaboration in bioinformatics with scientists at North Carolina State University and Iowa State University. He is working with the group to build a database and search engines to link the genetic code of blighted or mutant corn to the plants' phenotypic. or visible, manifestations of the maladies.

The team's goal is to provide biologists with worldwide access to databases that are searchable using images of afflicted corn. The phenotypes can be matched to plants with identical visual characteristics in order to make a determination about genes that are responsible for the mutations.

In August 2008, the National Science Foundation (NSF) awarded Shyu nearly $450,000 to support advanced knowledge database searches in biology, medicine, and geospacial applications. The new research uses a novel approach to mathematically model the description of corn disorders. Shyu will transform subjective verbal knowledge descriptions of corn maladies, made by plant sciences faculty emeriti Edward Coe and Gerry Neuffer, into computer manageable digital formats using artificial intelligence and computer vision algorithms. Shyu explained that project is extremely exciting, but risky because the cognitive model covers new computational ground that has not been widely studied.

"It involves text mining of certain words and phrases and using an algorithm to link descriptions with image patterns of maize mutants," Shyu said.

"With fifty years of experience, these two maize researchers are University of Missouri treasures," added Shyu explaining that the sheer length of their careers has made them expert at identifying maize mutations.

Above, an example of a search result from the text-queried database of maize mutant image patterns that is being developed by Chi-Ren Shyu, director of the University of Missouri's Informatics Institute, and his research group.

Additionally, Shyu is engaged in research on a $2,225,000 National Institute of Health-sponsored medical informatics project with Dr. Jane Armer, director of the American Lymphedema Framework Project and a professor at the MU School of Nursing, developing computational tools to track the quality of life in patients who suffer from lymphedema after breast cancer surgery. By building a database that profiles patient pre- and post-operative experiences, it is hoped that informed quality of life predictions can ease the pain and suffering caused by this associated swelling.

Cerner Healthcare Systems also has contracted with Shyu to help build the next generation search engine with the capability to mine predictive information from ECGs, CAT scans and other non-traditional data searches from medical records.

"Biomedical informatics is about prediction and decision-making for the quality of life using computational methods in biology and medicine," said Shyu. "It's very exciting and rewarding work."

To learn more about the Informatics Institute, visit muii.missouri.edu

Protein structure prediction defines career

In 2001, Dong Xu, now the James C. Dowell computer science professor in the University of Missouri College of Engineering, and department chair, collaborated with then fellow researcher Ying Xu at Oak Ridge National Lab—now at the University of Georgia—to develop a set of computational tools for protein structure prediction and evaluation. Labeled PROSPECT, the young men's software program won them an international R & D 1000 award.

Within each gene, Dong Xu explained, is a sequence of nucleotides that produces a chain of amino acids, creating proteins.

"Proteins are the major molecule in every biological system," he said, adding that every protein is made up of, on average, 300 amino acids, and the order of their sequences causes protein to fold into unique three-dimensional structures.

"The topology of proteins is intrinsically very beautiful, not only because of this physical order, but also because of its biological diversity," Xu said. "In humans there are 30,000 proteins, and with so many species of living organisms, there are potentially billions of proteins."

A protein's structure reveals its mechanism. If its sequence changes, its structure—and mechanism—changes, and such alterations may explain many diseases including cancer and HIV.

"One of the ways that protein structure research can be useful is in drug design," said Xu. "If a small molecule can be discovered that interacts with a disease protein to make it inactive, the pathogen will die."

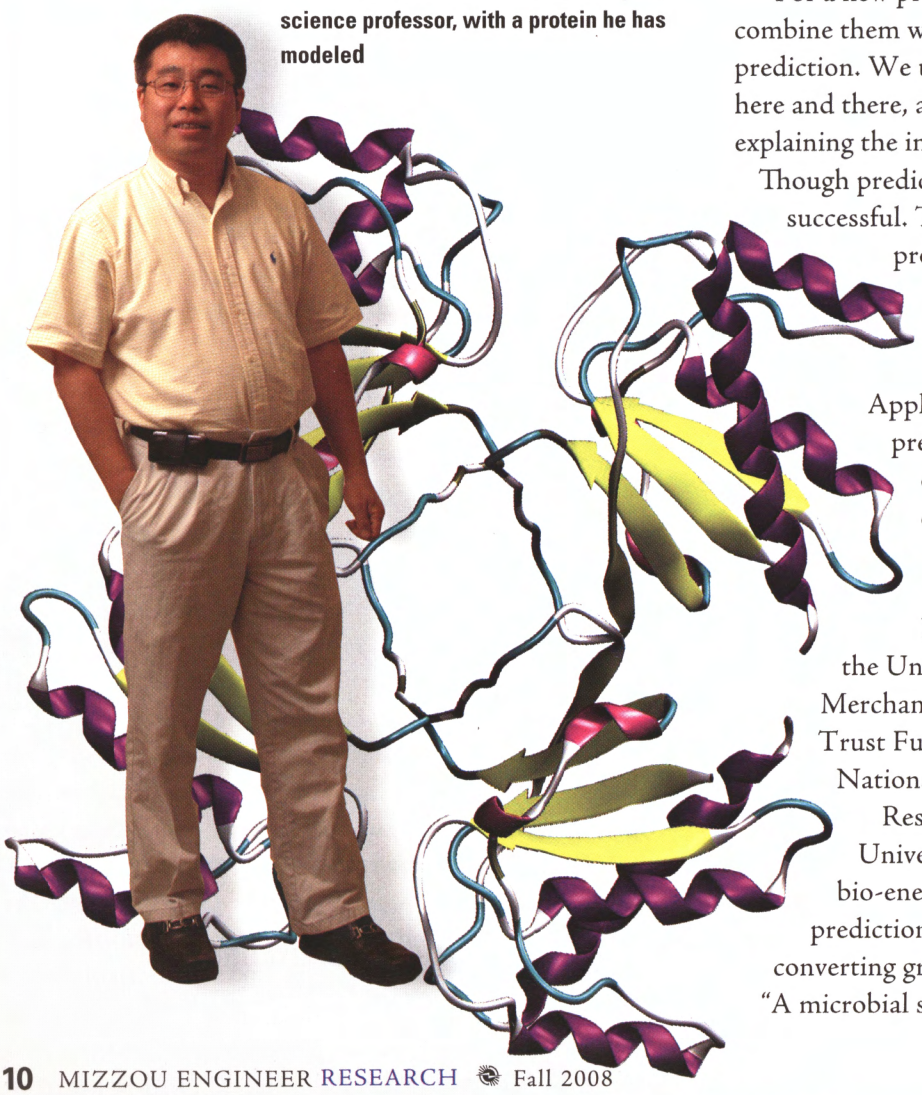
"For a new protein, we use known structures, then combine them with other information for novel structure prediction. We use algorithms that search and find pieces here and there, and many models are generated," said Xu, explaining the intensely computational process.

