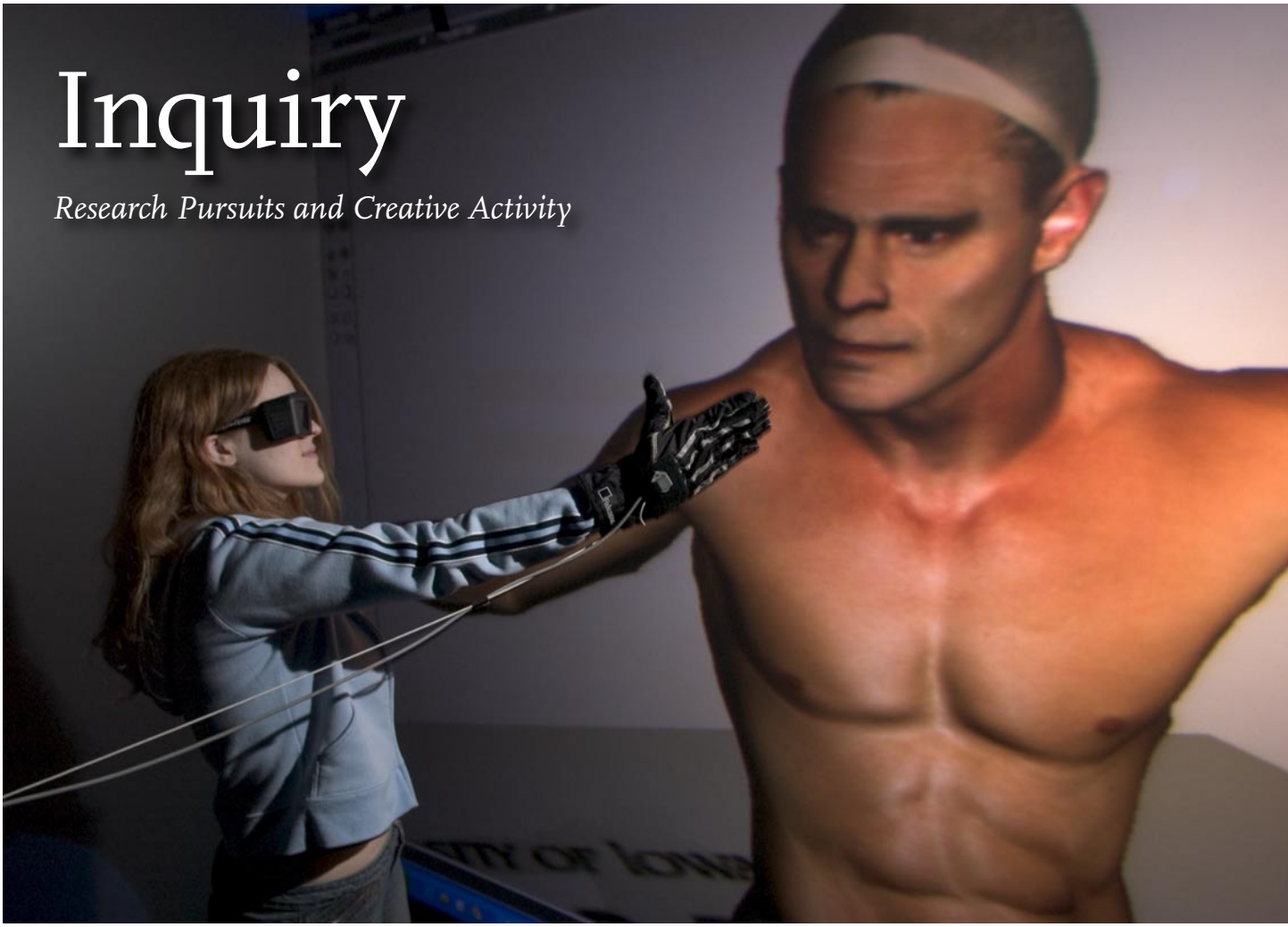
# Inquiry

*Research Pursuits and Creative Activity*



## *G.I. Joe from Head to Virtual Toe*

What if they gave a war and nobody came? That may not be the precise goal of virtual reality research under way in the College of Engineering, but scientists in the college nonetheless are hard at work creating digital characters to replace human soldiers in a variety of contexts.

If they can't end war, they might at least end wasteful spending. Karim Abdel-Malek and a team of University of Iowa researchers are developing technology that could give the U.S. Army a more efficient way to test new equipment, vehicles, and armaments.

Abdel-Malek, associate professor of mechanical engineering and researcher in the college's Center for Computer Aided Design (CCAD), was awarded a Department of Defense contract worth as much as $17.5 million over the next five years for work on the Army's new Future Combat Systems, which include undertakings in virtual reality such as digital human models, unmanned aerial vehicles, and robotic direct firing systems and other ordinance technologies.

