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ANNUAL REPORT 2006-2007

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Cover Art:
This composite photo illustration represents the scientific efforts of ANDRILL, the multi-national, National Science Foundation-funded Antarctic drilling project managed by the University of Nebraska–Lincoln. From their drilling rig on the Ross Ice Shelf during 2006-07, scientists drilled through 272 feet of ice, 2,788 feet of water and 4,216 feet into the sea floor to retrieve long cores of sediment that will help us better understand the history and future of climate change.

Welcome

Researchers at the University of Nebraska–Lincoln have pushed the frontiers in their disciplines in the past year, setting new drilling records in Antarctica, winning the nation's highest honor for technology and building an ultra-fast, high-intensity laser that has the highest combination of peak power and repetition rate of any U.S. laser.

These accomplishments exemplify how UNL's emphasis on innovation, interdisciplinarity and international collaborations is propelling our research into new arenas, producing new products and technologies for the marketplace and offering our students intensive research experiences.

Chancellor Harvey Perlman and
Vice Chancellor Prem Paul

The National Science Foundation-funded Antarctic Drilling Program (ANDRILL), an international partnership for which UNL is the lead institution, drilled 1,285 meters into the sea floor under the Ross Ice Shelf and Sea, surpassing the previous Antarctic drilling record. In addition to top-notch science, ANDRILL offers students and K-12 educators opportunities to work in Antarctica and is spinning off exciting educational programs.

UNL civil engineer Dean Sicking was awarded the National Medal of Technology by President Bush in July at the White House for his innovative energy-absorbing guard rails and other technologies that save lives and make the nation's highways safer. The entry of these technologies into the marketplace is estimated to save state transportation departments more than $60 million annually.

The high-intensity Diocles Laser can create conditions in the laboratory never before produced on earth, enabling both new studies in theoretical physics and development of innovative technologies. Interdisciplinary collaborations with chemists, biologists, oncologists and engineers have the potential to develop novel applications of the laser in sensors, imaging and medical treatments and therapies.

An interdisciplinary team made up of a UNL architectural engineer, an art historian and their students is collaborating with Turkish researchers and using advanced imaging technology and their knowledge of historical ruins to rebuild an ancient Roman temple in southern Turkey.

These and other highlights of UNL research featured in this report are driving the growth of our research enterprise. Our sponsored funding continues to grow, with awards of $171.9 million last year alone. Our focus on technology development has led to successful start-up companies, like GC Image, based on a UNL computer scientist's image processing software, which are creating jobs and spurring economic development. The work of our talented faculty is drawing national attention; UNL research projects were chosen by *Discover* magazine as two of the top 100 science stories of 2006. And our international presence in research and education continues to expand, with projects on all seven continents, ranging from Antarctica to Africa.

Research is on the move at UNL, and we are confident that our continued investment in faculty innovation and interdisciplinarity will sustain our momentum.

Prem S. Paul
Vice Chancellor for Research & Dean of Graduate Studies

Engaging Antarctica Brings Research Home

To many Americans, Antarctica is a remote, icy continent. Known for penguins and glaciers, sure, but not necessarily for uncovering clues to climate change.

An integrated science education project at UNL will bring the excitement and relevance of scientific discoveries in Antarctica into the nation's homes, classrooms and communities. Nebraska Educational Telecommunications and the University of Nebraska State Museum are collaborating with ANDRILL, the international Antarctic geologic drilling project. Funded by a National Science Foundation grant and geared to the 2007-08 International Polar Year, the project – "Engaging Antarctica" – includes an NET Television-produced public television documentary for the PBS series NOVA and a museum-developed education and outreach program.

The project will help Americans better understand and appreciate polar research, its history, significance and underlying science. ANDRILL and its scientists are the primary focus. The NSF-funded ANDRILL project involves more than 150 scientists from five nations who are investigating the continent's historic and future roles in global climate change. UNL manages U.S. scientific efforts.

Combining NET's award-winning documentary skills, the museum's informal science education expertise and ANDRILL's international scientific acumen creates a great opportunity for innovative science education, said project leaders Michael Farrell, NET Television production manager, and Judy Diamond, museum curator of informal science education. Besides ANDRILL, the other project partner is TERC, a Massachusetts-based science curriculum development center.

NET's crew was "on the ice" with scientists in late 2006 and early 2007 capturing the natural beauty, excitement and challenges of polar research. They'll return in late 2007 and the NOVA documentary, "Antarctica's Icy Secrets," produced in partnership with WGBH Boston, is scheduled to air in 2009.

Diamond and colleagues are designing multifaceted education and outreach exhibits, materials and activities. They'll test the package at several sites before its nationwide release in 2008.

An innovative informal learning exhibit that blends interactive learning with information technologies is at the heart of the outreach effort. It will include images, displays, educational activities and multimedia files available via the Web. The UNL team devised a way to make these relatively low-cost materials easily adaptable to different venues. That means a classroom or community event can feature high quality displays and learning tools traditionally seen in museums or science centers. Nebraska 4-H is working with the development team; outreach partners include 4-H youth development organizations in 22 states.

Engaging Antarctica educational displays.

NET Television crew members (from left) Joseph Brunette, videographer Brian Seifferlein and audio engineer James Lenertz videotaping in Antarctica.

ANDRILL's Season of Discovery

The inaugural field season for ANDRILL, Antarctica's newest geologic drilling program, broke records and yielded scientific surprises.

Researchers drilled 1,285 meters (4,216 feet) into the sea floor beneath the Ross Ice Shelf and Sea, surpassing the previous Antarctic drilling record of 999 meters. They retrieved more than 97 percent of the sediment and rock cores drilled at this site.

"This is a tremendous accomplishment because, with better than 97 percent recovery, you have an extraordinary amount of data to analyze," said geologist Frank Rack, who heads ANDRILL's management office at UNL. Funded by the National Science Foundation, the office is responsible for planning U.S. scientific efforts.

If laid end-to-end, these long cores of sedimentary and volcanic rocks would stretch nearly three-quarters of a mile. These samples are geologic time capsules, dating back about 10 million years. They are revealing how environmental changes shaped Antarctica over the millennia while offering clues to future climate change. It will take years to analyze these samples but preliminary examination offered insights:

- Samples, especially from the past 5 million years, contain a wealth of fossil diatoms, single-celled algae that live in surface or shallow waters. Their presence confirms that large areas of the Ross Ice Shelf – a floating slab of ice now the size of France – previously melted and were replaced by open water.
- Cores show more than 50 significant fluctuations in the amount of ice in the Ross Sea over the past 10 million years, pointing to frequent and extreme climate changes.
- Samples indicate that the Ross Ice Shelf, today the world's largest, probably completely disappeared during periods when Earth was 2 to 3 degrees Celsius warmer than today. Some climate models predict similar temperature increases within the next century. Melting of continent-based ice sheets and glaciers would raise sea levels worldwide.

Frank Rack

Drillers carry a drill core sample.

Project Iceberg Captures Life on Ice

Megan Berg

In 2006, UNL history major Megan Berg traveled to the edge of the earth – literally. She spent several months at the ANDRILL field station in Antarctica recording daily life for "Project Iceberg," an interactive Web site that gave visitors worldwide a sense of science in action.

Science education and outreach are among ANDRILL's major goals. "We thought it would be fun to include the general public and schools across the country and around the world in real time," Berg said.

The site featured video clips, blogs and photos documenting research at McMurdo Station, which at times housed up to 900 international scientists and students working on a variety of projects. It was an overwhelming success. Berg received extensive feedback from enthusiastic teachers and students. ANDRILL compiled video journals from the Web site and other information in an educational DVD and booklet for teachers, students and others.