Though prediction quality varies, some predictions are successful. There are approximately 40,000 verified protein structures in the international protein database (PDB). Some proteins have similar structures to known proteins and are easier to predict.

Applications for such successful bioinformatic predictions are endless, and as director of MU's Digital Biology Lab, Xu is a collaborator on the informatics end of a dozen of the University's life science research projects, supported by DOE, NSF, USDA, NIH, the U.S. Army, the United Soybean Board, Missouri Soybean Merchandising Council, Missouri Life Science Trust Fund, Monsanto Research Fund and the National Center for Soybean Biotechnology.

Researchers on the MU and Washington University campuses are collaborating on a bio-energy project utilizing protein structure prediction that is aimed at more efficiently converting grasses into energy/alcohol.

"A microbial species—a bacteria—has the enzyme to



Dong Xu, computer science department chair and the James C. Dowell computer science professor, with a protein he has modeled

convert grasses into alcohol with a protein, but a better protein would make it more efficient," said Xu. "There is a lot of technology out there, but it's not efficient enough to compete with oil. Using protein design, microbes can be engineered to more efficiently break down grasses so that they can compete as a source of energy."

Management of protein food allergies, such as the extreme allergic reaction some people have to peanuts, is another area of research where protein structure prediction offers hope. "Recognizing the mechanism behind the allergic reaction can help scientists to re-engineer peanuts so that they do not contain the protein that causes it," Xu said.

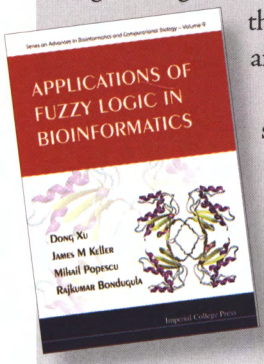
Xu is working to develop new bioinformatic software to predict protein structure. One such program is MUPRED, which aids in predicting secondary structures of protein helices. The software has been made available to the general community, and Xu is now developing a new program called MUFold aimed at more difficult aspects of protein prediction. MUFold was used in this year's Critical Assessment of Techniques for Protein Structure Prediction (CASP), an international protein structure prediction contest. Xu is among a handful of invited speakers at the CASP8 meeting in December, based on the success of MUFold's predictions.

Recently, the National Institute of Health awarded Xu and two MU colleagues—Yi Shang in computer science and Ioan Koztin in physics—a five-year, $1 million grant to research assembly and evaluation techniques in protein structure prediction.

"I've worked on protein for a long time. It's just molecular research, but to me proteins are like people. They have their own personalities," said Xu. "And they are beautiful."

Book links informatics and fuzzy logic

Properties and behaviors of biological systems and objects often behave randomly, and analyzing them with bioinformatics programs can present certain limitations. A new book written by University of Missouri College of Engineering researchers offers insight into how fuzzy set theory and fuzzy logic can provide tools to aid in solving some of these problems.

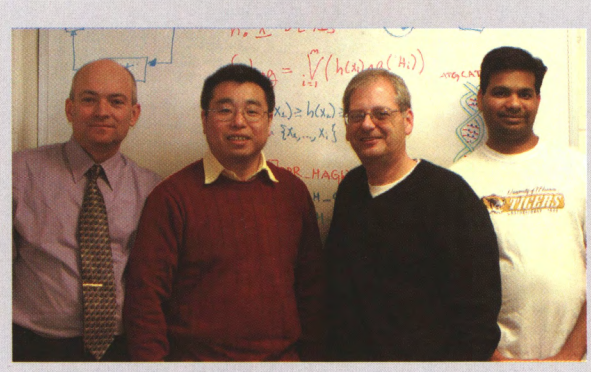


Dong Xu, the James C. Dowell professor in computer science, and department chair, and James Keller, curators' professor in the electrical and Computer engineering and computer science and the R.L. Tatum professor for the college, along with two graduate students, Mihail Popescu and Rajkumar Bondugula, have coauthored a book that addresses the pairing.

"It's a great combination of two disciplines," said Xu. "It offers a bridge to connect them."

As the first book on the topic, "Applications of Fuzzy Logic in Bioinformatics," published by Imperial College Press in August, offers a unique and detailed look at how the two approaches compliment each other.

"Brilliant successes have been achieved through the use of models based on bivalent logic and probability theory," writes Lotfi A. Zadeh in the book's forward. "However, there are many problems such as those discussed in "Applications of Fuzzy Logic to Bioinformatics," in which better results can be achieved with better models based on the use of fuzzy logic."



