

**Step by step**

The need of the community is bringing focus to the research process.

U2-3

**Construction in motion**

Lessons taken from tennis and ballet are impacting the construction field.

U4

**Use-inspired: Research benefiting society****Real-life needs drive growing portfolio of ASU research***By Skip Derra*

Use-inspired research has long been a staple of the ASU science portfolio – and, in today's highly competitive research funding climate, it is a growing portion of that portfolio.

Use-inspired research, which has the goal of solving specific societal problems or challenges, is being shaped by several forces at ASU. These include the accent on interdisciplinary and transdisciplinary research, efforts to make ASU more relevant and transform it into the New American University, and several trends in research funding, says Stephen Goodnick, ASU's associate vice president for research.

Across all four ASU campuses, faculty

*"Use-inspired research meets community needs. Its importance lies in the fact that it helps solve big problems that affect society and the quality of life for many people."*

– Stephen Goodnick, associate vice president for research

members, researchers and students are engaged in a wide range of use-inspired research projects. From work on specialized forms of bacteria that can transform waste into electricity, to development of devices

that can help a person recover movement after a stroke or walk after a spinal cord injury, to studying the effects of rapid urban growth on scarce water resources, use-inspired research is on the rise at ASU.

ASU's geographical location in a major metropolitan area is one of the leading reasons why use-inspired research plays a big role in ASU's research capabilities.

"Use-inspired research meets community needs," Goodnick says. "Its importance lies in the fact that it helps solve big problems that affect society and the quality of life for many people."

Use-inspired research is very goal-oriented and is more about developing new technologies that can be applied rapidly. It is less about basic or long-term research.

"Energy, the environment and resource use are use-inspired research topics," Goodnick

(See **USE-INSPIRED** on page U4)

**Algae provides fuel for 'green' research***By Chris Lambrakis*

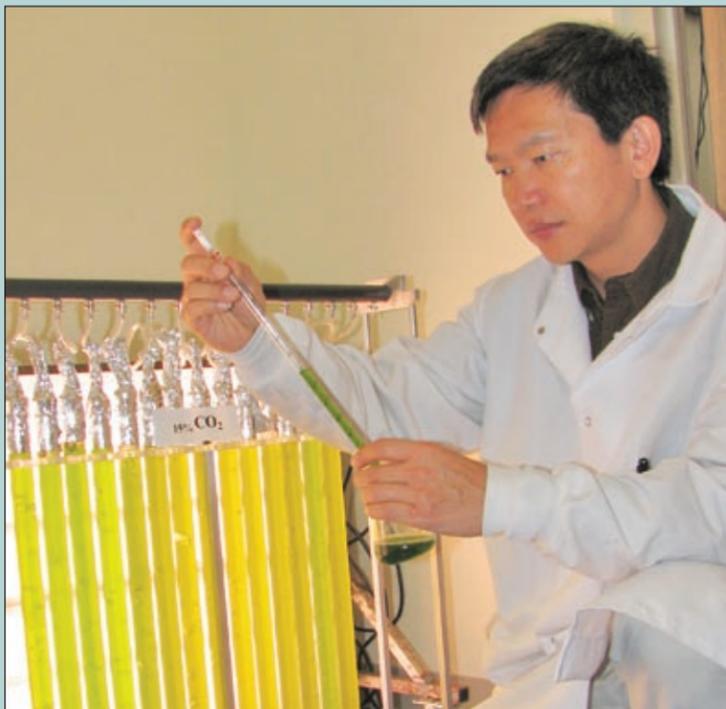
As anyone with a pool knows, algae can be quite pesky plants. ASU researchers Qiang Hu and Milton Sommerfeld are shedding a whole new light on the plant in the Laboratory for Algae Research & Biotechnology (LARB) at the Polytechnic campus.

Even though algae can be a nuisance, these plants have multiple benefits to the environment that are sustainable, renewable and relatively inexpensive to produce, according to Hu and Sommerfeld.

The duo has been able to take their combined 40-plus years of research with algae and apply it to use in air and water remediation, alternative fuels and animal feed. During that time, they have identified 100 to 200 algal species of the more than 1,500 they have studied that are hardy and potent for various uses from producing algal oils for biofuels to removing carbon dioxide from power plant emissions and nutrients from various wastewaters.

What makes algae so appealing for so many applications?

"They reproduce quickly, and unlike the cells found in a leaf, they don't have unnecessary baggage. In other words, no roots and stems and they do not go dormant," says Sommerfeld. "Algae have natural properties that allow them to grow quickly, with some species able to double two to three times in a day. That's a good



**ASU Researcher and Applied Biological Sciences Assistant Professor Qiang Hu measures algae samples in the Laboratory for Algae Research and Biotechnology.**

thing when you want to produce large quantities of algae."