Berg's time on the ice working with ANDRILL was life-changing. In June 2007, she headed to New Zealand to attend college.

"I feel now like the whole world is open to me," she said. "I feel like I can go anywhere and do anything. Being a part of something bigger than yourself … really impresses in you a feeling that you can strive to accomplish big things."

Evidence Points to Climate Shifts

Increasing atmospheric carbon dioxide levels over the coming centuries could lead to climatic instability.

This is among the conclusions of a scientific team that included UNL geoscientists Christopher Fielding and Tracy Frank. They found evidence, reported in *Science,* of repeated major climate changes during the period when Earth last came out of a major ice age more than 250 million years ago.

This National Science Foundation-funded study examined the sedimentary record of glacial activity in eastern Australia from the late Paleozoic era, 305 million to 265 million years ago. Researchers found evidence of several major climate shifts, alternating between glacial periods and periods of relative warmth. In each instance, an increase in atmospheric CO_2 accompanied a shift to a warmer climate and a decrease accompanied a shift to a glacial climate.

Atmospheric CO_2 levels ranged from 280 parts per million in the early period to 3,500 parts per million near the end, with many shifts in between. Today's CO_2 level is around 380 parts per million, the highest in at least 650,000 years, and rising fast.

"The rate of change that we may undergo here in the next 100 or 200 years might be a lot faster than we've seen in the past," Fielding said. "We really don't know how the Earth is going to respond to such rapid change."

Frank said the late Paleozoic era has important similarities to today. Earth is again coming out of a major ice age, one that began between 34 million and 40 million years ago, with "CO_2 building in the atmosphere and acting as a greenhouse gas."

"There's an increasing need for the civilian and military space communities to cooperate, and we're going to be a forum for that."

Matthew Schaefer

UNL Launching First U.S. Space Law Program

Space may be the final frontier, but it's getting crowded up there. As on planet Earth, sorting things out requires lawyers – in this case, space lawyers.

To meet the needs of this rapidly expanding field, UNL will become the first law school in the nation – and one of just a few worldwide – to offer a master of laws (LL.M.) degree specializing in space and telecommunications law, beginning in the fall of 2008. Law students will also benefit from the additional course offerings.

"The United States is the most dependent country on space for both our national security and our economic well-being, but we currently have no degree-bearing program in space law," said Matthew Schaefer, UNL College of Law professor. Most U.S. students and lawyers head to McGill University in Montreal, Canada, to learn about legal issues regarding space.

"Space and telecommunications law seems exotic, but it deals with matters that are central to modern life, such as weather forecasting, TV and radio broadcasting, GPS positioning in our cars, e-mail and internet services, our national defense," said Steven Willborn, dean of the law college. "We are excited to be able to offer a program that will prepare the world's best trained professionals to work in these important areas."

For decades after the Soviet Union launched Sputnik and the Space Age in 1957, the Americans and Soviets dominated space, spawning a series of Cold War space treaties. Today, the dominant force and the primary need for space lawyers are the expanding global telecommunications and remote-sensing industries, which rely on satellites. Private industry is an important player in what happens in space and lawyers must handle contracts, licenses, financing and insurance issues. Space tourism also is expected to boom.

National security and international interests remain a top concern, particularly as more countries, such as China, Japan and Australia, develop space programs.

"There's an increasing need for the civilian and military space communities to cooperate, and we're going to be a forum for that," Schaefer said. Having the U.S. Strategic Command, which is in charge of military space operations, nearby in Omaha makes UNL the ideal location to train America's future space lawyers.

Matthew Schaefer

Improving Psychiatric Recovery

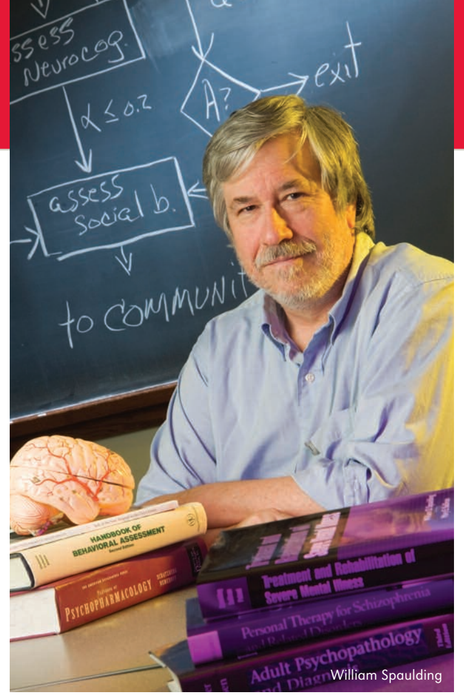
UNL is teaming with Lincoln's Madonna Rehabilitation Hospital, mental health facilities and other universities to better understand how clinical decisions are made during psychiatric and physical rehabilitation. The aim is to devise information tools to aid key decisions that influence psychiatric patients' recovery.

Deciding which treatments are best for individual patients is increasingly complex. A better understanding of the recovery process and improved decision-support and information management tools are needed. Researchers are studying clinical decision-making in community and hospital settings with a three-year grant from the National Institute of Mental Health. This project brings together experts in psychiatric and physical rehabilitation, mathematical modeling, computer science, psychology and consumer needs. Collaborators are from UNL, Madonna, the Community Mental Health Center of Lancaster County, the Lincoln Regional Center, the University of Southern California and Yale University.

Researchers will analyze data from about 10,000 patients collected before, during and after physical or psychiatric rehabilitation. They will compare clinical information systems in different settings and explore how best to develop clinical data-management and decision-support systems for psychiatric settings.

Physical rehabilitation experts are far ahead of psychiatric rehabilitation practitioners in using computer management of clinical information, said William Spaulding, the UNL psychology professor who heads this project. "As we study clinical decision-making processes ... it's very helpful to be able to look at two types of rehabilitation in two different settings."

Improved psychiatric rehabilitation depends on better understanding the process of recovering from mental illness and on developing advanced knowledge management capabilities, he added.



William Spaulding

Buros Leads Way in Test Assessment

We live in an era of seemingly omnipresent assessment and testing. But ever wonder if those tests are accurate? Making sure tests are measuring what they purport to is the job of researchers at the Buros Center for Testing.

Since 1938, the Buros name has been synonymous with validating tests. That's when center founder Oscar Buros published the first *Mental Measurements Yearbook.* Buros developed a forum for scholars to review commercially available tests. *Mental Measurements* and *Tests in Print* have become the world's most authoritative source of testing information.

Founded in New Jersey, the institute moved to Nebraska in 1978 following Buros' death. His widow, Luella, selected UNL as permanent home for the work and archives, ensuring Buros' interests in improving the science and practice of testing and measurement continued.

The center has two divisions – the Buros Institute of Mental Measurements (BIMM) and the Buros Institute for Assessment Consultation and Outreach (BIACO). BIMM publishes the yearbook and *Tests in Print* series, mostly online, providing reference materials and impartial reviews of commercially available tests. BIACO is the center's consultation arm, said Kurt Geisinger, center director. Its scientists evaluate proprietary tests typically used in high-stakes decisions about individuals required to take them for certifications, licensures, admissions and employment. Clients contract with BIACO to provide evaluation, research and training.


Kurt Geisinger

BIACO's largest contract to date involves the National Assessment of Educational Progress. Also known as "the Nation's Report Card," it is the only nationally representative and continuing assessment of what America's students know and can do in various subject areas.