Authors: Mihail Popescu, Dong Xu, Jim Keller and Raj Bondugula

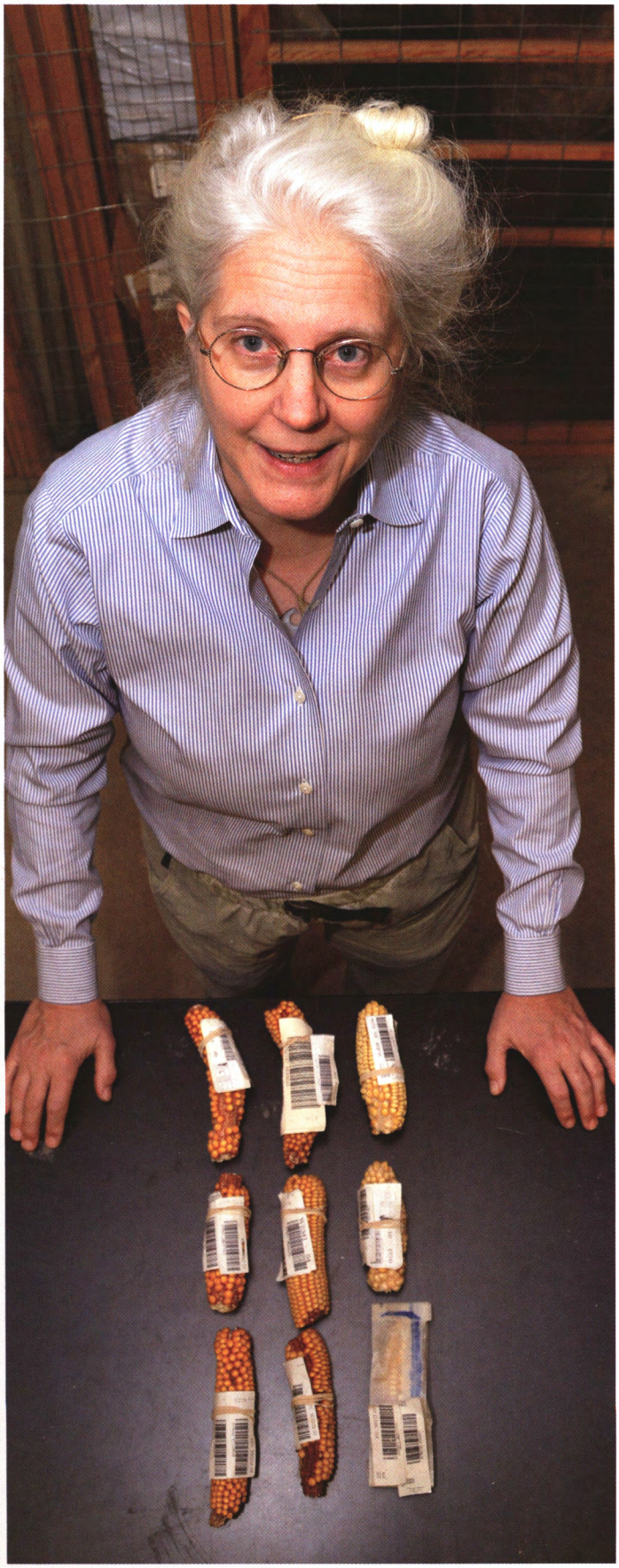


Photo by Dory Colbert

Research with corn phenotypes used to model data network

"The University of Missouri is one of the few places in the country that does interdisciplinary research well," said Toni Kazic, the C.W. LaPierre professor in computer science. "It adds richness to the research, makes it easier to find solutions, and fosters a dialogue that will be ever richer'" added Kazic, who serves on the MU Informatics Institute (MUII) faculty and on the graduate faculties of the Interdisciplinary Plant Group, genetics, and molecular biology. She is delighted with the new commitment the University has made to informatics.

Kazic believes the actualization of MUII typifies the way science is being done today. "So many problems in biology, medicine and agriculture revolve around complex systems with millions of interacting parts. Computation is essential to solving these, and the scale and complexity of the systems poses important new challenges for computer science," she said.

Kazic's research allows her to experience both ends of bioinformatics, planting, pollinating and collecting data from the same corn whose physical characteristics and genetic information are the foci of her work.

Before she got hooked on maize, she devoted herself to computational experimentation.

"I got very interested early on in how the networks of biochemical reactions in cells are organized and function," Kazic said.

Understanding them required data on real biological systems, a need that led Kazic and her colleagues to work on how to represent biochemical information in databases so algorithms could reason with it, and on how databases could precisely share information.

In order to tackle the problem, she began genetic and computational experiments with the phenotypes—observable characteristics—of 50 mutations in corn that produce spots on leaves similar to those produced by a fungal infection, though no infection exists. At least half of the mutations, known as lesion mimics, are genetically distinct.

"When you look at the lesions from the different mutations, you find that there are many differences in the distribution of the spots, their size, and when they appear in the plant's development," said Kazic. "Two questions occur: What is the network of genes and reactions that produce these very complex phenotypes, and what algorithms could infer that network?"

Kazic and her student assistants use photography to document phenotypes of mutant corn leaves from plants that have been carefully back crossed to inbred lines of corn at the University's South Farm. This is necessary to remove other mutants so that only the effects of lesion mutants can be measured.

In the field, waterproof barcodes are assigned to each row and to each plant. These denote the year, crop, genetic family, row, and plant number, uniquely identifying each plant. PDAs with built-in scanners are used to record the barcodes and collect the phenotypic and genetic data that will be linked to its genes in databases.

Identical protocols are used to pollinate each plant, and to photograph their leaves. These careful processes allow the researchers to make inferences about the functions of genes in the network. The portion of each plant's genetic information that is involved in the lesions—a network of at least 200 genes—is matched to its phenotype and computationally modeled using parameters derived from the photographs. Inferences from the resulting data may inform research for a number of additional organisms.

"The next big challenge is for us to design algorithms that mimic the reasoning of geneticists studying small systems and see how well it scales to much larger systems," said Kazic.

"As it turns out, progress on the mimic lesion phenotypes will help to understand the biology of southern and northern leaf blight in maize," said Kazic. Southern leaf blight devastated the U.S. corn crop in the 1970s, and affects crops today. Many of the biological features of those diseases are analogous to the lesion mimic mutants, so we hope our computational models will be useful there, too."

Kazic believes that the computational biochemical model may even be leveraged to help unravel systems within the brain, possibly revealing mechanisms of diseases such as Alzheimer's.

"The maize community has been so supportive," Kazic said of MU's world-renowned maize research program. "We couldn't do this without them."

Photo by Dory Colbert

Far left, Toni Kazic poses with the ears of corn whose offspring will become data for her research to map the network of genes and reactions that cause lesion mimics. Below, Kazic works in the field to identify each row and plant with barcodes and a PDA. Above, Carefully labeled crossbred corn is stored in a cold facility.

Unlocking the secrets of protein mimics

"Our lab is developing computational methods that will rely on experimental and evolutionary data to determine structural information about protein complexes," said Dmitry Korkin, a University of Missouri assistant professor of computer science, and a faculty member of he MU Informatics Institute.

He explained that evolutionary data is novel data that, with the recent advancements in computational methods, has become vastly available to scientists. Experimental data is just that—sometimes it is insufficient, and sometimes it may be inaccurate. But data from a variety of sources increases the odds of a good result.

Korkin is collaborating with Melissa Mitchum, an assistant professor in life sciences, on her research investigating the infection of plants by nematodes, roundworms found in the soil.

Assistant Professor of computer science, Dmitry Korkin with a protein he has modeled

Invasion and survival of pathogens in animals, plants and humans—whether the pathogens are viruses, bacteria, or multi-cellular parasites—involve vast numbers of protein interactions, Korkin said.

"We are trying to detect nematode proteins that interact with plant proteins, and to characterize the ones that are critical for this nematode infection. It would allow us to generate a biological hypothesis that can be tested in Dr. Mitchum's lab."

Pathogens are in desperate need to penetrate the host's defense system and must secrete proteins that will interact with the host proteins, altering the host's function. For the host organisms, explained Korkin, the evolutionary rate of modifications within their proteins is slow.

"With a pathogen, it's much faster, which is a very cool advantage because it can compete with its host," said Korkin. "Pathogens invent the need for their proteins to perform the same function as structurally unrelated host proteins, altering themselves to do so. Once the protein interaction corresponding to a host function has been detected by a microbe, it can alter its proteins radically, mimicking one of the host's interaction partners."

Experimental data has identified individual residues used in these interactions. Amazingly, these residues can be superimposed in the same positions in a protein structure with the same properties even though the proteins are often totally unrelated.

"Detecting binding sites of pathogenic proteins is a difficult task. You often need to know the right structure of the lock, a host protein, to know the right structure of the key, or pathogen protein," Korkin continued.