Abdel-Malek directs the University's Digitial Humans and Virtual Reality Laboratories as well as the engineering college's Virtual Soldier Research (VSR) program. Under contract from the U.S. Army Tank Automotive Command Center, Abdel-Malek and his colleagues are creating computer screen characters who resemble real people in anatomy, behavior, motion, and intelligence. Components of the VSR technology were featured at this summer's SIGGRAPH computer graphics conference in Los Angeles.

Much of the VSR technology comes from animation technology used in the entertainment and gaming industries, Abdel-Malek says. The program is collaborating with VICON, a leading animation technology company in the film industry. Abdel-Malek says VICON will help his soldiers come to life with realism through a 3D motion capture system.

University of Iowa researchers collaborating with Abdel-Malek include Jasbir Arora, professor of civil and environmental engineering; Nicole Grosland, assistant professor of biomedical engineering; Ray Han and Jia Lu, professor and assistant professor, respectively, of mechanical and industrial engineering; Colby Swan, associate professor of civil and environmental engineering; Soura Dasgupta, professor of electrical and computer engineering; and Thomas Cook, professor of occupational and environmental health in the College of Public Health.

## *Stellar Beginning*

The most ambitious exploration of Saturn, its rings, moons, and atmosphere began when NASA launched the unmanned *Cassini* spacecraft on Oct. 5, 1997. Seven years later, we finally got there, in the words of a space scientist at The University of Iowa who remarked on *Cassini*'s arrival in Saturn's orbit on June 27.

"This marks the beginning of the scientific exploration for the people who will study the planet's magnetosphere," says Don Gurnett (below), professor of physics and astronomy in the College of Liberal Arts and Sciences and principal investigator of the project's radio and plasma wave research.

A University of Iowa research instrument on board *Cassini* will use the spacecraft's giant radio antenna array to send back data on the density and temperature of plasma—thin, electrically charged gas—trapped within Saturn's magnetosphere. *Cassini* became the first manmade satellite to orbit the ringed planet and now begins a four-year study of the planet. Gurnett is veteran of more than 25 spacecraft projects during his lifelong career at The University of Iowa, having played a principal role in *Voyager* flights to the outer planets and the *Galileo* mission to Jupiter. He made the first observations of plasma waves and low-frequency emissions in the magnetospheres of Jupiter, Saturn, Uranus, and Neptune, and discovered lightning in the atmospheres of Jupiter and Neptune. A collection of sounds Gurnett has recorded from Saturn and other places in space are available through his web site: **www-pw.physics.uiowa.edu/space-audio**.


## *Trouble in Middleton*

Investigators from the College of Public Health are concerned about the health of workers who may have been exposed to radioactive material at an ammunition plant in southeast Iowa. Laurence Fuortes, professor of occupational and environmental health, is leading a Department of Defense–funded research project to find out more about the health of current and former workers of the U.S. Army portion of the Iowa Army Ammunition Plant in Middletown, Iowa.

Fuortes recently concluded work on a three-year U.S. Department of Energy project that included a medical screening program for former nuclear weapons workers at the plant. His new study will address health outcomes of employees who worked in operations and locations of the plant other than those associated with nuclear weapon production.

Fuortes says his research team will focus on occupational lung disease and, through epidemiological studies, cancer and death rates. He hopes to screen 2,500 workers in all.

## *Fructose: It's a Gas!*

Fructose may be a simple sugar but what it does to some people is not simple at all. Bloating, abdominal pain, diarrhea, and flatulence are among the discomforts endured by people with fructose intolerance and Irritable Bowel Syndrome.

But relief may be possible. According to Satish Rao, professor of internal medicine in the Carver College of Medicine and the study's primary investigator, people who complied with a fructose-restricted diet significantly reduced their symptoms. The study was based on patients with fructose intolerance who received oral and written dietary instructions to eliminate most fructose—found in pop, canned foods, and candy—from their daily food intake. Rao and colleagues intend to study different types of diets to see which are both effective and easy to follow. In addition, there may be other solutions to eliminate the effects of fructose.