To grow mass quantities of algae, the researchers developed industrial photobioreactor technology that allows for an optimal growth environment for maximum production, according to Hu. "It's basically an engineered device to enhance the natural process,"

adds Sommerfeld.

What the plant and its cells are naturally producing makes them a valuable product, according to Hu. "For example, we have been able to identify one species of algae that synthesizes and accumulates large quantities of oils or lipids that could be a perfect al-

(See **RESEARCH** on page U4)

**Study calls out workplace bullies***By Sharon Keeler*

Bullies are something most people hope they leave behind on the childhood playground. Unfortunately, those bullies grow up, taking their abusive behavior to the workplace, where they can create war zones for their co-workers.

In a study published in *Management Communication Quarterly*, bullied employees explain their experiences in emotional language that illustrates the depth of their mistreatment.

Adult bullying at work can include a variety of tactics or negative acts including screaming, excessive criticism, spreading rumors, the "silent" treatment and exclusion from meetings and gatherings. It can be peer-to-peer or perpetrated by a supervisor. Similar to the playground variety, the bully leaves the victim feeling stressed, fearful and abused.

"Many people can tell you they know bullies at work – and many have been targeted themselves – but few people truly understand the psychological and physical damage that results from these relationships," says lead author Sarah Tracy, associate professor in ASU's Hugh Downs School of Communication. "It is very difficult for the targets of bullies to put into words their experiences, and when they do they are often seen as disgruntled employees or as being over-sensitive."

In fact, 25 percent to 30 percent of U.S. employees are bullied and emotionally abused sometime during their work histories. This mistreatment can cost employers, as stressed employees are more likely to be ill, less productive and likely to quit. Perceptions and reports of unfair treatment also are precursors of workplace aggression, violence and sabotage.

Workplace bullying, by definition, is not explicitly connected to demographic markets such as sex or race. It also is noted by its duration and persistence. There are no legal sanctions in the United States, although there are in other countries, such as Canada.

Tracy, along with co-authors Jess Alberts, ASU professor of communication, and Pamela Lutgen-Sandvik, an assistant professor of communication and journalism at the University

(See **STUDY** on page U4)

**Professor makes medicine personal with microtechnology***By Joe Kullman*

Biomedical science and engineering are taking humans toward their most personal connections with technology, and this close relationship can be seen emerging in research by Bruce Towe, a professor in the bioengineering department of the Ira A. Fulton School of Engineering.

In projects supported by the National Institutes of Health, bioengineers, electrical engineers and biologists are collaborating on an array of practical applications for new microtechnology discoveries. Development of micro-scale implantable biosensor and bioelectronic devices that detect, monitor and treat an array of medical conditions is progressing at a rapid pace in the labs where Towe leads a small team of ASU colleagues.

Major advances in individually tailored health care and treatment are expected to surface by harnessing tiny wireless biosensors and neural stimulators that use ultrasound and radio waves to ease pain or diagnose diseases and ailments.

Towe describes neurostimulation devices that can be implanted in the body to help physically disabled patients expand their range of movement, and instruments to do things such as monitoring blood pressure or working with implantable microsystems to perform automated medication delivery.

"We're achieving breakthroughs in the size of these devices and in the simplicity of their operation," Towe says. "There's no doubt in my mind these things will be among the biggest waves of the future in personalized medicine."

Implantable bioelectrical systems will allow people to assess conditions of their blood chemistry, as well as their heart and circulatory functions, to monitor overall stress levels, he says.

Towe and other ASU researchers are also developing small, simple "bioreporter" or "biosentinel" devices that maintain living biological cells in instrumented microfluidic systems for NASA. The devices are intended to provide immediate and detailed information about the physiological effects of outer space on astronauts.

"In space, the bioreporters are exposed to radiation, electromagnetic fields and microgravity and thus act as surrogates of the cells of the astronauts' bodies," Towe explains. "The bioreporters help create a metabolic fingerprint of the cells of the astronauts' bodies. We want to get a picture of that fingerprint down to the molecular level, so we can see how the environment in space is affecting their cellular structures."

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**Bioengineering professor Bruce Towe is using microtechnology to develop an array of practical medical and health care applications.**

## Questions key to design process

By Adelheid Fischer

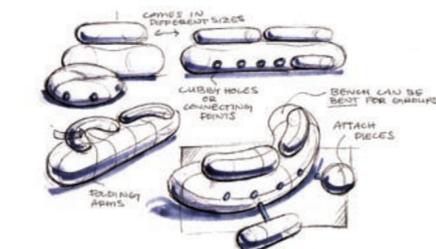
For students learning the art of product development in ASU's InnovationSpace program, working with a sponsor such as Herman Miller is a little like winning the design lottery. The global leader boasts a string of classic interior furnishings, the kind that command floor space at New York's Museum of Modern Art and grace the pages of design history books.