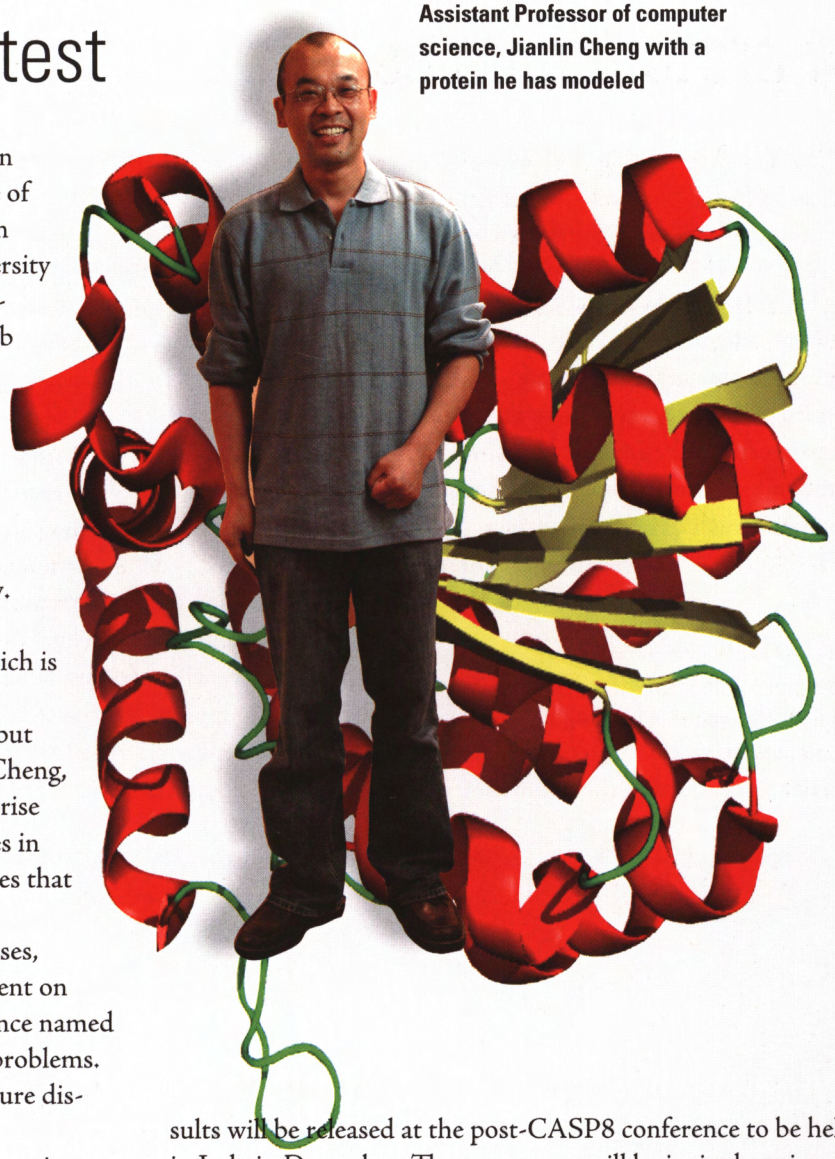
"If we are able to predict the mimicking microbial proteins—and to detect the residues that are important for their interactions with the host proteins—this information can enable experimental scientists to design drugs that block these residues," said Korkin.

Korkin explained that he and collaborators Andrej Sali, Carol Gross and Elizabeth Blackburn at the University of California-San Francisco, Wah Chiu from Baylor College of Medicine, and Judith Frydman from Stanford are working to refine their methods.

"There are a lot of exciting discoveries to be made, and I am fortunate to have these collaborations."

"Interdisciplinary research is a big advantage, and it distinguishes our program from other bioinformatics programs. Our ultimate goal is to discover the insights of a living cell on an atomic level to help experimental biologists study the structure, function and evolution of life."

New protein prediction software put to the test



Assistant Professor of computer science, Jianlin Cheng with a protein he has modeled

"Bioinformatics is one of the most exciting fields in science because it is interdisciplinary—the marriage of computer science and biology, said Jianlin Cheng, an assistant professor in computer science at the University of Missouri, and a faculty member of the MU Informatics Institute. "Students in this field have good job opportunities and great research opportunities in higher ed and beyond."

New to the University last year, Cheng is doing collaborative research with Charles "Bill" Caldwell, director of the University's Ellis Fischel Cancer Center.

"Cancer cells and normal cells function differently. We are looking at the mechanisms of cancer at the molecular level using one thread of my research, which is protein structure prediction," said Cheng.

"We know the sequences of millions of proteins, but we only know the structure of about 40,000," said Cheng, explaining that the amino acid sequences that comprise proteins must fold into three-dimensional structures in order to function, and that it is the shapes themselves that determine function.

"How we digest food, how we defend against viruses, how we see light—all are functions that are dependent on proteins," said Cheng. "In 2005, the Journal of Science named this one of the top 125 greatest unsolved scientific problems. If we can solve this problem, one day we may help cure diseases like cancer, Alzheimer's and Parkinson's."

Cheng and his research group have developed a protein structure prediction program called MULTICOM and are currently putting it to the test in an international competition that has taken place since 1994, in alternating years. The Eighth Critical Assessment of Techniques for Protein Structure Prediction (CASP8) is sponsored by the National Institute of Health. This year 230 teams are competing.

"CASP is unique in the scientific world because it is a blind test of real predictions." said Cheng.

From May through August, CASP sends protein sequences out to research groups around the world, two proteins per working day, for a total of 128 proteins. Participating teams must return up to five structure predictions within three days.

Independent experts will evaluate the submissions and results will be released at the post-CASP8 conference to be held in Italy in December. The top groups will be invited to give a talk at the conference and will have a paper on their work published. Cheng has been invited to speak about his prediction methods and performance.

Already participants are reviewing results and self-ranking their work. Out of the 128 targets, 113 are known and in the preliminary analyses, Cheng's predictions appear in the top five along with—and even higher than—some of the top experts in the field.

"Personally, I like the challenge and the fundamental scientific significance of protein folding. It has huge implications for science, the economy and technology. The tools we are developing can apply to any protein in any species, from soybeans to mice to humans," said Cheng.

Long-term project examines effectiveness of conservation

Story by Jan Wiese-Fales

Shannon and Reynolds counties, deep in the Missouri's Ozarks, are home to some of the most ruggedly beautiful landscapes in the state, if not the country.

Spring-fed, the Current and Jack's Fork Rivers snake clear and cold at the feet of the area's densely wooded dolomite and limestone hills and bluffs. Designated as the Ozark National Scenic Riverways by the U.S. Department of the Interior in 1964, these state treasures draw 1.5 million visitors annually. People of all ages come to canoe, camp, hunt, fish, hike, go horseback riding and just soak up the area's beauty.