The one thing Buros scientists don't do is develop tests. Geisinger said that would be an unethical conflict of interest. The center's reputation for unbiased, accurate assessment of commercial and proprietary tests is its greatest asset.

Understanding a Legendary Life of Science


David Cahan

"Advancing our basic understanding of the world ultimately leads to a better quality of life."

David Cahan

For UNL historian David Cahan, it was Hermann von Helmholtz's humanity as much as his extraordinary scientific achievements that attracted him.

With funding from the National Science Foundation, Cahan is writing the first scholarly biography of this preeminent 19th-century physicist and physiologist. As famous in his day as Charles Darwin, Helmholtz helped discover the law of the conservation of energy, which states that the total amount of energy in a closed system remains constant; invented non-Euclidean, or nonparallel, geometry; and revolutionized ophthalmology by inventing the ophthalmoscope to look inside the eye.

A discovery early in Cahan's career kindled his interest. He found letters from young Helmholtz to his parents describing mundane interests such as his love of reading and walking and his artistic pursuits.

"I could see that he was far more interesting than his science alone would suggest," said Cahan, who specializes in scientific history. "He gave me an opportunity to study his life and use it as a vehicle to understand the relation between science and culture at large."

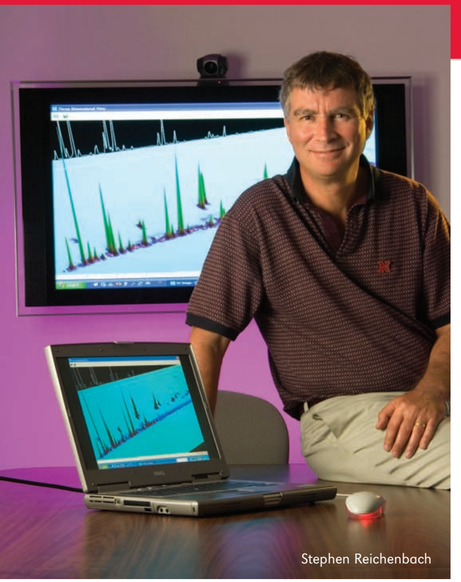
He hopes this biography also will bridge that gap, appealing to both academics and a general audience.

Helmholtz lived from 1821 to 1894, during the great age of German science and culture. A major force in shaping that era, Helmholtz helped popularize science and founded three scientific institutes.

Putting Helmholtz's scientific achievements into the context of the era in which he lived highlights the changing relationship between science and today's society. As science and technology became heavily interdependent, principally after the start of the electrical industry in the late 19th century, society began to emphasize using science as a means to advance a technological or engineering purpose. Yet Helmholtz and other great thinkers, from Copernicus to Einstein, made tremendous advances in scientific knowledge absent such pressure.

"Helmholtz believed you have to pursue science for its own sake if you want science and technology to flourish," Cahan said. "Advancing our basic understanding of the world ultimately leads to a better quality of life."

Commercializing UNL Technologies


Stephen Reichenbach

Software Interprets Complex Data

Sometimes the basic, everyday substances in our lives – like the air we breathe or the gas in our cars – are so chemically complex it's hard to figure out what's in there.

To help decipher the chemical code, UNL computer scientist and engineer Stephen Reichenbach developed the first software that performs image processing of complex data from comprehensive two-dimensional gas chromatography. He sells this technology through GC Image, a company he founded.

Gas chromatography, a common method for separating chemicals based on their physical properties, doesn't always do the job. For substances containing chemicals that are too similar for simple gas chromatography, scientists developed a two-dimensional version that further differentiates the chemicals using a second set of properties. But results can be difficult to interpret.

One two-dimensional gas chromatography company turned to Reichenbach, an expert in complex imaging, to see if he could translate the data, a two-dimensional array of spots each representing a chemical. After two years of research, Reichenbach and his colleagues developed software that analyzes the intricate images and creates a user-friendly list of the chemicals and their quantities.

"It became apparent that people were interested in buying the software," said Reichenbach, explaining the genesis of GC Image. UNL licensed the technology to the new company, which sells the software commercially. The Lincoln-based company has four employees.

The software appeals to a wide variety of users, such as the petroleum industry, agencies that monitor the environment to determine the pollutants in the air or contaminants in the soil, biomedical laboratories and the flavor and fragrance industries.


Mingsheng Liu

Boosting Energy Efficiency

Saving energy in large commercial and industrial buildings is far more complicated than simply turning down the thermostat. A UNL architectural engineer's inventions promise to slash energy consumption and improve overall controls.

Mingsheng Liu, a professor at the Omaha-based Peter Kiewit Institute, studies ways to improve building energy conservation and efficiency. He developed integrated automation systems and technologies that significantly improve energy efficiency and control of commercial heating, ventilation and air conditioning (HVAC) systems.

HVAC efficiency is a major concern because it consumes 40 percent of the energy used in commercial buildings. Liu said his technologies can reduce HVAC energy use by 40 to 50 percent.

"The automation system is unique, simple and effective," Liu said. Given growing demand for more efficient building systems, Liu is betting his inventions will be a commercial success. UNL is seeking patents on 10 of his inventions. In 2006, the university licensed several of these technologies to Liu, who launched DTL Controls, an Omaha-based start-up company. The company will produce its products in Omaha and expects to have 20 or more employees by late 2007.

Liu is optimistic about the energy-saving potential of his technologies, which have been implemented in more than 700 buildings and potentially could be used worldwide.

"You have to be excited when you can make a building work better," he said. "These are real energy savings. You can actually watch the BTUs drop."


Liu and students check energy efficiency.

Road Safety Engineer Earns National Medal of Technology

Dean Sicking

"We're trying to save lives."

Dean Sicking

For NASCAR drivers and everyday motorists alike, UNL civil engineer Dean Sicking is a lifesaver. Motorists pass his guard rails and other safety devices on highways nationwide. Racers whiz by his "soft walls" on high-speed ovals. In an accident, these largely unnoticed devices could be the difference between life and death.

Motorists may not know Sicking, but President Bush recognized the UNL professor's safety innovations, awarding him the nation's highest honor for technology. Sicking was one of 10 individuals and companies named 2005 National Medal of Technology Laureates, which the president announced in June 2007. The award honors America's leading innovators. It is given to individuals, teams and companies for outstanding contributions to the nation's economic, environmental and social well-being through technology development and commercialization.

Making the nation's roads safer has been Sicking's focus throughout his career. As director of the Midwest Roadside Safety Facility at UNL, he leads a team of engineers that has developed safer guard rails, road signs, crash barriers and other improvements now used across the country.

Sicking invented the first energy-absorbing guard rail terminal and subsequent generations of this technology, which are estimated to save 150 lives annually. These terminals are installed on virtually every high-speed, high-volume U.S. roadway. They also are estimated to save state transportation departments more than $60 million annually, thanks to marketplace competition.

Sicking's research on energy-absorbing guard rails led to development of the Steel and Foam Energy Reduction (SAFER) Barrier, which won a 2003 R&D 100 Award, a top technology honor. This "soft wall" has been installed at NASCAR and Indy Racing League high-speed tracks. No driver has been killed when they hit the SAFER Barrier since its introduction in 2002, and it has greatly reduced serious injuries.

Sicking holds more than 25 patents for his roadside safety inventions, but what drives him back to the test track is the chance to make roads safer.

"We're trying to save lives."

From left: John Marburger, director of the White House Office of Science and Technology, Dean Sicking, UNL civil engineering professor and National Medal of Technology Laureate, and Prem Paul, UNL vice chancellor for research, at the awards ceremony.

