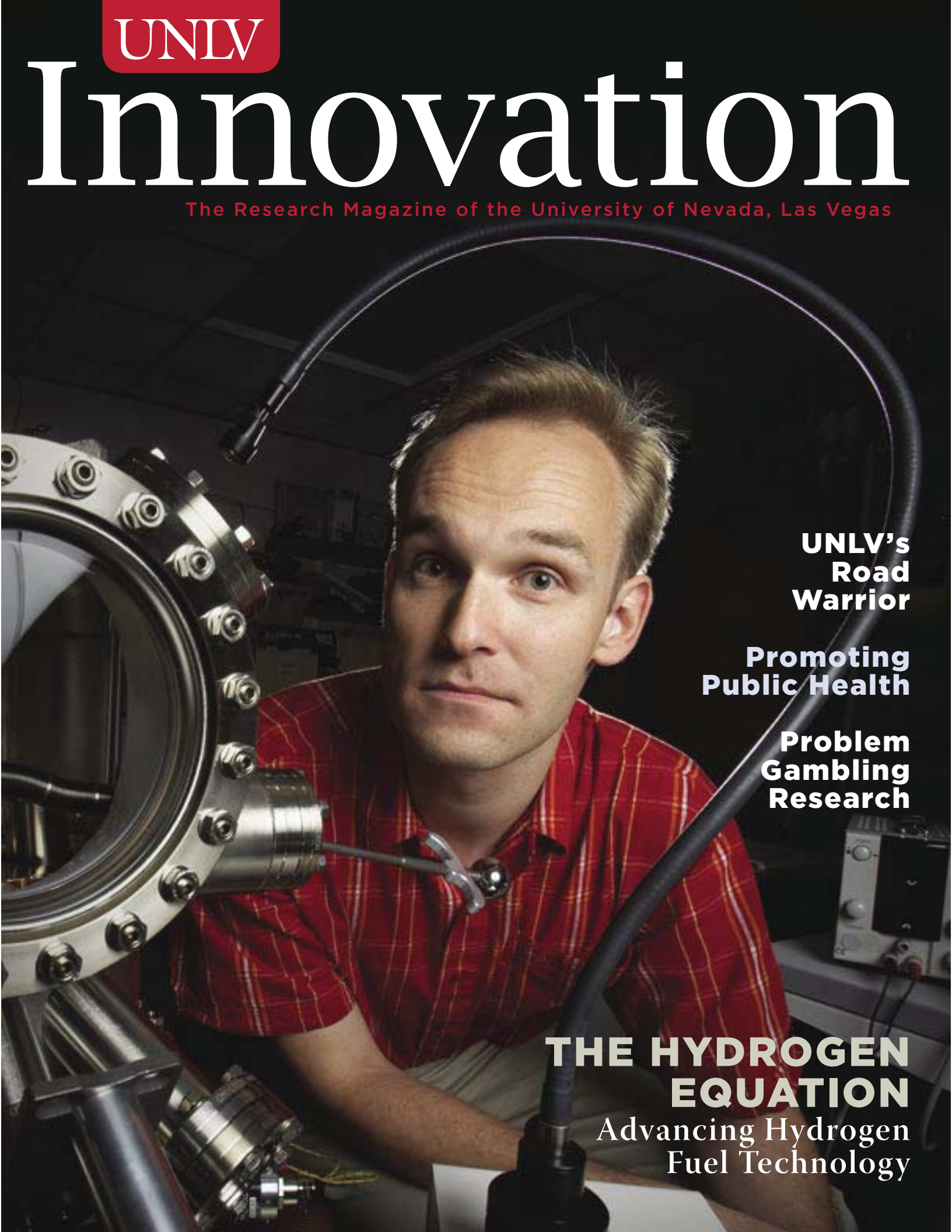
UNLV

Innovation

The Research Magazine of the University of Nevada, Las Vegas



UNLV's Road Warrior

Promoting Public Health

Problem Gambling Research

THE HYDROGEN EQUATION

Advancing Hydrogen Fuel Technology

New Leadership and Dedication to Research

David B. Ashley
UNLV President

UNLV's Commitment to Research

In my first few months at UNLV, I have made it a priority to learn as much as possible about the campus, meeting often with faculty, staff, and students, as well as interested constituent groups. Through these interactions I have discovered a great deal about the fine research that is being conducted at UNLV.