The two counties are also leaders in this state's vigorous logging and wood product industries.

Missouri is third in the nation in forestry economic impact, according to a Missouri Economic Research and Information Center (MERIC) brief. Forest product industries constitute about two percent of Missouri's Gross State Product, or $4.32 billion.

While some believe that recreation and timber harvest are at cross purposes, the Missouri Department of Conservation (MDC) believes that the two can coexist if logging is conducted using a series of best management practices (BMPs). The agency's guidelines were developed in response to the Federal Government's Water Pollution Control Act and the subsequent Clean Water Act.

Most states with harvestable timber have BMPs in place, but few studies have been conducted to quantitatively evaluate their effectiveness–until now.

A seven-year research collaboration between the Missouri Department of Conservation and John Bowders, a University of Missouri civil and environmental engineering professor, will do just that. The project is evaluating the impact of MDC-managed clear-cut timber harvests on water quality in the Angeline and Current River Conservation Area. Bowders' team is putting Missouri's BMPs to the test in Shannon and Reynolds counties.

The project represents intensive work between dozens of collaborators and research assistants. Countless hours have been spent in the field—often in less than hospitable conditions—installing equipment and returning repeatedly to replace it and collect samples. Back in the lab, hundreds of

Ephemeral streams, like the one above at left, flow only after measurable precipitation events, and represent one of the major avenues of non-source point pollution into waterways. To the right, undergraduate research assistant Tyler McKee readies sampling bottles to capture runoff for testing back in the lab. Far right, Professor John Bowders in the water quality lab.

department's best management practices

samples are being processed, for the payoff: a growing body of data.

"It's looking better and better," Bowders said of projected results as the project nears the end of its sixth year.

Bowders explained that best management practices call for the preservation of trees and vegetative growth along waterways, known as streamside zones, according to a strict formula: 25 feet on either side of the streambed, plus twice the slope percentage. These green buffers maintain the bank's natural function of absorbing non-point source pollution before it enters the river's flow.

Additional BMP components regulate stream crossings, access roads, timber harvesting, site preparation, reforestation, forest protection, and chemical and fertilizer use.

"MDC manages forests by dividing conservation areas into timber sites of five to 50 acres, and each is visited every 15 years to make management decisions, for example, to clear cut, do nothing, or something in-between," said Bowders.

"We are most concerned with sustainable forest management," said David Gwaze, a silviculturist in MDC's resource science division, and a collaborator on the timber harvest and water quality project. "We want the same services and goods that we enjoy today, or even better ones, to be there for our kids."

Fifteen sites within a 500 square mile segment of the two MDC Conservation Areas that had been scheduled for regeneration oak clear-cut were chosen for the study. Most exhibited oak decline and were in need of the rejuvenating effect that clear-cutting the forests' end-of-life growth provides.

People think of clear-cutting as very destructive, but each site is closely scrutinized in terms of the environment and the regeneration requirements of different species, Bowders explained. A great number of factors are weighed when making these decisions.

Water and sediment collection instruments were placed in ephemeral streambeds—those that only flow after measurable precipitation has fallen—located on slopes draining into the waterways below, and in the streambeds themselves.

Control-data samples were collected

Photo by L.G. Patterson

for three years before any of the sites were logged. The first was clear-cut in December 2006, and the most recent in early 2008. All harvests strictly adhered to BMPs. To date, the lumber from 10 sites has been cut, though data—temperature, precipitation, water quantities in the ephemeral streams, water quality samples from the streams, and sediment loads from hillside sediment traps and in-stream samplers—has been collected continuously from all 15 sites each time there has been measurable rain.

"It is very physical work and I'm happy that we have been able to collect samples in such a challenging environment, especially right after harvesting because some samples are hidden," said Amod Koirala, a doctoral student working with Bowders who has made the project the topic of his dissertation.

"We refrigerate them to American Health Standards when we travel. Back at the lab we check them for total suspended solids, total volatile standard solids, dissolved solids, pH, and conductivity."

Koirala explained that pure water is not conductive and that high conductivity points to more nutrients/pollutants in the samples.

"I've been working on the project for two and a half years," said Koirala. "We've gotten good samples, I am working with good students, and I've gotten good advice from Dr. Bowders and Dr. Inniss. It's a good team."

Enos Inniss, an assistant professor in environmental engineering, and water quality specialist, is co-leading the project with Bowders.

"More than 20 undergraduates have worked on this project, in the field or on the data," said Bowders, voicing his support for one of the greatest benefits of faculty real-world research projects. At least two have gone on to jobs—one in hydrology, and one in urban conservation—benefiting from the capacity of real research to guide career paths, and from the favorable light the experience casts on graduates in the eyes of potential employers.

The "timber team" meets weekly to share information, illumination and advice. Tyler McKee, a junior in civil and environmental engineering, joined the project a year ago. In addition to

aiding with sample gathering, he has started to work with the collected data, impressing team members with his mathematical talents.

"It's been a fantastic experience," said McKee of his work on the study. "I get to be outdoors and work on a real-world engineering project that incorporates a little bit of everything: lab work, spreadsheet set-up, associated statistical work and data analysis, and some field work."

"Working on this project helped to verify that this is the field that I would like to go into. And it ties back into the environment," he added. "That's really a passion for me."

"We will still monitor the sites, but we are already doing some statistical analysis," said Koirala. "We have a decent amount of data, and I'm feeling good about it."

The team expects to present its findings at the Missouri Natural Resources Conference in February. Plans are being made to submit papers to forest hydrology journals and an MDC report is expected within a year. Gwaze anticipates that Missourians everywhere will be learning about it in MDC's magazine "The Conservationist."

"We are excited about this project. It's been six years working on the project and we can't wait," said Gwaze. "Our best management practices will be backed by science."

"All you can do is encourage people to do the right thing. BMPs are voluntary. That's why this project is so important," Gwaze said.

"And we are demonstrating that they do work," said Bowders.

Above left, tools of the water sampling trade. At left, one of the Missouri Department of Conservation's timber clear cut sites.

Bowders named Davidson professor

Anyone who knew Bill Davidson can tell you what an unpretentious and unfailingly generous man he was, qualities that are reflected in his gift to the University of Missouri's College of Engineering.

Davidson chose to endow the William Andrew Davidson Professorship in Civil Engineering—the first-ever endowed professorship in the department—with a gift of $590,000—the bulk of his estate. And he named it after his father.

"My Uncle Bill had no children," said Josh Billings, Davidson's nephew who, along with his wife, Louise, has been working to shepherd the gift process. "He visited us often after his wife, Peg, passed away. He was such a giving person, a genuinely kind man, but he always stayed in the background."