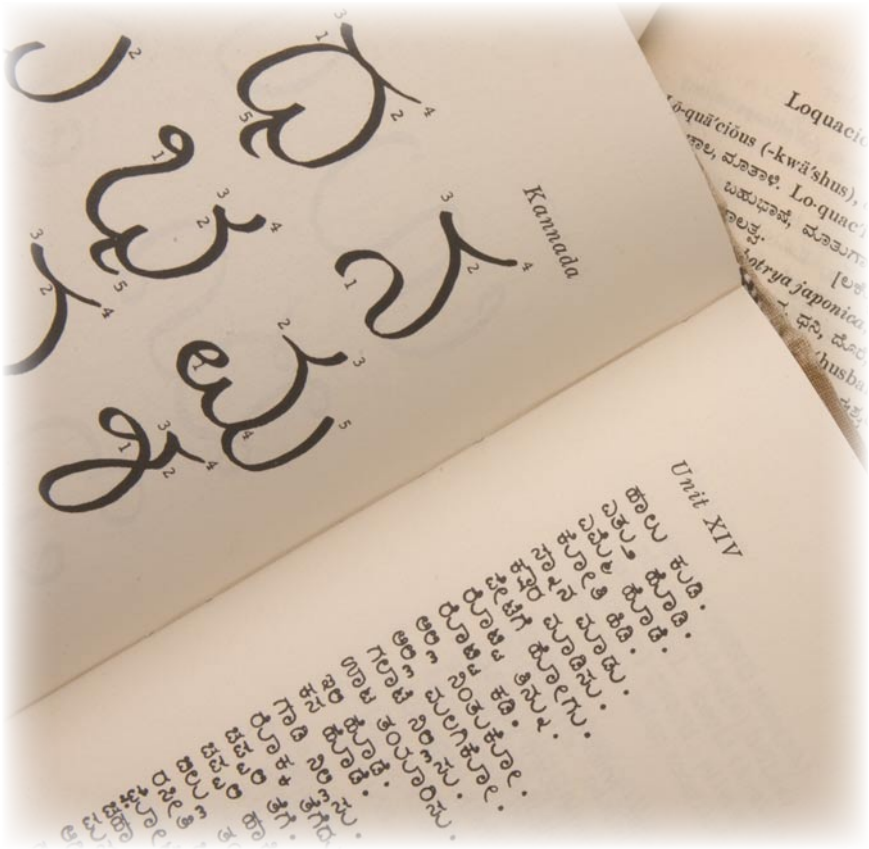
"It's understandably hard to have people change their lifestyle, so we're also looking at what we can do other than diet," Rao says.

## *Giving Voice to Language Opportunities*

Thanks to two grants totaling more than $1.4 million, students at The University of Iowa can benefit from stronger undergraduate and graduate programs in international studies and take courses in less commonly taught languages like Arabic and Kannada.

The three-year U.S. Department of Education grants run from 2003 to 2006. They support 25 new international studies courses, including Arabic and Kannada, and advanced courses in Swahili for students who want to go beyond the University's current offerings.

The new courses are part of the curriculum for the new degrees in international studies at both the undergraduate and graduate levels. The awards also support professional development for faculty, offer a dozen prestigious scholarships annually to graduate students for yearlong and summer study, and fund new outreach initiatives for the campus and community.





## *Court Battles for Freedom*

Iowa law professor Lea VanderVelde has begun chronicling 250 freedom suits filed by Missouri slaves in state and territorial courts in the 19th century.

"Slaves attempted to use the courts to legally escape slavery," VanderVelde says. "Our conception is that slaves either suffered or tried to escape. What we never knew was how many sought their freedom in court, and how many received it. When you read these lawsuits, you hear the voices of people rising up against enslavement in a way that's not been heard by Americans today."

VanderVelde stumbled upon the papers while doing research on another project about Harriet Scott, wife of Dred Scott, the St. Louis slave whose own freedom suit led to the infamous 1858 Supreme Court decision that denied Scott and all blacks the rights of citizenship, prohibited the federal government from banning slavery, and helped set the stage for the Civil War. VanderVelde is writing a book about the suits.

## Allied Against Emerging Disease

The Center for Emerging Infectious Diseases, recently established in the College of Public Health, will take advantage of the latest laboratory technologies and advanced epidemiological methods to study zoonotic (animal-originating) occupational infections among Iowa's meat processing workers.

Working for the center are investigators from the Carver College of Medicine, the UI Hygienic Laboratory, Johnson County Public Health, and the Iowa State University College of Veterinary Medicine, as well as researchers from a number of national and international organizations.

"It has been estimated that 70 percent of emerging infectious diseases in humans are due to bacteria and viruses that normally infect only animals," says Gregory Gray, professor of epidemiology and the center's director. "Since Iowa leads the nation in egg and swine production and is second in chicken production, this state is an appropriate place to study these diseases."

## Catalysts for a Greener Future

The University of Iowa is one of three institutions that will participate in a five-year, $17-million National Science Foundation grant awarded to the Center for Environmentally Beneficial Catalysis (CEBC), headquartered at the University of Kansas. The CEBC is a multidisciplinary research center led by the University of Kansas. The University of Iowa and Washington University in St. Louis will serve as core partners

The mission of the Kansas center is to develop environmentally friendly and economically viable chemical processes for industry. Catalysts—substances used to accelerate chemical reaction—are used in the production of such things as medicines, food products, and gasoline. In addition to the focus on catalysis research, the CEBC also will develop hands-on opportunities for undergraduates and graduates students.