For a young institution, UNLV has made tremendous advances in building its reputation as a university committed to research. Evidence of this commitment is seen in a number of campus developments, such as our classification in the category of "high research activity" by the Carnegie Foundation for the Advancement of Teaching; sizable gains in research funding in recent years; and the construction of the new Science and Engineering Building, which is profiled in this publication.

As our university continues to grow, the advancement of research will become an even greater priority. Excellence in research is an integral characteristic of major universities, and UNLV must remain dedicated to supporting and enhancing this endeavor. Much of our progress will depend on our success in this area.

In the next stage of our evolution as a major public university, we must continue to focus our research activities in areas that bring prominence to the institution and that involve, educate, and inspire our students. It will also be critical to conduct research that both engages and benefits the community and state. You will find examples of such timely, relevant research in the following pages. We hope that these stories are as enlightening as they are helpful in demonstrating the importance of UNLV research.

David B. Ashley
UNLV President

Mark Rudin
Interim Vice President
for Research
& Graduate Dean

Advancing Innovative Research

We are delighted to bring you another issue of UNLV's research magazine highlighting the outstanding work of our faculty. This issue contains a diverse selection of stories about UNLV research on such topics as transportation, hydrogen fuel, problem gambling, and public health. These are some excellent examples of UNLV research, but they represent just a sample of the exceptional work that is being performed.

You may recall seeing our very first issue of this publication last year under the name *UNLV Fusion*. We have implemented a name change in this issue with the goal of better reflecting the nature of research at UNLV. "Innovation" is a term that truly applies to all forms of research at UNLV and most appropriately captures the spirit of the research enterprise. We hope you enjoy this issue and that it enables you to better understand the scope and significance of research at UNLV.

Mark Rudin
Interim Vice President
for Research and Graduate Dean

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UNLV
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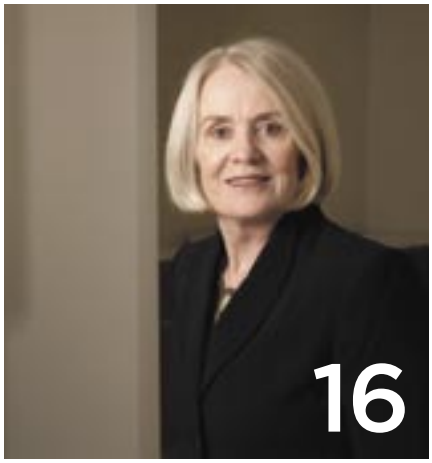


Features

Departments

Building On Success

The new Science and Engineering Building will be a sophisticated facility where interdisciplinary research and education will flourish

By LaNelda Rolley

To the casual observer, the large construction site on the north side of the UNLV campus is simply a sign of the times: Another major university building is being erected to accommodate the institution's continuing growth.

But to the UNLV faculty who will move into the new Science and Engineering Building, the construction site represents much more.

To them, it is the future of research at UNLV – a physical manifestation of the university's continuing advancement as a nationally recognized research institution.

The Science and Engineering Building (SEB) will seek "to create a world-class environment for interdisciplinary research and education," according to Mark Rudin, interim vice president for research and graduate dean.

"The building will support innovative research approaches and will house new technologies that are conceived and developed through collaboration among faculty in the sciences, engineering, fine arts, and allied units on campus," Rudin says. "It will truly be a remarkable environment for research."

The SEB's interdisciplinary focus exemplifies a trend in higher education and private industry to foster collaborative research to advance knowledge, Rudin adds. The building is strategically located on campus – on Cottage Grove Avenue just north of the Thomas T. Beam Engineering Complex – to support research in the disciplines of science, engineering, and entertainment technology, which are based in that area. It is anticipated that the interdisciplinary approach to programming the building will not only support and enhance ongoing research, but will also serve as an attraction to national and international researchers.