But substance – not just style – is key to Herman Miller's success. One of the company's best sellers, the Aeron office chair, represents years of research and collaboration among engineers, ergonomists, orthopedic specialists, physical therapists and designers. Before it hit the market, hundreds of ordinary people had taken the chair for a test drive, rating it for comfort and usability.

"Herman Miller's approach is very familiar to us," says senior industrial design student Erik Hernandez. "We try to discover what the user's needs are first, and then design for that."

Hernandez is a member of Merge, one of three InnovationSpace teams sponsored by Herman Miller for the 2006-2007 academic year. Their assignment is to develop product concepts for acute and ambulatory care environments.

But instead of rushing pen to paper, students have spent half of the first semester of InnovationSpace's two-semester class conducting research. Hernandez and his team, for example, have compiled a whopping 300-page binder that includes information on everything



Using information gathered from product research and field observations, InnovationSpace students are able to sketch out possible product ideas. Student Sarah Johnson has envisioned a possible modular furniture system (above).

from competitors' products and new health care technologies to the incidence of on-the-job injuries for nurses and price points for existing health care products.

Using such tools as rapid ethnography, the students interviewed potential users and experts, and observed people interacting with objects in their everyday environments. The multidisciplinary nature of InnovationSpace teams, which comprise students from industrial design, visual communication design, business and engineering, ensures that information will be gathered from as many viewpoints as possible. This layering of perspectives helps make the final products more functional, desirable and marketable.

The Merge team, for example, arranged for exhaustive tours of Desert Samaritan hospital and the new Banner Estrella Medical Center in Glendale, ranked as one of the top 10 most technologically advanced hospitals in the nation. Other teams, such as the group

known as Sum, visited walk-in clinics in Mesa and on the ASU campus.

The students interviewed nurses and watched them stock supplies or answer patient calls for attention. They lingered in waiting rooms, toured operating theaters and hung out around nurses' stations. Through sketches and scribbled notes, they recorded their observations.

Next semester, students will make the tough choice of focusing on a single product idea. By semester's end, they will have conducted exhaustive user research and developed detailed designs, marketing analyses, engineering feasibility studies and communications strategies. In May, their final projects will be on display in a public exhibition at the College of Design. With any luck, their designs might one day be a key part of hospital infrastructure.

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## Workplace situations provide research fodder

By Kelly Miller Grysho

Jeffrey Kassing has built a research profile niche around workplace issues. For almost a decade, he has studied employee dissent and its varied facets. His work began with his dissertation in 1997 and since then Kassing has conducted 18 studies of some aspect of employee dissent.

According to Kassing, freedoms are reduced when one enters into a worker-employer scenario. He studies how those interactions play out.

"Dissent happens when you try to put constraints on individuals," he says. "We often don't have the luxury of freedom of speech at the one place where we spend the most time."

An associate professor of communication studies in the College of Human Services at ASU's West campus, Kassing's most recent research features an analysis of about 140 individuals who discussed circumvention, or dissent, by going around or above one's supervisor. He found that although risky, going around one's boss can be appropriate at times but can lead to supervisor-subordinate relational deterioration.

Kassing says he is surprised by the actions of supervisors and that unethical behavior is a frequent occurrence in the workplaces he studied. "Behaviors ranged from outright theft to sexual harassment," he reports.

Given the numerous examples of unethical conduct by corporations, Kassing says dissent serves as an important corrective action in the workplace. Circumvention typically occurs when an employee's supervisor is unwilling to consider his or her subordinates' dissent.

Kassing's findings can help organizations develop reporting policies that provide clear and open access to authorities above an employee's immediate supervisor. "By doing so, organizations allow for employee input that may not otherwise come forward," Kassing says. "In this way, employees can air concerns without jeopardizing their working relationships with their supervisors."

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ASU researcher Bert Jacobs has few equals when it comes to pox viruses. He is turning that knowledge against a variety of human ailments.

## Jacobs turns pox virus on a variety of human diseases

By Joe Caspermeier

When it comes to understanding the deadly impact of pox viruses, ASU researcher Bert Jacobs has few equals. Jacobs is one of the world's foremost experts on a pox virus called vaccinia, a cousin of the smallpox virus.