Enticing Aspiring Engineers

UNL is making it easier for community college students to transfer into the College of Engineering and enticing more students – particularly minorities and women – to choose engineering careers.

With a $1.99 million National Science Foundation grant, the College of Engineering is collaborating with Nebraska's six community colleges through STEP – Strengthening Transitions into Engineering Programs. This program allows students to complete freshman and sophomore engineering courses at community colleges before seamlessly transferring into UNL's engineering program as juniors.

"This type of project was desperately needed," said Stephanie Adams, College of Engineering associate dean for undergraduate education. "We recognized that an education in engineering was not an attractive option for community college or transfer students." Only about 8 percent of the community college students who transfer to UNL annually enroll in the College of Engineering, partly because students couldn't complete a degree within the traditional time frame.

STEP guarantees the transfer of engineering credits so students can complete a bachelor's degree on time.

Adams anticipates a 200 percent increase in the number of engineering transfer students at the end of the five-year grant. There's a special emphasis on attracting women and minority students, who make up a larger component of community college students.


Stephanie Adams

Adams and colleagues have developed engineering courses for community colleges, trained instructors to teach them and are recruiting transfer students.

Community college students and faculty have embraced the program. In addition to taking four engineering courses at a community college, transfer students participate in activities such as peer mentoring, UNL campus visits, career development workshops and summer enrichment programs to support their coursework and smooth their transition.

Technological innovation is a key component of a thriving economy, Adams said. By creating educational opportunities that encourage students to become engineers, UNL enhances the nation's ability to compete in an increasingly global environment.

Going 'Green' with Ag Byproduct Fibers

Yiqi Yang wants to weave sustainability into the world's growing demand for fiber by converting agricultural leftovers into textiles and other products.

The UNL textiles scientist and colleagues have invented processes that convert cellulose from cornhusks and rice straw into fibers with properties similar to cotton or linen. From proteins in wheat gluten and chicken feathers, they produce fibers with mechanical properties similar to wool and a look and feel similar to silk.

Turning abundant, low-cost agricultural byproducts into fiber for everything from clothes to construction materials makes environmental and economic sense, Yang said. These materials are renewable and sustainable. Wheat gluten, for example, costs 50 cents or less a pound compared with around $8 per pound for wool and $15 for silk. Cornhusks, chicken feathers and rice straw also are cheap and plentiful.

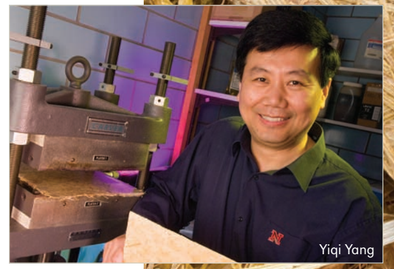
"We hope this research stimulates interest in using agricultural byproducts for textiles and other fibers," Yang said. More than half of all fibers now come from petroleum, a dwindling, non-renewable and increasingly expensive raw material. The fiber industry is looking for "green" alternatives, he said.

"World fiber demand is increasing. We don't have a choice but to find alternative fibers that are renewable, sustainable and have a positive impact on the environment."

Yang's team also studies uses for fibers from different byproducts. For example, they've made a composite material from chicken feathers that has excellent insulating and sound-absorbing properties well-suited for vehicle headliners.

The university is patenting these technologies and exploring commercialization opportunities. Yang now is focusing on increasing production of his biofibers to enable testing by industry.

"If an investor were identified tomorrow, we could get a product out in two years. We're ready," Yang said.


Yiqi Yang

Redox Biology Center – Tracking Clues to Health

Most living creatures need oxygen to survive, but the element also has a dark side. Redox reactions, which often involve oxygen compounds, are vital cellular processes. But when imbalances – called oxidative stress – occur, oxygen becomes the bad guy that can damage cells and contribute to aging and a range of diseases.

As a researcher in UNL's Redox Biology Center (RBC), biochemist Mark Wilson uses the center's concentration of experts to aid his investigation into the role of oxidative stress in Parkinson's disease. Oxidative stress causes the brain cells that produce dopamine to die prematurely, leading to tremors and other symptoms. Scientists don't yet know why these cells are so vulnerable to oxidative damage. Wilson hopes his study of DJ-1, a protein missing in Parkinson's sufferers who inherited the disease, someday will provide answers and lead to a cure.

So far, Wilson has learned that when reactive oxygen molecules, the bad guys, oxidize DJ-1, it acts like an early alarm system, warning the cell of a problem and helping to correct it. Without that early warning, cells die prematurely when subjected to oxidative stress. He's working to understand how the protein warns the cell.

Wilson came to UNL two years ago specifically to join the RBC, whose members come from UNL's departments of biochemistry, chemistry, plant pathology and veterinary and biomedical sciences and from the University of Nebraska Medical Center in Omaha. Their research covers diverse redox questions important to human disease, such as the molecular mechanism of prostate cancer, staphylococci virulence regulation and the molecular effects of selenium.

"It's a very rare and valuable concentration of experience," Wilson said. "Everyone is looking at different aspects of the same broad phenomena using a variety of tools. There's a lot of collaboration going on."

Established in 2002 with a $10 million National Institutes of Health award, the RBC has become one of the university's most productive and collaborative research programs. In 2007, NIH renewed the center's funding, providing $10.8 million over five years. Mentoring junior faculty was a major component of the original grant.

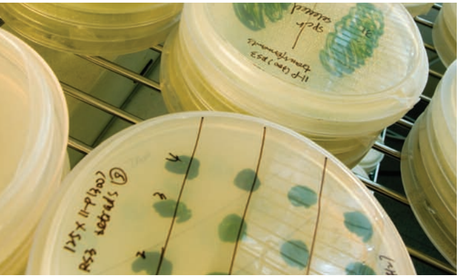
Biochemist Vadim Gladyshev, who became RBC director in 2007, said the center will continue to mentor young faculty members like Wilson to successful NIH-funded careers. The renewal also enables the center to hire five new faculty across several disciplines. "The new members will strengthen the center and allow us to expand into new horizons in redox biology."

Mark Wilson

Exploring RNA Interference

Organisms – from humans to fungi – sometimes use genes to turn off, or "silence," the expression of other genes. UNL biologist Heriberto Cerutti and his team are uncovering how one of these silencing methods, called RNA interference (RNAi), works. Their research may one day lead to advances against viral diseases.

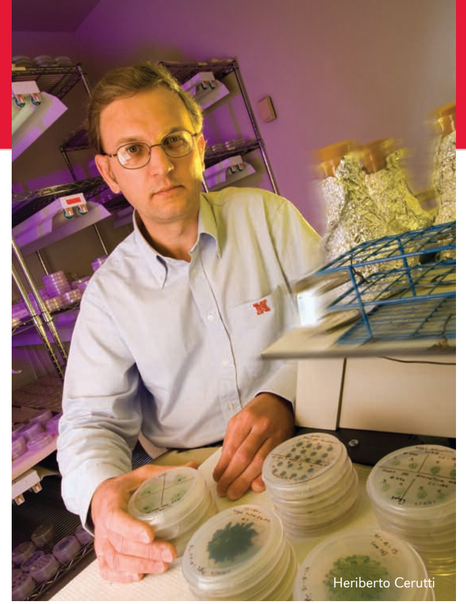
RNAi serves a regulatory role by controlling the expression of certain genes and as a defense against viral infections by disrupting the virus's ability to take over its host's RNA machinery. RNA is the intermediary molecule that translates a gene's DNA code into a protein. When activated, RNAi either degrades the target RNA or prevents its translation into a protein.