Establishing the Need

The vision for the SEB began to take shape several years ago as community and state leaders, including Gov. Kenny Guinn, key legislators, and members of the Nevada Development Authority and the Las Vegas Chamber of Commerce, identified economic diversification as one of the

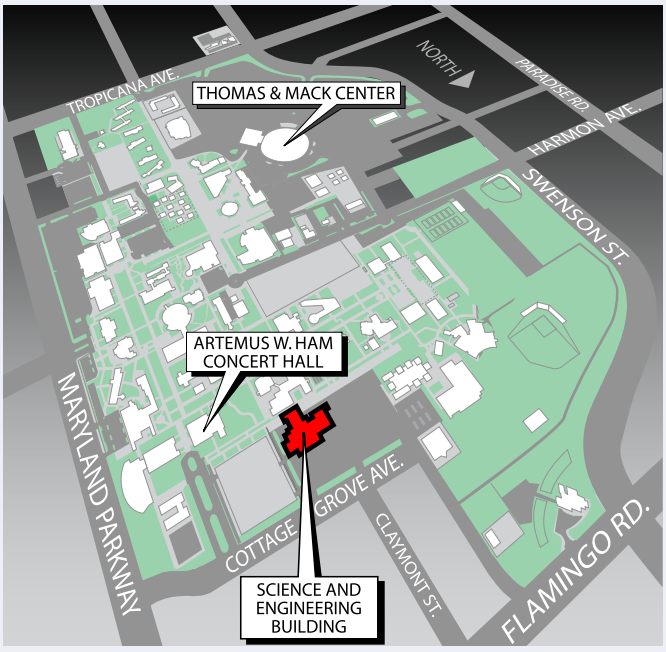
state's top priorities. They highlighted the need to provide additional space for the education of a highly sophisticated workforce and for research on new technologies with commercialization potential that would support a more diverse Nevada economy.

In the meantime, enrollment growth has placed heavy demands on UNLV's engineering and sciences colleges. From 1996 to 2005, the university experienced a 66.5 percent increase in the number of undergraduate and graduate students seeking degrees from the Howard R. Hughes College of Engineering and the College of Sciences.

Additionally, UNLV had been successful in attracting faculty from the top institutions across the nation but began to find limited space for research. An analysis conducted in 2000 revealed that the university had only 96,862 square feet of science and engineering space, compared to the national average of 359,862 square feet for doctorate-granting research universities.

Another striking statistic came from a February 2002 study conducted by the Nevada Development Authority indicating that 80 percent of Nevada's top high school students left the state for their post-secondary education and did not return upon completion of their degrees.

It became clear a new science and engineering facility would be critical to the future of UNLV and Nevada. University, government, and the private sector representatives recognized a shared interest in building such a facility and began to commit time and resources to advocating it. Support for the new building expanded, and it moved from the university's wish list to the top of the state's planning and construction project list. The building was approved by the 2001-03 Nevada Legislature.



The Planning Process

Faculty input was considered critically important to the SEB planning effort. The university began holding visioning sessions early on involving faculty committees, as well as a steering committee composed of key administrative and faculty leaders, including Dr. Peg Rees, associate vice president for research and community outreach; Thomas Hagge, associate vice president for facilities management and planning; Susan Hobbes, director of planning and construction; Dr. Rod Metcalf, associate professor of geoscience; and Dr. Bill Culbreth, associate dean of the Howard R. Hughes College of Engineering. The science, engineering, and fine arts deans were also fully engaged in the planning process.

The visioning sessions set the stage for the building, and four major objectives were identified: 1) provide an academic setting to foster collaboration and interaction among the disciplines of science, engineering, and fine arts; 2) optimize lab space and operational systems to gain functional efficiency in the circulation of people, data, and materials; 3) utilize sustainable design principles to conserve water, energy, and natural resources; and 4) accommodate future growth.

An overarching goal in planning the building was to ensure that it would enhance research activity involving the following interdisciplinary research areas:

- Information, data, and communications technology;
- Arid lands environmental science, policy, and engineering;
- Energy and materials science and engineering; and
- Entertainment and convention technology and engineering.