Vaccinia virus, or coxopox, was first used to wipe out the deadly scourge of smallpox from the face of the earth. Jacobs has more than 20 years of experience at ASU as a professor in the School of Life Sciences. Jacobs has been awarded more than \$3 million in federal research funding for projects that include producing a safer smallpox vaccine and a post-exposure vaccine in case of a bioterrorism incident.

"Certainly one aspect of the research we are doing is making a better, safer smallpox vaccine," says Jacobs, whose group is part of the Biodesign Institute's Center for Infectious Diseases and Vaccinology. "But, as we started getting information on how to make better smallpox vaccines, we thought the vaccinia virus was

also a really great vector for vaccinating against a variety of different things."

It was during this time that Jacobs realized his research could have an even broader human health impact. Now, Jacobs has genetically engineered vaccinia as a vehicle against a number of infectious agents, bioterrorism threats, cancer and other viruses, including HIV and AIDS.

Jacobs recently received a \$900,000 award as part of an international \$15.3 million effort funded by the Bill and Melinda Gates Foundation to use vaccinia virus to create a new AIDS vaccine.

"We think we've developed a vaccine vector that will give a better immune response than anything we've had before, and now we're going to put HIV genes in there and hope it gives a better immune response to HIV than anything else that has been tried before," Jacobs says.

His research group includes assistant research professor Karen Kibler and a team of 20 dedicated undergraduate,

graduate and post-doctoral researchers.

Because of the importance of his efforts for national security, Jacobs' work has been on a fast track, with the studies projected to yield a usable vaccine virus against smallpox in the coming year.

Jacobs' research team is able to create a vaccine that can cure smallpox infections in their early stages but may also provide a powerful tool for fighting a host of other viral pathogens, including the new project directed at HIV. Genes from hard-to-treat viruses such as HIV could potentially be added to the mutant vaccinia virus, which would draw the immune system's attention to the target virus's proteins, thus creating a strong immune response to the virus of interest. Such a method could ultimately provide effective protection from some of humankind's most challenging viral enemies.

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## Use-Inspired Research - Step by Step

### 1. Defining the Community Need:

A new technological innovation was necessary to help ease the burden for the estimated 750,000 victims of stroke in the United States, most of whom will need lengthy and costly physical rehabilitation.

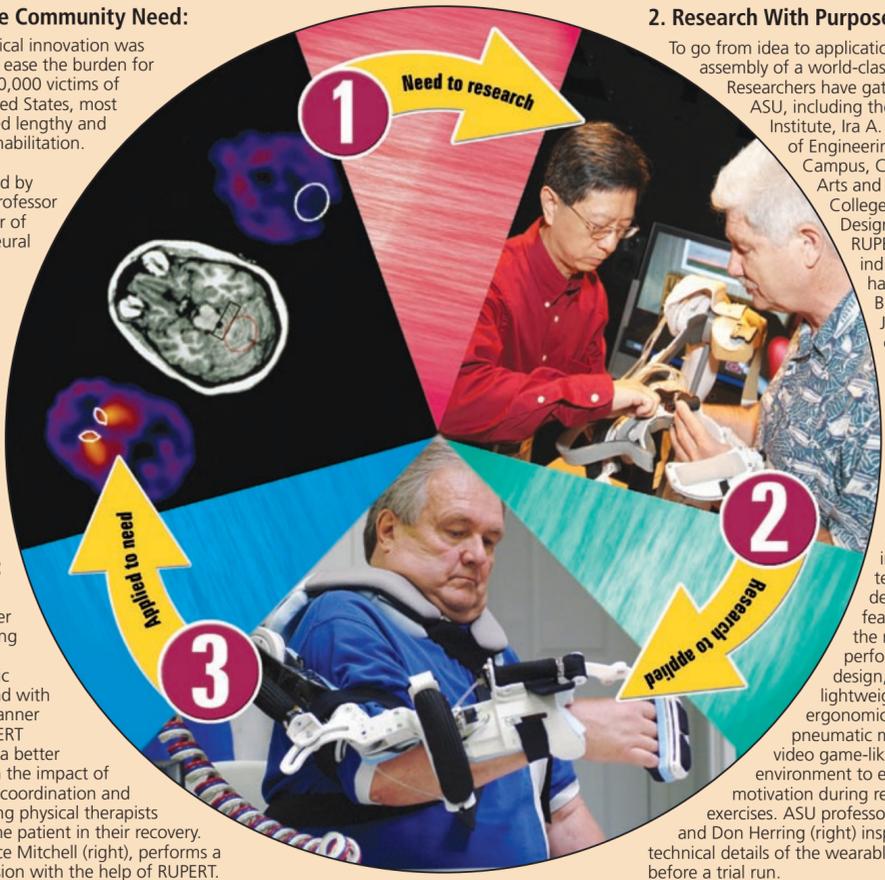
The idea behind RUPERT, conceived by bioengineering professor Jiping He, director of the Center for Neural Interface Design at the Biodesign Institute at ASU, was to design a lightweight, wearable robot that could help a stroke victim to relearn the use of their arm for daily activities.