Using *Chlamydomonas reinhardtii*, a single-celled green alga, Cerutti has so far identified six genes involved in RNAi. By introducing foreign genes, called transgenes, into the algae's genome, he can look for those mutants that suppress the algae's RNAi capabilities and determine which genes have been affected. Once identified, Cerutti uses other biotechnology techniques to decipher their role in the RNAi process. His research on how one of these genes degrades RNA was published in *Science*.

Discovered less than 10 years ago, RNAi is only beginning to be understood. Cerutti and others envision using the knowledge they're gaining to one day develop ways to combat viruses and diseases resulting from defective proteins, such as Huntington's disease.

He credits the Plant Science Initiative (PSI), an interdisciplinary program for plant scientists at UNL, with aiding his work. Networking opportunities help scientists learn from each other, additional funding options allow them to undertake novel research unlikely to receive federal funds, and a training component attracts graduate students.



Heriberto Cerutti

"Being part of this umbrella program integrates lots of different departments and allows us to put forward a graduate program that we couldn't do individually," Cerutti said. "PSI has been very useful to all of us in many ways."

Expanding Distance Ed Tools

Tired of winters on their Nebraska farm, Fred and Ethel plan to move to Alabama. But will their new farm, with its different soil type, be as successful?

That's the hypothetical question posed to students in soil science classes at UNL and campuses across the country. Created by UNL soil scientist Martha Mamo and colleagues, this case study is part of the Plant and Soil Sciences eLibrary (http://plantandsoil.unl.edu), a database of online distance education tools developed by UNL's Agronomy and Horticulture Department with partners from a growing list of universities worldwide.

The eLibrary materials are free to the public. Professors use this information to supplement online and regular classes and students can review lessons or study for continuing education credits. Additional topics include genetics, weed science and plant physiology.

The online case studies give Mamo an opportunity to diversify her teaching methods. She sparks students' interest with an intriguing problem then provides targeted questions with links to principles students must master to find a solution.

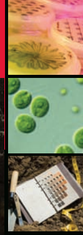
Mamo's case studies, developed through a National Science Foundation grant, go beyond soil science to incorporate disciplines such as ecology and environmental science.

"Traditionally, soil science has been used only in agricultural science. Yet, its concepts apply to many disciplines," Mamo explained. "The idea is to broaden the use of soil science by changing the context of the case studies without changing the principles." This helps non-agriculture students relate soil science to their disciplines. She plans to create additional case studies and lessons with NSF funding.

Mamo collaborated with colleagues at UNL, Connecticut's Trinity College, University of Minnesota, Oregon State University and Colorado State University, who also developed and use the online case studies. As more instructors learn the advantages of distance education tools available through the eLibrary, Mamo expects its use to expand.

The eLibrary is part of broader UNL agricultural distance education offerings.

Martha Mamo



Measuring Biofuel Systems' Performance

Biofuel production promises to reduce oil imports, turn crops into energy, grow rural economies and decrease greenhouse gas emissions.

It's a tall order. Determining how individual biofuel plants and their grain supply measure up is critical to the burgeoning industry's long-term success.

In 2007, UNL agricultural researchers unveiled a tool to assess plant performance. Their Biofuel Energy Systems Simulator (BESS) software analyzes total energy yield and efficiency, greenhouse gas emissions and resource requirements for biofuel production systems – from seed to biofuel and byproducts.

"On average, ethanol plants are thought to reduce greenhouse gas emissions. It's clear some do a better job than others," said Ken Cassman, a UNL agronomist and director of the Nebraska Center for Energy Sciences Research who led this inter-disciplinary research. "This research lays the foundation to have the best data available to look at not only average biofuel production systems but also state-of-the-art systems that are far better at conserving resources."

Quantifying the environmental impact of individual biofuel systems has environmental, economic and public policy implications. To meet emerging renewable fuel standards or to participate in the growing carbon credit market, plants will have to document their environmental performance.

"It's important to create appropriate, scientifically sound, customizable certification methods for biofuel systems based on research in the Corn Belt," Cassman said. Faculty expertise and long-standing research in efficient crop production and carbon sequestration position UNL as a leader in developing these tools.

The user-friendly software is backed by complex modeling tools and extensive scientific data. Each default assumption is validated by a visible published reference. Users can customize data unique to their operation or explore different scenarios. BESS estimates net energy efficiency and net greenhouse gas emissions for each production component and the whole system. It's more flexible and customizable than existing energy and emissions models.

The Western Governors' Association and the Nebraska Energy Office funded the initial version for corn-based ethanol production systems. Researchers envision versions for soybean biodiesel and biomass ethanol production from switchgrass and corn stover.

The free software is available at www.bess.unl.edu.

Ken Cassman


Craig Allen

Targeting Riskiest Invasive Species

Even something as small as a nematode can ignite what scientists call an "invasional meltdown." The cascading collapse of an entire ecosystem by a single nonnative species has both economic and environmental consequences, so many agencies are scrambling to stop invaders.

In Nebraska, for example, invasive species such as red cedar trees, purple loosestrife and a reed called phragmites may drive out native bird and grass species, reduce pastureland productivity, alter water flow and increase fire hazards. The soybean cyst nematode, now found in eastern Nebraska, reduces soybean yields and is impossible to eradicate once established in a field.

UNL wildlife ecologist Craig Allen leads research to identify, understand, track and better manage Nebraska's invasive species threats. To make the most of limited resources, he aims to pinpoint the greatest risks.

"The goal is to sift through the intractably large number of potential invasive species to identify the species that pose the greatest risk to native communities," said Allen, who leads the Nebraska Cooperative Fish and Wildlife Research Unit at UNL, a multi-agency partnership.

To do that, Allen and colleagues are assessing risks to native plant, insect, fish and wildlife communities to determine their susceptibility to potential invaders. They're also developing geospatial models to predict and map the spread of different invasive species based on numerous features. The research may identify factors to help limit the spread of invaders.

As the number of invasive species explodes, precipitated by increased global trade and travel and by global warming, communication between agencies becomes more important.

To unify efforts, findings will be available on the Web as part of a broad effort to improve communication, information sharing and networking among local, state and federal agencies. While this research is geared for Nebraska, access to the Web-based information will aid control efforts elsewhere.

The U.S. Geological Survey, Nebraska Environmental Trust and Nebraska Game and Parks Commission fund this research.

Molecular Biology Pioneer Returns to UNL Roots


Brian Larkins

When Brian Larkins, a leading plant scientist and molecular biology pioneer, became UNL associate vice chancellor for research in 2007, he was literally coming home – to his native state and the university where he discovered his love for science.

A member of the National Academy of Sciences, Larkins has been a leader in the development of plant molecular biology and plant agricultural biotechnology. His research on the nutritional quality of corn and other cereal grains has significant implications for improving human health.

Larkins is tapping his years of research experience and passion for excellence in his new role, which includes helping to enhance UNL's life sciences research.

"Today's highly competitive world requires a strong and highly collaborative program in the life sciences," he said.

UNL's Plant Science Initiative is an example of the payoffs from building a critical mass of faculty who work collaboratively, Larkins said. University investments led to strategic faculty hires that complement existing expertise and strengthen UNL's capabilities. Increased grant support and demand for research space are evidence of progress.

"It's been quite successful," he said. "In a relatively short time, the university has created a nucleus of really good people researching and teaching in the basic plant sciences."

UNL aims to enhance its overall life sciences program to better serve Nebraska's agriculture, students and economy. Chancellor Harvey Perlman initiated an effort to develop a comprehensive strategic plan for the life sciences. Larkins is working on this effort. The goal is to create a comprehensive, well-coordinated and collaborative life sciences program.