In support of these areas, a dozen core laboratories, listed below, were programmed into the building.

- National Supercomputing Center for Energy and the Environment
- Earth Materials and Environmental Chemistry Center
- Environmental Soil Analysis Center
- Geographic Information Systems Laboratory
- Graphics and Visualization Laboratory
- Greenhouse
- Imaging and Electron Microscopy Center
- Nanotechnology Center
- Nevada Isotope Geochronology Center
- Nuclear Magnetic Resonance Laboratory
- X-Ray Diffraction – Single Crystal Laboratory
- X-Ray Diffraction – Earth Materials Laboratory

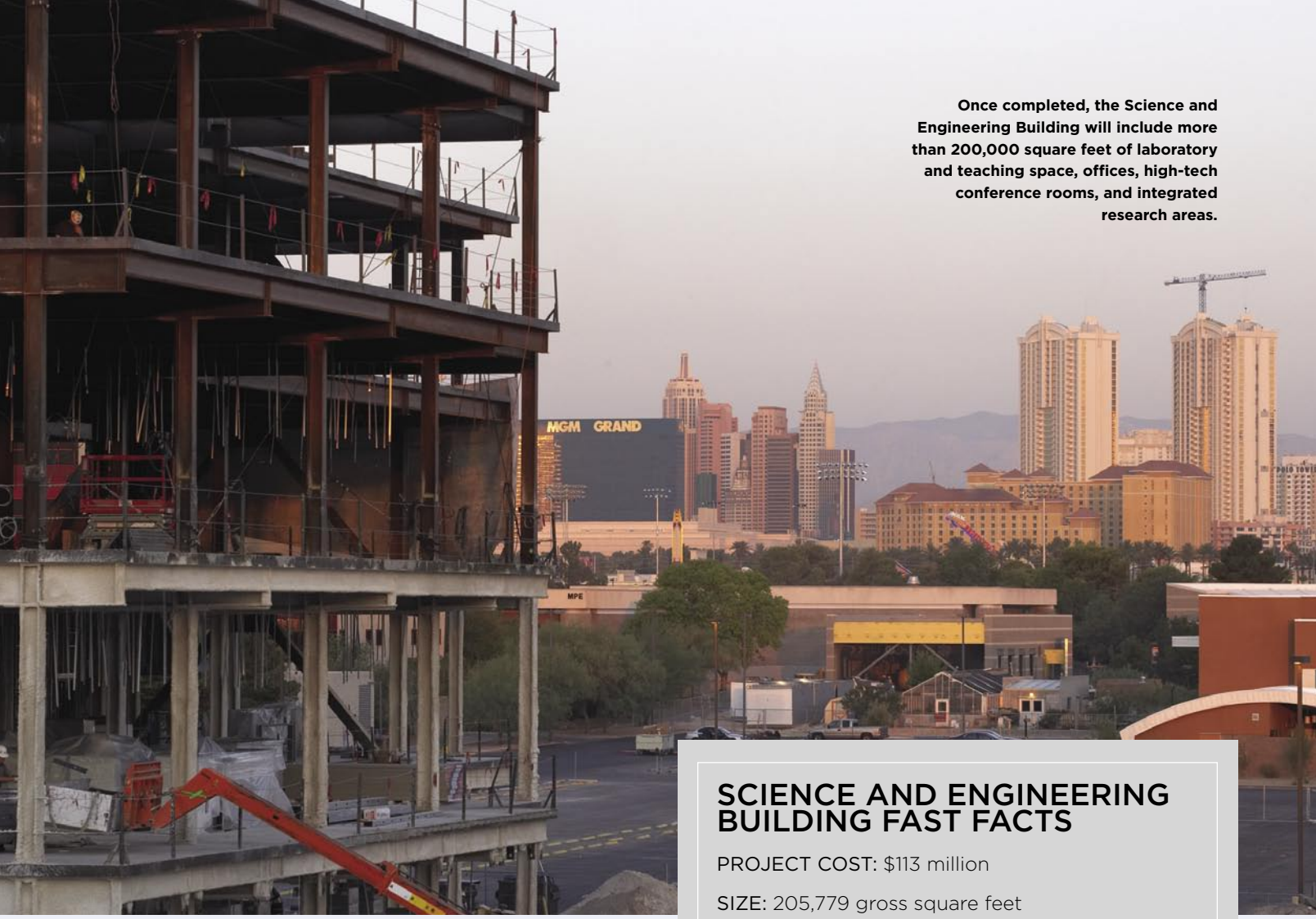
An Environmentally Friendly Design

The momentum in planning the building continued to grow as drawings emerged from the architects, revealing an environmentally conscious, state-of-the-art facility.