After serving in the U. S. Army Air Corps during World War II, Davidson attended MU, receiving a degree in business in 1949. Following in his father's footsteps, a 1907 civil engineering graduate, he worked for Missouri Pacific Railroad. He retired at the time of his father's death with the realization that he no longer needed to work at anything but what he most wanted: making life a little better for others.

In addition to tirelessly serving and supporting the First United Methodist Church of Jefferson City and the area chapter of the Boy Scouts of America, Davidson was instrumental in establishing Capitol Projects Inc. This job training and vocational rehabilitation service operates a sheltered workshop.

Billings, an engineer who made his career in the oil business, is impressed with his uncle's altruistic vision and the great lengths Davidson went to make Capitol Projects a going concern.

"It's a great success story. He always downplayed his involvement, but he was key in its success," said Billings.

And his success continues.

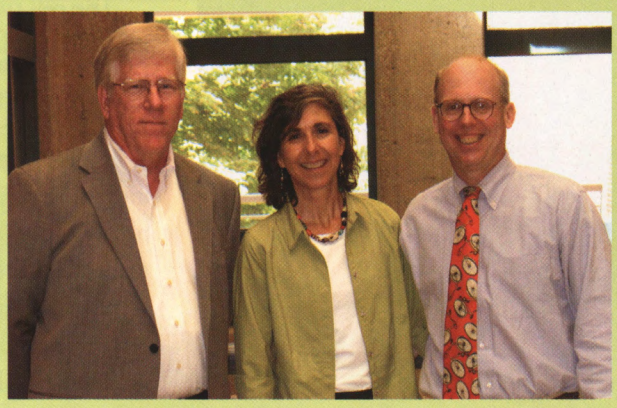
By supporting a faculty member with an endowed professorship, Davidson has extended his legacy of caring and sharing to the hundreds of engineering students whose futures will be touched by that instructor.

Civil Engineering Professor John Bowders has been named the Davidson Professor.

When recommending Bowders for the professorship, Mark Virkler, civil engineering department chair wrote, "He has led the effort to move the MU geotechnical engineering graduate research and education program into a position of national prominence."

Bowders' colleagues from the civil engineering department, his wife, Patti Schnitzer, an MU assistant professor of nursing, Billings, and other representatives from the College of Engineering were on hand at a September luncheon when his appointment was formally announced.

"I am extremely honored to be named the Davidson Professor of Civil Engineering and at the same time humbled by the generosity and philanthropy of the Davidson family," said Bowders. " Training our future civil engineers is especially rewarding as they all leave MU with the talent and potential to make life better for others, and perhaps even become a philanthropist like Bill Davidson."



Josh Billings, at left, Bill Davidson's nephew, with the new William A. Davidson Professor of Civil Engineering, John Bowders, and his wife, Patti Schnitzer.

Photo by L.G. Patterson

Measuring phase change one cell at a time

Story by Jan Wiese-Fales

Standing in front of the MizzouCentral stage at the Missouri State Fair this summer, microphone in hand, Gary Solbrekken worked the crowd like a pro. His demonstration of scientific principles was one of several sponsored by the University of Missouri College of Engineering to accentuate its informational booth.

Holding a grape over a canister of liquid nitrogen, the mechanical engineering assistant professor asked a group of rapt children in the front row, "What do you think will happen?"

Guesses flew as the grape dropped.

After being fished out with a tongs by Solbrekken's graduate assistant, William Zhao, a volunteer from the audience was called upon to verify the outcome. As some in the audience had predicted, the grape shattered under a hammer blow, fragments skittering along the cement floor.

At minus 321 degrees, the liquid nitrogen froze the grape within seconds, a process with direct ties to the National Science Foundation-funded research project that Solbrekken and Zhao are doing with cryopreservation of biological tissues.

The research project, a collaboration with John Critser, a professor of comparative medicine with MU's School of Veterinary Medicine, is aimed at developing more effective ways to store biological tissues at low temperatures, while still preserving their mechanical functionality.

"The cell type we are working on with Gary is the oocyte—mouse, bovine and swine—for agricultural research," said Critser.

Challenges involved with the rapid freezing of tissue occur at a cellular level when water molecules form ice crystals, and increased concentrations of salt result in cell dehydration—both potentially lethal to cells. To further compound the difficulty, each type of cell responds differently.

"We're relatively good at preserving sperm cells, but the larger egg cells are harder to cryopreserve," Solbrekken said. "The probability of cell survival depends on the cooling

rate. Each cell type has a cooling rate for which its survival probability is optimum."

"We are building a tool—a micro-scale differential scanning calorimeter (micro-DSC)—to evaluate the intracellular phase change process within a single cell," said Solbrekken. Similar tools exist on a large scale, but none are sensitive enough to measure phase change at such a minute level.

Scientists follow a series of steps in cryopreservation during which a cryoprotectant such as glycerol—think antifreeze—is added to biological samples to prevent the formation of ice crystals during rapid freezing. During this ice crystal-less freezing process, known as vitrification, molecules move increasingly slower as they are cooled, eventually reaching a solid, glassy state without structural damage to the cell. When thawing, the protocol must be reversed.

"Our goal is to understand the fundamental biology and each of the steps we subject cells to during the process," said Critser. "We want to be able to measure basic biophysical and biomechanical criteria and use the data to improve tissue survivability."

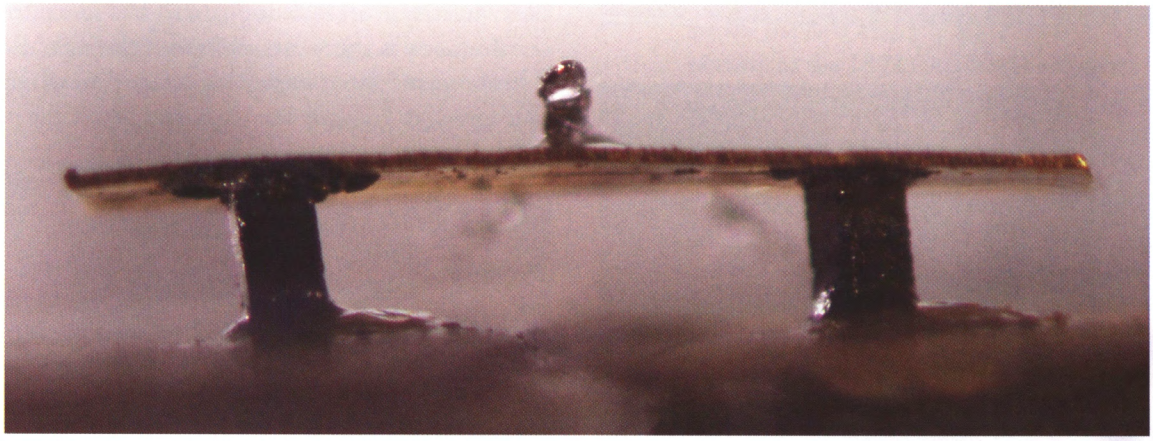
Engineers Solbrekken and Zhao are utilizing the micro-DSC with its thermoelectric heating and cooling capabilities that operate based on the Peltier effect to do just that. The device will measure and closely characterize phase changes within a single cell as it is cooled. Solbrekken explained that it is the same technology used in "coolers" that plug into a car's cigarette lighter and offer the option of keeping its contents cool or warm.