### 3. Enhancing Quality of Life:

By engaging with an industry partner with manufacturing know-how and experience, Kinetic Muscles, Inc. – and with clinical partner, Banner Health – the RUPERT project can bring a better understanding on the impact of stroke on muscle coordination and movement, helping physical therapists in their job and the patient in their recovery. Stroke victim Bruce Mitchell (right), performs a rehabilitation session with the help of RUPERT.

### 2. Research With Purpose:

To go from idea to application requires the assembly of a world-class research team. Researchers have gathered throughout ASU, including the Biodesign Institute, Ira A. Fulton School of Engineering, Polytechnic Campus, College of Liberal Arts and Sciences, and College of Industrial Design to develop RUPERT. The individual expertise has involved the Biodesign Institute's Jiping He, in collaboration with Ed Koeneman at Tempe startup Kinetic Muscles, Inc. and Tom Sugar, Thanassis Rikakis, Todd Ingalls, Loren Olson, and Don Herring of ASU. Each interdisciplinary team member developed new features to enhance the robotic arm performance and design, including lightweight materials, ergonomic comfort, pneumatic muscles, and a video game-like, virtual reality environment to enhance patient motivation during rehabilitation exercises. ASU professors Jiping He (left) and Don Herring (right) inspect some of the technical details of the wearable, robotic arm before a trial run.



## Professor brings persuasion to a science

By Carolyn Kennedy

Robert B. Cialdini has been studying the science of persuasion for more than 30 years. Cialdini, Regents' Professor of Psychology and Marketing, has concentrated primarily on the major factors that bring about a specific form of behavior change – compliance with a request. In other words, what are the basic principles that govern getting people to say "yes"?

In his book "Influence: Science and Practice," Cialdini examines the six basic tendencies of human behavior that factor into a positive response: reciprocity, consistency, social validation, liking, authority and scarcity.

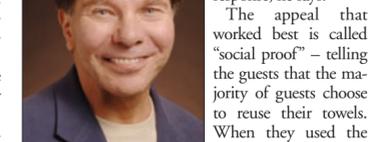
After years of conducting persuasion studies in the controlled setting of a university lab, Cialdini recently began to examine lessons learned in the real world.

Cialdini's research has unique applications to marketing, advertising and sales appeals. His recent research has focused on local hotels' appeals to their guests to reuse the towels in rooms.

"If you've stayed in a hotel lately, you may have seen a card in the room asking you to recycle," says Cialdini, who holds joint appointments in the W. P. Carey School of Business and College of Liberal Arts and Sciences. "Here's the question: What should the hotel say on those cards?"

Cialdini and his colleagues experimented with various appeals to get customers to reuse the towels,

including environmental appeals ("do this for the environment"), social responsibility appeals ("do this for future generations") and even appeals to the pocketbook ("cooperate with us ... and we will donate a percentage of the profits in the name of our guests to an environmental cause"). The various appeals generated about the same response, he says.



Robert Cialdini

The appeal that worked best is called "social proof" – telling the guests that the majority of guests choose to reuse their towels. When they used the appeal, "The majority of our guests who have stayed in this room have recycled their towels," Cialdini says they got the best response.

In other words, small changes in the presentation or the wording of an idea can produce significant differences in the willingness of people to agree with a request.

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## Million-dollar study aims to support women in STEM fields

By Joan M. Sherwood

Women have earned more than half the bachelor's degrees awarded in science and engineering since 2000 – while, just a generation ago, just 3 percent of America's scientific and technical workers were women.

Despite the growing number of women pursuing science and engineering careers today, their representation on university and college faculties and in industry settings fails to reflect these gains.

Bianca L. Bernstein and John J. Horan, professors of psychology in education within ASU's Mary Lou Fulton College of Education, and Mary Anderson Rowland, associate professor of industrial engineering within the Ira A. Fulton School of Engineering, are leading a research study designed to help female doctoral students overcome the barriers that impede their persistence in STEM (Science, Technology, Engineering and Mathematics) fields.

This fall, their research team was awarded a \$1 million grant from the National Science Foundation (NSF) to support the three-year project, "Career-Bound: Internet-Delivered Resilience Training to Increase the Persistence of Women Ph.D. Students in STEM Fields."