"A central design goal was for the building to obtain the Leadership in Energy and Environmental Design (LEED) certification," Rudin says, noting that the certification is a green-building rating system for developing high-performance, sustainable buildings.

The architects – Dekker, Perich, Sabatini of Las Vegas

MAP: DAVE MELTON; PHOTOGRAPH: AARON MAYES



Once completed, the Science and Engineering Building will include more than 200,000 square feet of laboratory and teaching space, offices, high-tech conference rooms, and integrated research areas.

– described their design approach as "driven by solid sustainable design principles, paired with the desire to create a comfortable environment that sparks discovery, provides space for diversity and flexibility, and gives the building a unique image with a sense of place."

Once completed, the building will include more than 200,000 square feet of laboratories, teaching space, offices, high-tech conference rooms, and integrated research areas that can be effortlessly converted from one use to another.

The building will also embrace the environment of Southern Nevada. Natural stone quarried in the area will be included in certain portions of the building, and water and energy efficiency will be an important characteristic of the building's engineering. Educational signage will enhance visitors' understanding and appreciation of the facility.

Perhaps most important, this functional, unique, and aesthetically pleasing building will house some of the most technologically advanced equipment available, thus facilitating the conduct of research that will serve both the university and the community, Rudin says.

"The end result will be a beautiful building that will also be a remarkable research facility," Rudin says. "The university, state, and community will be proud of their investment in it."

SCIENCE AND ENGINEERING BUILDING FAST FACTS

PROJECT COST: $113 million

SIZE: 205,779 gross square feet

ARCHITECTURE FIRM: Dekker, Perich, Sabatini, Las Vegas

CONSTRUCTION FIRM: Sletten Construction, Nevada

ESTIMATED COMPLETION DATE: 2008

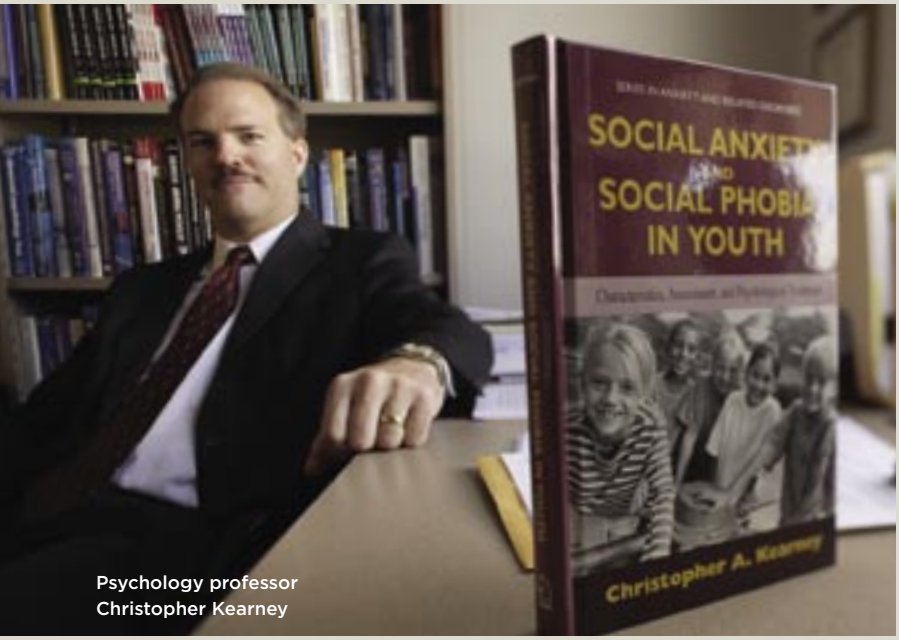
SPECIAL FEATURES:

- Designed for interdisciplinary teaching and research with flexible classrooms and a 200-seat auditorium
- State-of-the-art laboratories
- "Smart" conference rooms
- Integrated research space
- Satellite energy plant, housed in a separate building, to provide heating and cooling for the SEB and future buildings on the north side of campus
- Space for 116 offices
- Digital production facility for distance learning
- Design received 2004 Citation Award in the Unbuilt Category for the AIA (American Institute of Architects) Nevada Design Awards

In Print

UNLV faculty authors shed light on social anxiety in children, implementing change, and more

By Barbara Cloud



Psychology professor Christopher Kearney

While many children experience social anxiety in certain settings, approximately 4 percent experience it so severely that it profoundly affects their lives. They are simply unable to participate in normal social activities.

This debilitating anxiety experienced by children is the focus of a new book by Dr. Christopher Kearney, professor and director of clinical training in the department of psychology, who serves as the director of the UNLV School Refusal and Anxiety Disorders Clinic.

Kearney, who based the book in part on his work at the clinic, delves into the issues involved in this complex problem that often incapacitates the affected children in social settings and deeply concerns their parents.

"Of all the expectations we have regarding our children, a basic one is that they will enjoy being with other people," Kearney writes. "We hope our children will be generally popular and well liked by classmates, happy to speak to relatives, respectful of others, compliant to adult requests, willing and able to have friends, enthusiastic about attending social events, and cheery and confident with peers."

Kearney notes, however, that many of the children he sees at the UNLV School Refusal and Anxiety Disorders Clinic have "such strong social anxiety that they have great trouble making friends, going to school, or even speaking to people in public."

To compound the matter, Kearney says, full appreciation of the problem by the psychology community is relatively recent, dating from the 1980s. Even today, he notes, the prevalence of childhood social phobia is unclear.

In his book, Kearney describes assessment and treatment procedures that he and his colleagues have developed at the clinic and elsewhere. Kearney, who opens the book with a set of examples of the kinds of problems children experience, goes on to define several kinds of social phobias and related disorders. He then reviews the literature relating to the various personality traits–such as introversion, shyness, behavioral inhibition, social withdrawal, and social and performance anxiety–that, in extreme forms, become social phobia. Psychological assessment tools and treatment strategies follow.

Kearney became interested in the psychology of young people as an undergraduate at the State University of New York at Binghamton, while working with youths with autism. His interest in the area expanded in graduate school at the State University of New York at Albany, where he assessed and treated children with anxiety disorders and school refusal behavior at an anxiety disorders clinic.

"I have always enjoyed the challenge of working with children and adolescents," he says, adding that he hopes the book helps the psychology community better understand the disorders. "To see kids becoming more comfortable socially – going to school, making friends, doing these things for the first time or doing them on a consistent basis for the first time – is very gratifying."

PHOTOGRAPH: AARON MAYES

GUIDE TO LICENSING AND ACQUIRING ELECTRONIC INFORMATION
BY CHRIS SUGNET (WITH STEPHEN BOSCH AND PATRICIA A. PROMIS)
SCARECROW PRESS, 2005

Chris Sugnet's extensive experience with library collection development made him the right person for the job of updating a guide to acquiring information in electronic formats. Thus, the American Library Association asked the director of UNLV Libraries' Collection Management to lead the project.

Originally published in 1994 and updated in 2005 after a "sea change in the information market," the **Guide to Licensing and Acquiring Electronic Information** will aid library staff members as they seek the many and varied types of electronic material available today: journals, books, DVDs, videotapes, video games (instructional and recreational), CD-ROM, software, and locally and remotely loaded full-text content.

Sugnet (pronounced Soon-yā) says the guide is intended to "empower colleagues and help them compete in the new information marketplace."

"I especially hope it helps institutions in states where limited funding has most seriously impacted accessibility to scholarly information," says Sugnet, who is responsible for obtaining such materials with the UNLV Libraries' acquisitions budget of $5 million – an amount that he acknowledges doesn't go far these days in stocking library shelves.