"With the micro-DSC, we can control the amount and direction of the electric current and therefore control the amount of cooling and heating within a cell in a very precise way," said Solbrekken. "This will allow for accurate measurement of ice formation inside the cell during the cooling process."

"Some ice crystals may be tolerated," he said, speculating the results. "Just how much cryoprotectant, toxic to a cell at high concentrations, is necessary to suppress the formation of ice crystals? Is there an optimum time to add it? Maybe there are other options entirely."

"Developing a more efficient and effective protocol for cryopreservation of sperm and oocyte cells is just the first step," said Solbrekken. "Then we can move on to other things, like skin tissue."

"In my mind," he added, "cryopreservation of organs is the holy grail."



At left, mechanical engineering Assistant Professor, Gary Solbrekken and Graduate Assistant William Zhao, share a laugh in the lab where they are evaluating the intracellular phase change in single cells during cryo-preservation. Above, the .75 millimeter by .5 millimeter "bridge" that controls the temperature when testing biological samples. When an electric current is applied to either of the towers that hold up the bridge, heating or cooling results where the towers meet the bridge.

Study examines effectiveness of educating public, posting lower speed limits

Story by Elise Hasty • Photos by L.G. Patterson

Top and right, Ginger Rossy, a civil engineering graduate assistant working with associate professor Carlos Sun on a Columbia traffic speed study, hams for the camera as cars whiz by on a busy city street. Above, Rossy shows the equipment used in roadways to measure traffic speed.

The City Council of Columbia is collaborating with Carlos Sun, associate professor at the University of Missouri department of civil and environmental engineering, and his team of graduate students to make Columbia's neighborhoods safer.

Sun was contacted early this summer by the City of Columbia and asked to conduct a study to determine whether lowering speed limits by five miles-per-hour in certain residential neighborhoods will decrease driving speed.

"I was getting so many calls from people who complained about speeding on their streets in the sixth ward. We need to do something," said Ward 6 City Council Representative Barbara Hoppe, who has been pushing for a reduced speed limit program.

Hoppe believes the pilot study is a great way to determine the next step. The outcome may result in a citywide 25 mph speed limit, unless otherwise posted, or an application process in which neighborhoods can apply to be 25 mph.

"The city and many residents are very concerned about safety in certain areas. It is possible that some drivers use certain roads as short cuts and speed through," Sun said.

Enthusiastic about improving safety through the project, Sun agreed to conduct the study and began the preparation process.

Ginger M. Rossy, Sun's graduate assistant, said preparations have taken a couple of months.

"We did background research to see what other studies have been done in this area," Rossy said.

They found that there is not much related research. Speed studies generally focus on decreasing highway speeds rather than in residential areas.

Working with the City Council, Sun and his team have chosen two neighborhoods, Rothwell Heights and Shepard Blvd., to perform the study. Researchers are donating some of their time and have a $10,000 budget, limiting the field study sites to only two areas.

According to Hoppe, the study consists of three steps. First, measuring speeds before making changes, then recording speeds with 25 mph speed limit postings, and finally, measuring speeds after a speed limit educational campaign.

Within the next few weeks, measurements will be taken using standard traffic speed detectors. When all of the data is in, the team will begin its analysis. They will determine

distribution and make statistical comparisons to ultimately see if lowering the speed limits will actually have an impact.

"It is up to the city to determine whether or not to pursue actually lowering the speed limits in certain areas. We are going to do our best to present the information we collect," Sun said.

For Sun and Rossy, the choice to volunteer time toward this study was an easy one.

"The main reason I wanted to help was because this project is related to safety. There are too many vehicle-related deaths and if I can do anything to help minimize those, I want to pursue that," Rossy said.

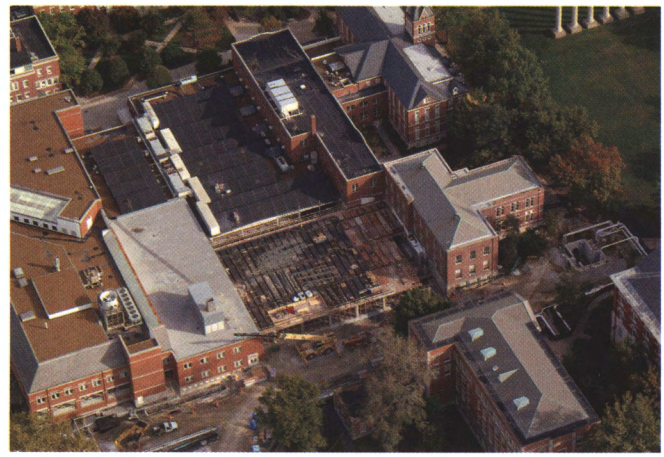
Sun agreed.

"We appreciate and love this community very much. It is our duty to give back through service," Sun said.

Sun said his team won't have results until next year, but he is looking forward to seeing the outcome.

"While reducing speed limit signs at a minimum may not immediately correspond to a decrease in speed, it certainly won't increase speeds, and I am quite confident the study will show over time, with an educational campaign, that speeds are reduced." Hoppe said.

UPDATE: Lafferre Hall Addition



Aerial photo taken in October 2008,

Marty Walker, director of administrative services for the College of Engineering prepared the following answers to some of the most often asked questions about Lafferre Hall's construction project. You may reach him at WalkerMW@missouri.edu if you have additional questions.

Q. *When will the new building be completed?*

A. The building is scheduled for completion and turn over to the College of Engineering on June 10, 2009 and will be ready for the 2009 fall semester.

Q. *Will there be classrooms in the new building?*

A. There will be six new classrooms in the new addition; two in the new building and four in the renovated portion of the 1892 Civil Engineering wing. Capacities will range from 40 to 80 students.

Q. *What will the new addition contain?*

A. The first floor will be devoted exclusively to undergraduate use and contain two large classrooms. Lex Akers, associate dean of students, has worked tirelessly to ensure that this area is a state of the art learning area. All furniture, demonstrations modules, and general equipment will be new. The second floor will house most of the Civil Engineering labs and some faculty offices, while the third floor will be the new home to some MAE Department labs and a few faculty offices.

Q. *Will parking be restored to the south side of the building after the construction work has been completed?*

A. In the past this area was devoted to parking for student and campus vehicles. When finished, two-thirds of the area will be a pedestrian plaza containing seating, trees and shrubs. The area near Sixth Street will contain parking for campus vehicles only.