The project is supported by an interdisciplinary research team consisting of nearly 20 students and faculty members, representing the social sciences, engineering and physical sciences, including Nancy Felipe Russo, Regents' Professor of Psychology and Women and Gender Studies, and director of ASU's Center for Academic Institutional and Cultural Change.

Studies have not found any significant biological differences between men and women in performing science and mathematics that can account for the lower representation of women in academic faculty and leadership positions in STEM fields. But climate surveys and studies conducted on university campuses across the country suggest that bias and outmoded practices governing academic success are the more likely barriers to women in STEM fields.

This reality inspired Bernstein and her colleagues to address the question of whether deliberate resilience training, delivered via the Internet, can strengthen the persistence of female students in STEM fields. The research team has begun conducting focus groups with female doctoral students in STEM majors.

"The purpose of the focus groups is to understand firsthand what today's woman doctoral student experiences as encouraging and discouraging as she progresses toward her degree," says Bernstein, who

holds a joint appointment with Higher Education and Educational Policy Studies and is an affiliate of women and gender studies.

The project will examine and evaluate the effectiveness of an Internet-based, multimedia-enhanced program designed to strengthen career aspirations and personal skills, as well as increase the number of female doctoral students completing degrees in selected fields at multiple universities.

"The project coursework is being designed to inoculate participants against documented interpersonal, climate and role challenges women face in male-dominated STEM fields," Bernstein says. "Interactive critical incident technology will create an audio-visual library of narratives by prominent senior women scientists and engineers, as well as younger professionals in the field who have handled such situations successfully."

The coursework also provides training in decision-making, problem-solving, cognitive restructuring, conflict management and negotiation.

"The CareerBound program includes social support not by providing supportive groups of mentors but rather by empowering the women to seek them out." Bernstein says. "Our intervention, then, is deliberately designed to teach women to fish, along with giving them a supply of fish."

The coursework will be housed within the Virtual Counseling Center, a project led by Horan in ASU's Center for Research on Education in Science, Mathematics, Engineering and Technology (CRESMET). The Virtual Counseling Center contains many research-supported resources for helping students and graduates develop life skills and career plans.

"We hope to ensure that all students and graduates have access to the best career information possible, develop decision-making and other skills associated with personal competence, and be able to overcome barriers for exploring STEM majors and careers," Horan says.

"This project advocates a novel form of social support for women as they navigate career advancement in STEM professions," says Marilyn Carlson, CRESMET's director and mathematics education professor. "The research based interventions, proposed by Professor Bernstein and her colleagues, will produce substantive increases in the number of women who persist in STEM professions and Ph.D. programs, providing much-needed human resources in areas of critical need."

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## Study determines success factors of Mexican-American children

A team of ASU researchers is taking an unprecedented look at Mexican-American Families, trying to determine what factors will predict success for Mexican-American children.

The study, by researchers from ASU's College of Liberal Arts and Sciences, involves interviews with 750 Mexican-American families in the Phoenix Metro area and is supported by a \$3.57 million grant from the National Institute of Mental Health.

"This is the largest study of Mexican-American families ever," says Mark Roosa, a professor in the School of Social and Family Dynamics and principal investigator for the project known as "Proyecto: La Familia – Culture, Context and Mexican-American Mental Health."

Compared to other U.S. ethnic groups, Mexican-origin youths experience higher rates of emotional and behavioral problems, including depression, drug and alcohol use, juvenile arrests, and falling in – and dropping out of – school.

"If those problems are left unchecked and those kids

are not provided with opportunities to succeed, you could have a large population that is not educated, that has a greater need for social services and is a bigger drain on the health-care system," says Nancy Gonzales, women and philanthropy dean's distinguished professor of psychology and one of four "La Familia" investigators.

Psychology professors George Knight and Delia Saenz round out the group.

With an emphasis on intervention, the team would like to reverse the trend of adult Mexican-Americans, who today suffer from obesity, diabetes, cardiac problems, mental-health problems, antisocial behavior and substance abuse with far greater frequency than any other ethnic minority in the United States. Part of the solution, the team believes, is understanding how the cultural beliefs of Mexican-American mothers, fathers and children influence family practices – and, ultimately, children's adjustment.

"I think people are finally coming face to face with the

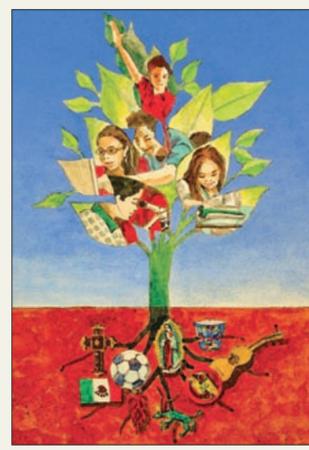
fact that we have this very large influx of Latinos in the United States," Roosa says. "People in social services and in the schools have been wrestling with this for the last decade or so with little information."