The guide opens with a discussion of different kinds of electronic material and offers advice on selection, examining the issues associated with such questions as, "What hardware will you need to use the material?" Discussion is offered on major issues to be considered during the acquisition process and the many factors involved in licensing.

"We are now immersed in an environment in which academic library budgets have been battered by the increasing commercialization of the scholarly communication process," Sugnet says. "This has led to extravagant annual pricing increases for journals and other resources. Unlike most European and all other English-speaking countries, the U.S. does not have a national licensing agency to negotiate the fairest deals. This guide is an attempt to help librarians level the playing field."

Sugnet's collaborators on the guide, Stephen Bosch and Patricia Promis, are librarians at the University of Arizona Library. The guide also contains contributions by Trisha Davis of Ohio State University.

"The electronic information environment is changing so rapidly that a year of change in the new millennium equals a decade or more back in the '80s," Sugnet says. "A guide like this should be very useful in today's market."

For Dr. Gene Hall, a professor in UNLV's department of educational leadership and former dean of the UNLV College of Education, the phrase "change is the only constant" takes on special meaning: For more than 30 years, change – or, more specifically, understanding change as a process in organizational settings – has been a nearly constant subject in his research.

Hall's latest book in this field, a second edition of **Implementing Change**, written with longtime collaborator Shirley M. Hord, gives readers a model to guide them in facilitating change.

Hall's interest in the subject emerged when he was a new faculty member at the University of Texas at Austin, many years ago. "One of my first assignments was to work as an external change agent to 40-plus higher ed institutions around the United States that were implementing innovative teacher education programs," Hall recalls. "Some of the key constructs in my model of change, the Concerns-Based Adoption Model (CBAM), were derived from that experience."

IMPLEMENTING CHANGE: PATTERNS, PRINCIPLES, AND POTHOLES, 2ND EDITION
BY GENE E. HALL (WITH SHIRLEY M. HORD)
ALLYN & BACON, 2006

Hall received several large contracts from the National Institute for Education to develop measures and to verify whether key CBAM constructs were representative of real-life change processes. Hord, from the Southwest Educational Development Laboratory in Austin, Texas, was "one of the talented colleagues," Hall says, who joined the research team and has collaborated with him for 30-plus years.

"We are known as the 'godfather' and 'godmother' of CBAM, one of about four paradigms that are used around the world for understanding, studying, and facilitating change."

Hall and Hord start from the assumption that change "is a process, not an event."

"This is more true today than ever," Hall says, advising that viewing change as a process is key for those working in organizations. "Don't make change an event; do not assume that it is ever 'done.' Enjoy the process."

"We also emphasize that there is a personal side to change. You can't just deal with the innovation. You have to understand the role of people in the process."

Each chapter in the book describes a key change construct that Hall, Hord, and their colleagues have developed and researched over the years.

Hall notes that in a climate calling for education to pay more attention to the way accomplishments are achieved in the private sector, *Implementing Change* is one example of "academic research and ideas that are applicable in business."

He notes that the concepts introduced in the book have already been adopted with success by a national company as it went through major restructuring.

Commending Creativity

UNLV has dominated the Regents' Creative Activities Awards, drawing attention to the varied artistic talents found in several disciplines on campus

By Tony Allen

The creative activities of UNLV faculty members have been acknowledged the world over. Their works of art have been displayed in the finest galleries; their performances have graced important stages across the globe. Award-winning authors, composers, and architects are included among their ranks.

When it comes to accolades, however, some say that there is no greater honor than to be acknowledged at home.

For more than a dozen UNLV faculty members, the Regents' Creative Activities Awards are particularly prized for that reason.

UNLV faculty have received 14 of the 16 awards bestowed since the statewide honor was established in 1993 to recognize faculty with distinguished records of creative activity.

The award, which carries a $5,000 stipend, is presented annually to faculty members at institutions within the Nevada System of Higher Education (NSHE).*

"UNLV has placed an increased emphasis on the arts in recent years," says Jeff Koep, dean of the College of Fine Arts. "Recognition such as the Regents' Award serves to inform the community that our faculty are not only teaching but are also engaged in the creative process and are making great contributions in their fields."