FOR ALL WE CALL

MIZZOU

A goal in the campaign end zone

The Mizzou Tiger football team's shut-out against the Colorado Buffaloes on homecoming weekend wasn't the only big scoring game on campus.

On Friday, Oct. 24, it was announced that Mizzou Engineering surpassed its campaign goal of $68 million, two months before the end of the University of Missouri's eight-year "For All We Call Mizzou" billion dollar capital campaign.

A $1 million gift by an anonymous donor, to be named at a later date, coupled with the $5 million matching gift by previously anonymous donors Tom and Nell Lafferre, put the College of Engineering over the top.

From all of us at Mizzou Engineering, to all of our alumni and friends who made this possible with gifts great and small, we would like to express our extreme gratitude. Your continuing kind and caring generosity never ceases to amaze us.

To show our appreciation, we would like to invite you, one and all, to our end of the campaign celebration to be held April 23 to 25. Mark your calendars and stay tuned for more information.

Nell and Tom Lafferre

Mizzou Engineering benefactors

In 2004, halfway through the University of Missouri's "For All We Call Mizzou" capital campaign, Engineering Building East received a name change. Because of their generous $7 million gift, it became Thomas and Nell Lafferre Hall. It remains the largest single gift in the history of Mizzou Engineering, and it made a significant dent in the goal of $68 million to be raised by December 2008.

A couple of years went by, and despite the fact that the College of Engineering made steady progress toward its goal, when the calendar turned to 2008, the $68 million goal did not seem within easy reach.

Then out of the blue came the announcement that an anonymous donor, or donors, had promised to match every dollar pledged to Mizzou Engineering—up to $5 million—by campaign's end, energizing the effort. Monies generated from the challenge were to be used in the creation of a discretionary dean's fund.

When it was announced October 24 that the College of Engineering had met its goal, engineering's secret admirers' names were released, and once again the Lafferres were front and center among engineering's many generous donors.

"With our names on the building, I couldn't stand by and let them not make their goal. I just couldn't stand to see the dean not make it" said Tom Lafferre who earned a bachelor's degree in mechanical engineering in 1956.

"I have strong feelings for MU that go back quite a way to my first visit to MU in 1952, and the warm reception and tour I received then from Dean Huber Croft," said Lafferre. "And I met Nell at MU, at a Gamma Phi Beta Halloween party."

"We've been successful. We've had a good life and we'd like to give back," said Lafferre, adding that the two of them would have liked to have been on campus for the announcement.

""We look forward to being there in April 2009, to celebrate with everyone the great achievement of engineering meeting their goal, as well as the University achieving their great goal of $1 billion," said Lafferre.

Keep in touch with what's going on at

Mizzou ENGINEERING

To receive the **monthly e-newsletter,** please fill out the form to the right and mail it to the address at the top, or visit the website to sign up. **http://engineering.missouri.edu/alumni/**

To read **news and feature stories** about Mizzou Engineering online, visit **http://engineering.missouri.edu/news/**

To find out more about **student competition teams** at Mizzou Engineering, visit **http://engineering.missouri.edu/competition/**

To learn more about the **various ways to make a gift** to Mizzou Engineering, visit **http://engineering.missouri.edu/giving/**

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Class Year_____Spouse Class Year (i/a)_____

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Home Address_____

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RECRUITMENT

Please send information about Mizzou College of Engineering to:

Name _____

Address_____

City_____

State_____Zip _____

Currently Attending:_____

_____Year in School:_____

December

20 Engineering Convocation

February

10 Spring 2009 Engineering Career Fair

March

7-14 Engineers' Week

13 Missouri Honor Awards Banquet

14 MU Engineering Alumni Organization Board Meeting
Alumni Citation of Merit Luncheon
SWE Green Tea Reception

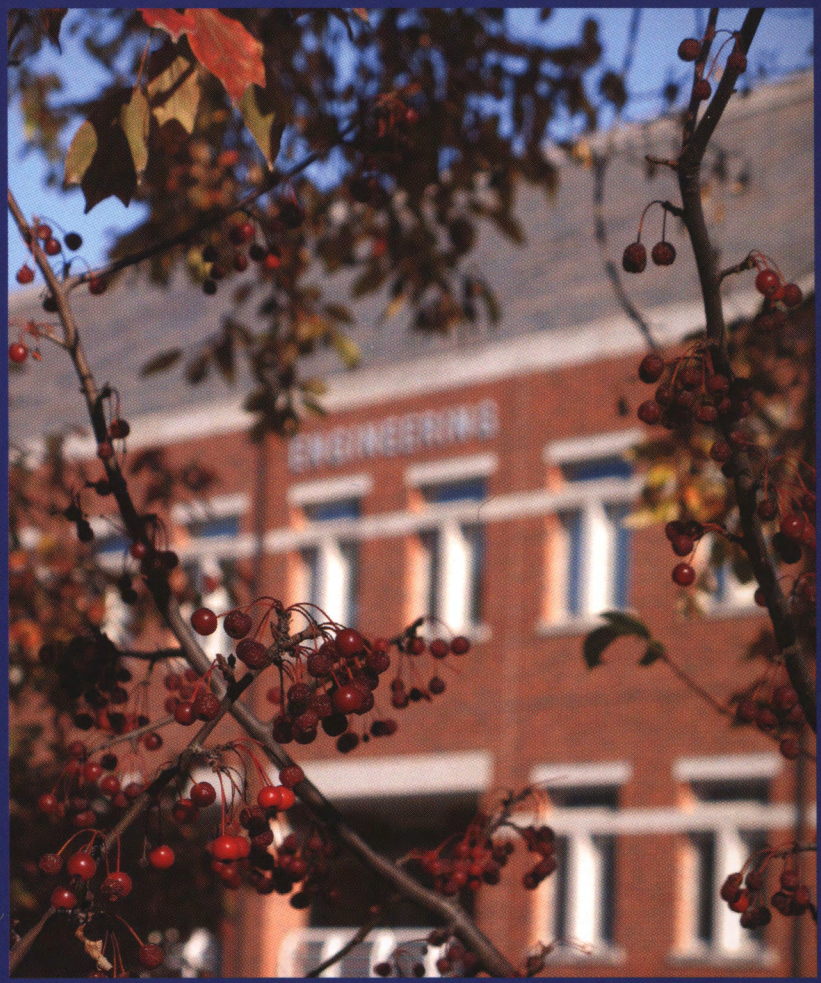
17 St. Patrick's Day

April

2 2009 Utility & Energy Conference

23-25 "For All We Call Mizzou" Campaign Celebration

24 Spring DEAC Meeting



Mizzou
ENGINEERING

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