The five-year "La Familia" study will provide an abundance of information to educators and social-service professionals. The data is collected from separate two-and-a-half-hour, in-home interviews with mothers, fathers and their fifth-grade children.

While project preparation began in 2003, the initial interviews began in 2004 and were completed this year by a team of professionally trained interviewers. The long-term goal of the project is to follow the students as they transition through adolescence into their early 20s.

The survey questions discuss all facets of life – from parent-to-parent and parent-to-child relationships, and mental health to educational backgrounds and the context of families' environments.

Excerpted from CLAS News magazine.



# Tennis, ballet put construction study into motion

By Joe Kullman

It has been happening since the dawn of science. A researcher tries to answer a specific question in a clearly defined area and finds the process leading down an entirely unexpected path.

It's how one of Avi Wiezel's explorations has been taking him from bricklayers to ballerinas – by way of tennis.

Wiezel, an associate professor in the Del E. Web School of Construction in the Ira A. Fulton School of Engineering, set out to devise computer models to measure, evaluate, teach and improve the physical skills involved in construction work.

"The abilities of construction workers in performing such tasks as bricklaying have a significant effect on construction costs, quality, time and safety," Wiezel says.

By using computers to monitor motions of experienced construction workers as they built brick walls, Wiezel dissected the combination, coordination and trajectories of their various movements. In attempting to analyze agility, accuracy, strength and quickness, Wiezel found himself collaborating with ASU dance professor Naomi Jackson and ASU biomechanics professor Richard Hinrichs to look at how movement skills in sports and dance are evaluated.



Avi Wiezel

"We were seeing ways to calculate what separates experts from novices based on their dexterity in coordination of basic types of movement," he says.

A pivotal discovery was made when a test subject (an ASU electrical engineering graduate student) with no construction experience performed bricklaying with a high degree of skill. What accounted for this surprising proficiency?

"We found out he had been captain of his college varsity tennis team," Wiezel says.

The student's tennis talents proved to precisely match the physical adeptness required for efficient bricklaying. Wiezel, an avid tennis player, envisioned how to expand his study to describe and measure the ensemble of movements necessary for optimal performance in tennis.

Wiezel undertook an exacting study of the elements of tennis skills by working with several ASU colleagues in mechanical, industrial and civil engineering with whom he had formed

the Sports Engineering Group.

As in construction, performance in tennis is enhanced by the tools of the trade. So the research group looked at the interaction between player, equipment and environment, arriving at formulas for how the variables in performance results could depend on the smallest details of racquet weight, string tension, air temperature, humidity and altitude.

Such intricate measurements open the possibility for methods to assess and develop movement skills in a variety of sports and similar physical tasks.

"We hope to come up with a whole theory and practical design systems to help improve performance," Wiezel says. "It could give us better methods to scout for the most promising athletes or to recognize the budding talent of the next great ballerinas."

So how does this work its way back to construction and engineering?

"Maybe one of the best ways to recruit good bricklayers is to go out to the tennis courts and watch for the better players," Wiezel says, winking.

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## Use-inspired research lets students see impact

(Continued from page U1)

says. "The Global Institute of Sustainability is a key example of an institute that is driven by use-inspired research. So is the Biodesign Institute. These organizations look at big societal issues, and they apply interdisciplinary research to try and solve these problems."

### An engaging location

Being a metropolitan research university puts ASU (and its faculty and students) in the middle of the large urban area that it tries to serve, Goodnick says. That fact puts it in a select group of universities that not only tackle the societal problems, but also experience those problems up close along with the communities they serve. This helps engage faculty and students.

"Location does have a big effect," Goodnick says. "Metropolitan universities have many more opportunities to do use-inspired research because of the urban setting. Many of our industrial partners are located in the same area as we are, and many of the problems we work on arise from the same neighborhood in which the university is located."

"We are not only in the middle of a large metropolitan area, but also in the middle of the seat of government for Arizona. Because of that, we have unique opportunities to make it easy for faculty and students to be engaged in research that is community-driven in a broad sense."

While faculty in any research university, regardless of its setting, can be "engaged," Goodnick says, the problems "ours face are right there in front of us, and we are experiencing them right along with everybody else."

Being in the southwestern United States also shapes ASU's use-inspired research.