"If there's one area where this university must be nationally competitive to succeed, it is in the life sciences. I am excited about what this effort can produce for the university and for the state," he said.

Larkins earned his bachelor's and doctoral degrees from UNL. He now holds the John F. Davidson, Ph.D., and Marian J. Fuller, Ph.D., Chair in Life Sciences.



Improving Food Security

Women in Tanzania support their families selling bread made with sorghum flour. Striga-resistant sorghum varieties help Ethiopian and Sudanese farmers save their crops from the parasitic weed. Better marketing strategies are raising incomes for farmers in Niger.

These and other programs in Africa, Central America and Eurasia continue to improve life in some of the world's poorest countries, thanks to the International Sorghum and Millet Collaborative Research Support Program, or INTSORMIL. In 2006 INTSORMIL, headquartered at UNL, received a $9 million, five-year renewal of its cooperative agreement from the U.S. Agency for International Development.

For nearly 30 years INTSORMIL has provided life-sustaining aid to developing nations, said John Yohe, INTSORMIL director at UNL. The U.S. also has benefited.

"The role INTSORMIL played in bringing germplasm back to the U.S. to develop greenbug-resistant hybrids resulted in higher yields and reduced pesticide costs," he said.

Plant breeders, soil scientists, agricultural economists, food scientists and other researchers from UNL, Kansas State University, Mississippi State University, Ohio State University, Purdue University, Texas A&M University and West Texas A&M University work with scientists in INTSORMIL host countries. Research focuses on improving nutrition, managing natural resources and increasing income, while developing technologies to improve sorghum and pearl millet production and use worldwide.

Sorghum and millet are important food staples, valued in semi-arid countries for their ability to tolerate drought. Under the new grant, INTSORMIL is expanding its mission to include other African food grains: finger millet, fonio, which is a type of millet, and the grain tef. The program's new official title is the Sorghum, Millet and Other Grains Collaborative Research Support Program, but officials continue using the internationally recognized name INTSORMIL.

Education and mentoring of host country scientists is a critical component. INTSORMIL has trained more than 700 students from host nations who come to the U.S. for their graduate degrees, then return home to develop research programs.

"I'm excited that we'll get to continue our research and continue to work with developing the program in other countries," Yohe said. "What we do has made a significant contribution to food security in the developing world and we've had some great people at UNL who focused their careers on this work."

John Yohe

Rebuilding, Learning from Ancient Ruins

A UNL architectural engineer and an art historian are teaming with their students and Turkish researchers to rebuild an ancient Roman temple in southern Turkey in a collaboration that crosses disciplines, continents, cultures and generations.

The project grew from a 2004 trip by UNL art historian Michael Hoff and students to investigate previously unexplored ancient ruins. People living in the region asked whether the Nebraskans could rebuild their city's small temple, today a pile of stones and columns. For that, Hoff needed an engineer. Ece Erdogmus, a UNL architectural engineer specializing in historic preservation who happens to be Turkish, jumped in.

"It sounded like a dream project to me," she said. In 2005, Erdogmus and her students visited the site to measure and sketch the remaining 270 stones where they lay. She hopes the information provides clues about how the stones collapsed and the temple's original appearance. Hoff and his students are analyzing surrounding ruins for additional clues.

In summer 2007, Erdogmus returned to move and analyze the stones. She used nondestructive ground-penetrating radar to investigate the underlying marble platform. Next she'll determine the condition of the stones, how they fit together and how to invisibly strengthen the temple's Corinthian columns.

The National Science Foundation funds this project to enhance undergraduate student learning experiences. Erdogmus and Hoff each take three or four undergraduate students to Turkey to work, as do their Turkish counterparts. Students get firsthand research experience on a complex project and learn to communicate with people from another culture and other disciplines. "It's challenging for the students but very enriching," Erdogmus said.

While it's likely the temple can be only partially rebuilt, the result will one day aid historical understanding and fulfill a Turkish town's dream. "It's really exciting," she said. "It's almost emotional for me to be around ancient stones and to think about how to put them together."

Top photo: Ece Erdogmus and Michael Hoff (both center back) and students on the ruins. **Lower photo:** Ece Erdogmus and student in nearby ancient tomb.

Team Enhancing Water Management Tool

Farmers in parts of Nebraska and other states are dealing with limited water supplies stemming from years of drought and new water allocation restrictions. That makes it increasingly critical that they use available irrigation water as efficiently as possible.

A UNL computer program called the Water Optimizer helps make these decisions easier. The tool enables producers with limited water to evaluate what crops to grow, how many acres to irrigate and how much water to apply.

The first version of the UNL tool, applicable to Nebraska's main crops, has been available to farmers since 2005. Now, with an $885,000 grant from USDA's Risk Management Agency, UNL agricultural researchers are developing a more useful and flexible version.

Among other enhancements, the new Water Optimizer will be applicable to a wider variety of crops, especially those grown in the semiarid High Plains, and to a larger geographic area, including additional Nebraska counties and irrigated areas in Colorado and Kansas. It also will be better suited to determining strategies for managing multiyear water allocations and will evaluate risk-management alternatives on a whole farm basis, as well as field by field.

"We want to take a whole farm view" in considering how to manage available water, said Gary Hergert, a soil scientist at UNL's Panhandle Research and Extension Center at Scottsbluff. "How do you divide that water among crops on your farm to make the most money? That's a step above where we are now on Water Optimizer."

Hergert leads an interdisciplinary team of UNL researchers including the tool's creators – agricultural economist Ray Supalla and biological systems engineer Derrel Martin.

Students Aid NU Press with Online Marketing

These days, if you want to make a hip impression, you do it in cyberspace. So the University of Nebraska Press turns to the cyberspace experts – students – to help promote its books.

To stay on the cutting edge of book marketing, the press recruits UNL students who help with innovative projects such as designing Web pages, developing digital media kits and writing a daily blog. UNL's press, one of the 10 largest university presses in the country, publishes more than 150 books and 12 journals yearly, including high-quality literary and scholarly work in a variety of fields.

Such extensive use of students is rare among university presses, said Margie Rine, the press's marketing manager and development director, but she sees it as a way to capitalize on the university's strength.

"We'd be lost without them," she said. "Publishing is very competitive. If a press appears technologically savvy, it gets more attention." Young people bring that techno know-how while helping the press stretch a limited marketing budget. In return, students gain new skills and valuable references.

The job of starting and maintaining the press's blog – a rarity among university presses – gave DeMisty Bellinger, a creative writing doctoral student, a new perspective on what's expected of writers and career options beyond teaching.

"Now, I would feel comfortable pursuing other options, like university presses," Bellinger said.

Graphic design undergraduate Eric Chloupek used his skills to design a Web site featuring author Lynn Stegner as well as several digital media kits, marketing information sent to booksellers and reviewers that's now available for download. The UCARE participant said he appreciates the work experience. Best of all, he'll have a professional portfolio to show prospective employers when he graduates next year. UCARE, short for Undergraduate Creative Activities and Research Experiences, gives UNL students firsthand experience working with faculty. It's sponsored by the Office of Undergraduate Studies.

The press plans to expand its digital presence with student-led ideas such as creating book trailers on myspace.com, the online social networking site. "I can't tell you how great the students have been for us," Rine said.

DeMisty Bellinger
and Eric Chloupek


Jess Miner

Unraveling CLA's Role in Weight Loss

Understanding why a component in cow's milk makes mice skinny may one day help people lose weight, too.