Iowa researchers will focus on biocatalysis, an area of longstanding expertise at The University of Iowa, according to John Rosazza, professor of medicinal and natural products chemistry in the College of Pharmacy and director of The University of Iowa's Center for Biocatalysis and Bioprocessing. Rosazza says biocatalysts are catalysts derived from nature and include substances such as bacterial enzymes, which can transform abundant starting materials into useful pharmaceuticals and agrochemicals. Rosazza will serve as an associate director of the CEBC.


## School Kids Behaving Badly

Mean girls—and boys—probably know they're making other kids miserable. But they might not know they're also putting their classmates at risk for serious health problems—or that they're doing the same thing to themselves.

Researchers at Iowa are studying the link between bullying and health. Daniel Clay, associate professor of psychological and quantitative foundations in the College of Education, and doctoral student Sandra Cortina will examine reported health ailments among school-children to see how violence and bullying at school affects schoolchildren—not only the victims but also the bullies. Using a three-year grant from the National Institutes of Health, Cortina, a fourth-year doctoral student in the college's counseling and psychology program, will study peer relationships among K-12 students as well as the impact that verbal and physical aggression have on such relationships.

Cortina and Clay also will look at school absences, medical care use and costs, and other physical and psychological symptoms of stress among schoolchildren.

## *Filling a Gap in Hispanic History*

Latinos have been largely invisible in Iowa's history, according to Kären Mason, curator of the Iowa Women's Archives in the University's Main Library. But for the past year, Mason and her staff have been collecting the history of Latinas and their families.

The new collection—called Mujeras Latinas, or, in English, Latina Women—includes donations from Teresa García, program associate in the Graduate College and doctoral student in the College of Education. García has been donating artifacts from her family's history (top photograph shows García's mother when she was a little girl) as well as documents, photographs, and newspaper clippings about the history of Hispanics in Iowa.

The collection includes artifacts from life in El Cometa, a Hispanic community in early-20th-century Fort Madison (bottom photo).

## *Undergraduate Researchers Reach for the Stars and More*

When Andy Cowan (above) began taking undergraduate courses in physics and astronomy two years ago, he started acquiring specialized knowledge through a research venture with scientists studying the aurora borealis. The scientists handed him a big assignment: Cowan would help develop software to interpret data from an experimental rocket the scientists had fired into the northern lights.

"I wanted to get my feet wet as soon as possible," Cowan says. "I wasn't particularly concerned at the time with what branch of physics and astronomy I was working in, but this project was definitely interesting. Research is nothing at all like class work. On top of that, there are research skills that can't be taught in the classroom, like budgeting time and developing the discipline to sit in front of a computer for eight hours a day."

Craig Kletzing, associate professor of physics and astronomy, believes students like Cowan have the distinct advantage of attending this major research university.

"Some of the most exciting research in the world takes place on the University of Iowa campus," Kletzing says, "and one of the greatest things about this research is that even undergraduates can play an important part in it."

They don't have to be students in rocket science to participate. Undergraduates across campus can engage in cutting-edge research in disciplines as diverse as dentistry and dance. Every year, more than 2,000 future doctors, lawyers, nurses, teachers, accountants, journalists, politicians, artists, and others supplement their undergraduate classroom education with research projects—either on their own or in collaboration with faculty members—because they want practical experience in their chosen field, they love to learn, and they know their campus is a hotbed of such activity.

Many academic departments open doors to faculty research through special course offerings, such as undergraduate research tutorials, honors courses, and independent study. Campus programs also support students interested in academic and scientific research, including the Iowa Research Experiences for Undergraduates program, established in fall 2002 to allow undergraduates, for the first time in the University's history, to apply for research grants in scholarly work, experimental and laboratory-based work, and creative work in the arts and humanities. In addition, the Undergraduate Scholar Assistantship Program enables professors to hire students as assistants on projects.

***"Some of the most exciting research in the world takes place on the University of Iowa campus, and one of the greatest things about this research is that even undergraduates can play an important part in it."***

Research opportunities also can grow from regular part-time University student jobs. The University of Iowa each year employs about 200 part-time student workers in academic and scientific research (assisting faculty through computer, analysis, and writing skills), 500 in general science labs (where work includes solution preparation, contact with chemicals, glassware washing, monitoring of tests and experiments, and cleaning field and lab equipment), and another 350 in health sciences and clinical labs (where duties involve patient and specimen testing).