"Being in a desert border region brings with it all sorts of issues in terms of the environment (problems in Phoenix such as combating the urban heat island effect), water usage (because of our desert location), urban sprawl (a phenomenon of western U.S. cities) and border issues that contribute to the nation's security," Goodnick says.

Another key factor in the rise of use-inspired research at ASU is its accent on interdisciplinary research. Goodnick says that if there is an advantage in the ASU use-inspired research approach, it is the fact that ASU researchers have embraced interdisciplinary research and have brought it to a higher level than other universities.

Goodnick says that the very idea of use-inspired research – to solve a spe-



Research in Bruce Rittmann's lab at the Biodesign Institute is aimed at specific environmental problems, with a focus on long-term sustainability.

cific problem – is what interdisciplinary research is all about. Having several different people from different areas explore that one problem – such as a group of researchers and city planners studying Mesa city growth and available water resources using tools developed by the Decision Center for a Desert City and using the Decision Theater to foster dialogue – helps the research team take a more holistic approach to the problem at hand. ASU has been trying to break down the walls between disciplines in an effort to foster greater collaborations across campus as the needs arise.

A prime example of looking at an issue from several disciplines is the Center for Nanotechnology in Society (CNS).

"We have strong science and engineering efforts in biotechnology and nanotechnology, but we also have the Center for Nanotechnology in Society," Goodnick says. "CNS is the largest such center funded by the National Science Foundation in the country. It is looking at the societal impacts of the research coming from the biosciences and nanotechnology."

ASU's strength in interdisciplinary research, in turn, has driven interest in our research capabilities from funding agencies, which helps Goodnick expand ASU's research funding base.

"Faculty are looking for different funding sources; that drives it," Goodnick says. "There has been a change in the way the federal government funds research. It is less and less of the basic research and more problem-oriented: here's a problem, how do you address it

by bringing in all of these different disciplines together to solve it."

Goodnick says that traditional research areas have pretty much had constant funding levels, so competition for those dollars has become fiercer.

"We have to look at new ways at generating revenue and bringing in research funding," he says. "It is more and more the case that a project be focused on some sort of societal need or application, be it environmental-, security- or human health-related."

### The payback to ASU

The main goal of use-inspired research is to improve the community, but that research also pays back dividends to ASU beyond the funding it brings to the university. It allows ASU to contribute to the communities in which it lives, and it provides students and professors with an immediate, tangible impact of their work.

"Faculty and students derive a benefit from use-inspired research by seeing an application for their work and seeing its impact on society," Goodnick says. "If you look at some of the reasons why people don't go into the sciences and engineering, particularly women and other underrepresented groups, it is because there is a lack of clarity on the use of the technology they are developing and how it is going to benefit society. The more there is a direct benefit to society, the more it inspires students to work in these fields."

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## Study: Bullies bad for business

(Continued from page U1)

of New Mexico, conducted the study to better understand how workplace bullying affects the targets, as well as the language used to express emotions and experience. What they learned could help managers better recognize, understand and stop these negative interactions.

"Identifying the effects of adult bullying is an important step in persuading organizational policy makers to pay attention to the phenomenon," Alberts says. "As little research has been done on the emotional aspects of bullying, we set out to answer the question, 'What does it feel like to be bullied?'"

The researchers have conducted a nationwide survey that examines the prevalence and practices of bullying and have interviewed more than 50 targets or witnesses of workplace bullying in a variety of industries, including service and sales, education and construction.

What they discovered is that the targets of bullies see themselves as vulnerable children, slaves, prisoners, animals and heartbroken lovers. Their defense tactics included trying to "tune out" the bully or "fly under the radar." Many blamed themselves, wondering what they had done to bring the bullying on themselves.

"People often can't recognize the difference between a tough boss or a bully until they become the target," Tracy says. "Co-workers, in fact, often blame the target for not speaking up. Our society sees victims as weak, so the focus is usually on getting rid of the weak employee than it is on getting rid of the bully. Bullies are often good at 'managing up,' so the organization doesn't see the problem."

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## Research sheds light on algae

(Continued from page U1)

ternative fuel for airplanes/jets because it releases far less air pollutants than petroleum-based fuels into the atmosphere," says Hu.

The byproduct from harvesting the oil makes a healthy animal feed product or organic fertilizer as well. Through an anaerobic digestion or fermentation process, the byproduct can also be converted to methane or ethanol – two other kinds of biofuels. So there is little waste associated with algal feedstock.

Their research has also been successful at removing waste nutrients from agricultural wastewaters through an algal filtration system, allowing for reuse of treated water. These research and development projects have been supported by the local industrial community, including Salt River Project and Arizona Public Service, along with state and federal grants.

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