Scientists have long known that mice fed a diet containing just 1 percent conjugated linoleic acid, or CLA, a fatty acid produced by a microbe in cows' stomachs, lose 50 percent to 80 percent of their body fat. With help from a National Science Foundation EPSCoR grant, UNL plant scientist Michael Fromm and animal scientist Jess Miner are discovering how CLA causes such dramatic weight loss at the molecular level. It's part of broader nutritional genomics research.

"It's very complex," said Fromm. "But the advent of genomics technologies, sequencing the mouse and human genomes in particular, has given us a chance to really understand the mechanisms of these nutritional effects."

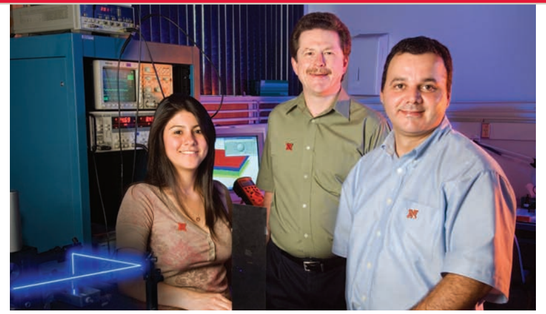
They compare gene expression changes in mice fed a CLA-rich diet with those on a normal diet using microarray analysis, which measures expression across the entire genome at once. They've learned that CLA prevents the body from absorbing fat and glucose and increases fat burning.

Fromm and Miner are analyzing each individual step in this molecular process.

The amount of CLA required in the human diet to produce the same effect as in mice is too large to be practical. Researchers hope that understanding the molecular process will one day lead to a dietary product that will reduce body fat in humans and help combat obesity.

CLA availability is limited. To provide a large supply of CLA at less cost, UNL's Plant Transformation Core Research Facility is engineering a soybean to make the fatty acid, which can then be harvested and produced in bulk. This advance will enable larger animal trials.

Summer Programs Share Nanoscale Research


Steve Ducharme (center) with visiting student-professor team, Stella Stephens and Horacio Vasquez, University of Texas-El Paso.

Visiting school teachers, undergraduate students and their professors get a macroscale immersion in nanoscale research through summer programs at UNL's Materials Research Science and Engineering Center (MRSEC).

The center fosters collaboration among UNL physicists, chemists and engineers to advance nanomaterials research. Education and outreach is part of the National Science Foundation-funded center's mission. Each summer, its 14 faculty members invite middle and high school teachers, and student-professor teams from four-year colleges to participate in MRSEC research.

"We're inviting folks to gain some new skills, learn some new things and to take what they learn here back home to disseminate to their students, some of whom will become scientists or engineers," explained Roger Kirby, chair of the Physics and Astronomy Department who heads the summer outreach programs. "We're building for the future."

MRSEC's summer programs give participants the chance to work closely with UNL scientists and engineers on cutting-edge research in nanomagnetics. One program brings five middle and high school teachers to UNL for eight weeks; another invites six students and their professors from smaller colleges for fellowships ranging from two weeks to two months.

In summer 2007, the program's fifth year, more than half the teachers and professors were women or minorities. Organizers hope the participating teachers return to their classrooms and inspire young women and minority students to consider careers in materials science.

Visiting students and teachers work on a variety of nanomaterials research projects, including investigating ferroelectric properties, x-ray diffraction and making nanoscale clusters of atoms, which can be used in various technologies, such as hard disk drives.

UNL physicist Steve Ducharme said the fellowships spark ongoing collaborations and encourage students to consider graduate school.

For example, a professor and her student took their knowledge of nanoscale clusters back to the University of Wisconsin-Platteville and involved other students in making clusters and investigating potential applications.

To Kirby, that demonstrates the program's success. UNL researchers also benefit through visitors' contributions of time, effort, new ideas and fresh perspectives.

Compact Laser Could Aid Cargo Screening

With millions of cargo containers arriving in the U.S. each year, checking for nuclear contraband is an onerous task vital to national security.

Physicist Donald Umstadter and his UNL Extreme Light Laboratory team are researching whether the state-of-the-science Diocles Laser can make cargo screening more accurate. With a grant from the Department of Homeland Security's Domestic Nuclear Detection Office, the team is developing a portable laser-based system for detecting nuclear materials that might be smuggled in heavily shielded cargo containers.

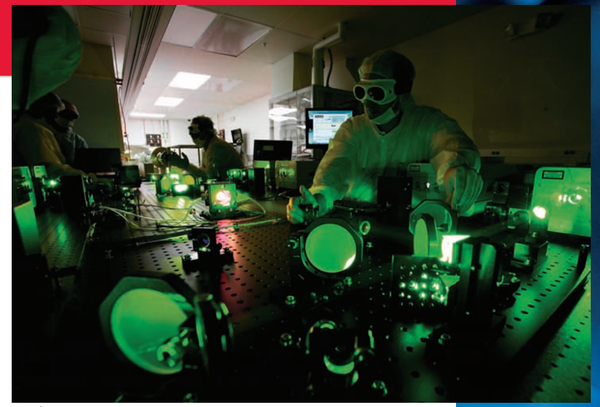
Diocles, a compact, ultra-fast, high-intensity laser, has the highest combination of peak power and repetition rate of any U.S. laser. Installed in 2006, it's the latest of a new generation of compact lasers that produce very brief pulses of extremely intense light. In a living room-sized space, it has the potential to generate higher energy x-rays than those produced by giant synchrotron accelerators more than a mile in circumference.

Umstadter's team is harnessing this combination of small size and high power to develop a portable x-ray source capable of "seeing through" cargo containers and spotting a nuclear material's specific characteristics.

Current screening techniques use either x-rays to look for suspicious shadows or other technologies that detect the radiation naturally emitted by nuclear materials. Both methods can generate false positive readings from harmless materials. When suspicious material is detected, opening and inspecting the container is the only sure way to determine what's inside.

"At an airport, it takes a few seconds to look through a bag, but it takes hours to open and inspect a cargo container, and there are millions of them," Umstadter said. "We want to demonstrate a novel and improved screening technology."

If it works, the Diocles-based system would be less likely to be fooled. Researchers envision actively tuning their x-rays to a nuclear material's unique resonance, providing a clear signature of a particular isotope.



Diocles Laser

Umstadter thinks the small, powerful Diocles laser is the best way to generate the type of x-rays needed for accurate detection. "We think we can build screening devices that are small enough to fit in trucks, which can be parked at ports of entry to the U.S., along interstate highways or even at overseas ports."

Donald Umstadter adjusting laser optics.

"We think we can build screening devices that are small enough to fit in trucks, which can be parked at ports of entry to the U.S., along interstate highways or even at overseas ports."

Donald Umstadter

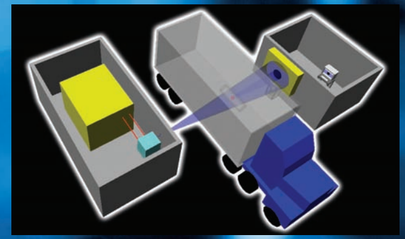


Illustration depicting a small laser screening cargo.

Creative Initiative Melds Arts, Technology

The Troika Ranch Digital Dance Company combines dance with digital technology.

Dance troupes usually don't look to computer scientists for artistic inspiration nor do computer scientists seek dancers for programming advice. But UNL's Lied Center for Performing Arts is bringing the two, along with other academic departments and a rehabilitation hospital, together to see what exciting new discoveries – and artwork – develop.

This multiyear arts and technology initiative unites the arts with other facets of the campus and community. It's funded by a $100,000 Creative Campus Innovations grant from the Association for Performing Arts Presenters, one of eight awarded to universities nationwide.

By uniting disparate groups, the Lied Center expects to encourage research breakthroughs, innovative teaching and creation of a unique work of art. The Lied Center has teamed with the Troika Ranch Digital Dance Company, a performing arts troupe that combines dance with digital technology. Troika's artistic co-director, Omaha native Mark Coniglio, developed a real-time, motion-capture software program that translates a dancer's movement onstage into a three-dimensional image that can be used during the performance.

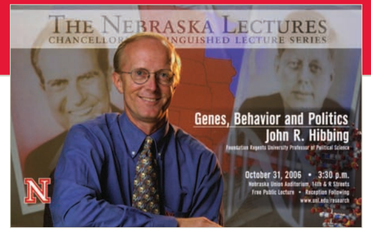
Motion-capture technology also can help advance physical rehabilitation by analyzing a patient's gait in real time to provide instant feedback. To further such efforts, Madonna Rehabilitation Hospital in Lincoln joined this collaboration. University disciplines involved include theater, architecture, education, digital media and computer engineering along with NET Television and the Lincoln Arts Council. Troika members visit UNL periodically for a series of residencies.

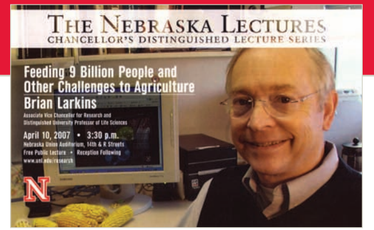
"Putting things together that don't naturally go together will start a conversation and a new way of thinking," said the Lied Center's Laura Kendall. "We hope that, at the end, there are profound discoveries and an incredible piece of art that we can all share."

The commissioned Troika work will debut in Lincoln in 2009 before touring nationally. Kendall said UNL's initiative will provide a model for other universities to develop interdisciplinary projects and encourage new, creative teaching and research methods.

The Lied Center for Performing Arts is teaming with the Troika Ranch Digital Dance Company and others on an interdisciplinary arts and technology initiative.

Encouraging Achievement, Collaboration





The Nebraska Lectures

A political scientist and a plant scientist, both of whose research examines the role of genetics, presented their work during the 2006-2007 Nebraska Lectures: Chancellor's Distinguished Lecture Series featuring prominent UNL faculty.

John Hibbing, UNL Foundation Regents University Professor of Political Science, discussed his research on the role of genes in shaping political temperament in his fall lecture, "Genes, Behavior and Politics." This innovative work received widespread popular media coverage when first published.

Plant scientist Brian Larkins presented "Feeding 9 Billion People and Other Challenges to Agriculture" at his spring lecture. His research on the genetics of nutritional quality of corn and other cereal grains has significant implications for improving human health. Larkins, a member of the National Academy of Sciences, is the John F. Davidson, Ph.D., and Marian J. Fuller, Ph.D., chair in life sciences and associate vice chancellor for research.

The Nebraska Lectures are designed to provide general audiences with insights about some of the university's leading research and scholarly activities. The Office of the Chancellor, the Research Council and the Office of Research and Graduate Studies co-sponsor the Nebraska Lectures.

Research Fair Highlights Achievement

UNL faculty and student achievements in research, scholarship and creative activities took the spotlight during the fifth annual UNL Research Fair during spring 2007.

The Research Fair has become a UNL springtime tradition. It provides a venue to celebrate achievements, hear from prominent speakers, meet federal agency officials and offer learning opportunities for faculty and students. Highlights included the annual recognition breakfast honoring faculty whose research and creative activity received major sponsored program funding.

Speakers included: Michael Teitelbaum, Alfred P. Sloan Foundation; Nathaniel Pitts, Frederica Darema, Peggy Fischer and Tim Turner, all National Science Foundation; Ed Trapido and Warren Jones, both National Institutes of Health; and Lynn Okagaki, U.S. Department of Education.

The Office of Research and Graduate Studies sponsors the Research Fair.

2007 UNL Research Fair

Interdisciplinary Faculty Retreats

Today's complex challenges demand interdisciplinary research and scholarship collaborations. Exploring strategies to enhance a culture of collaboration was the focus of UNL's second annual Interdisciplinary Faculty Retreats.

About 200 UNL faculty discussed ideas for working interdisciplinarily in energy science and recruiting graduate students belonging to underrepresented groups at the May 2007 retreats. These retreats annually bring together UNL faculty from diverse disciplines to share expertise and ideas and explore ways to expand collaborations.

The retreats were sponsored by the Office of Research and Graduate Studies, the Research Advisory Board and the Nebraska Center for Energy Sciences Research in partnership with the Office of the Chancellor, the Office of Academic Affairs and the Institute of Agriculture and Natural Resources.

Four Corners Research Alliance

Major research universities in four states are pooling resources and expertise to compete for major federal research investments through the Four Corners Research Alliance.

UNL, Iowa State University, Kansas State University, the University of Iowa, the University of Kansas, and the University of Missouri-Columbia formed the alliance in 2005. The goal is to collectively develop expertise that enables the region to compete for major national centers and other large-scale opportunities. The partners have identified six broad areas of intersecting strengths where they will focus their efforts.

In early 2007, more than 80 faculty representing the six partner institutions met in Kansas City to discuss ideas and strategies and identify available resources.

UNL Research in Top 100 Stories

Research projects involving UNL faculty ranked among *Discover* magazine's top 100 science stories of 2006.

The magazine ranked ecological research involving biologist Johannes "John" Knops as No. 62. A nanoparticle-based touch sensor developed by chemical engineer Ravi Saraf and doctoral student Vivek Maheshwari was No. 95. The list was published in *Discover's* January issue. UNL scientists also were involved in two of the top 100 stories in 2004.

CAREER/K Awards

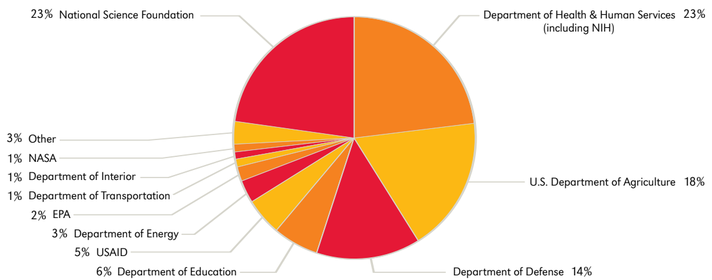
Several UNL faculty earned career development awards from the National Science Foundation or National Institutes of Health during 2006-07. NSF's CAREER program and NIH's K Award provide funding to help exceptional pre-tenure faculty develop as outstanding teacher-scholars and researchers. Recipients were:

NSF CAREER Award
Tracy Frank, Geosciences
Lisong Xu, Computer Science and Engineering
Yong-Rak Kim, Civil Engineering
Eileen Hebets, Biological Sciences

NIH K Award
Khalid Sayood, Electrical Engineering

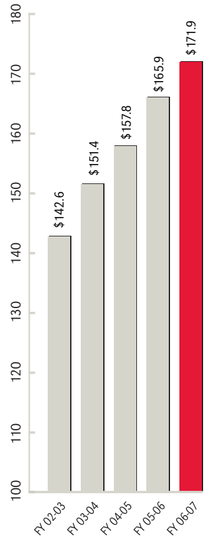
Financials

Research Funding by Federal Agency



Five-Year Total Sponsored Programs Funding

(in millions)



Credits

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