Faculty members from the School of Architecture and the departments of theatre, film, music, dance, art, and English have all received the Regents' Award for Creative Activities.

"The College of Fine Arts has attracted some remarkable artists," says Mark Hoversten, professor of architecture and winner of the Regents' Award for Creative Activities in 2003. "When I look around at faculty meetings, I have great respect for the colleagues sitting next to me and for the effort it has taken to recruit and retain them.

"Awards like this bring positive attention to the school of the recipient," he adds. "They also help inform people about the discipline and can help other agencies connect with faculty."

Beyond the recognition the award brings to the university, it also sends a positive message to students – namely, that their professors are leaders in their disciplines.

"Creativity is the core," says Catherine Angel, professor of art and internationally recognized photographer, who won the Regents' Award in 2004. "If I understand the creative process because I'm engaged in it, then I bring that understanding to the classroom, and the students can see it. Research, creative activity, and teaching go hand in hand in that I feel I'm a more effective teacher when I'm doing the work."

The ability to blend creative activity and teaching is one award selection criterion. Selection committee members, who represent the NSHE office and each of the

"Recognition such as the Regents' Award serves to inform the community that our faculty are not only teaching but are also engaged in the creative process and are making great contributions in their fields."

– Jeff Koep, dean of the College of Fine Arts

From left, Regents' Creative Activities Award recipients Richard Wiley, Mark Hoversten, Catherine Angel, and Dean Gronemeier

participating institutions, also consider student and peer feedback, as well as the significance, volume, and quality of a candidate's body of work.

"It takes an incredible artist and an incredible teacher to even be nominated," says Koep, who has nominated several of UNLV's winners. "I look at who's pushing the envelope, but also who can seamlessly connect what they teach with what they do. Our professors clearly practice what they preach, which keeps them sharp both as artists and as faculty members."

Creative writing is another area the award acknowledges; two creative writing professors, Douglas Unger and Richard Wiley, are among the winners.

"Certainly, creativity is a part of all scholarly activity," says Ed Shoben, dean of the College of Liberal Arts. "It is particularly evident in the works of our award-winning authors."

"Receiving an award like this is very helpful in that it provides a certain cachet," says Wiley, who won the first award in 1993. "It's as it is everywhere: Once an artist is vetted by a prize, people tend to take him or her more seriously."

Dean Gronemeier, associate dean of the College of Fine Arts and the 1998 recipient of the award, agrees, noting that the large number of these honors received by UNLV faculty is an indication of the talent and creativity to be found at the university.

"The Regents' Awards bring attention to the work of the recipients and to the success of the institution," Gronemeier says. "They serve as another form of acknowledgement of UNLV's growing reputation."

**Two awards per year were presented in 1994 and 2000.*

UNLV Regents' Creative Activities Award Recipients

YEAR	NAME	DEPARTMENT
1993	Richard Wiley	English
1994	Jerry Crawford	Theatre
1994	Hart Wegner	Film Studies
1996	Virko Baley	Music
1997	Carol Kimball	Music
1998	Dean Gronemeier	Music
1999	Julie Jensen	Theatre
2000	Louis Kavouros	Dance
2001	David Hickey	English
2002	Stefan Karlsson	Music
2003	Mark Hoversten	Architecture
2004	Catherine Angel	Art
2005	Douglas Unger	English
2006	George Stelluto	Music

PHOTOGRAPH: AARON MAYES

Field of Dreams

To the new executive director of the UNLV Research Foundation, the university's planned research park is 115 acres of opportunity

By Suzan DiBella

When Bud Pittinger first visited the university to interview for the post of executive director of the UNLV Research Foundation, he wanted to see firsthand the site of the UNLV Harry Reid Research and Technology Park.

"I wanted to walk the land," Pittinger says of the 115-acre parcel located in southwestern Las Vegas. "I stood on the site and looked out on to two mountain ranges and into the valley. What a fantastic opportunity, I thought. How exciting it is to have this extraordinary land for the research park. I could feel the adrenaline flowing."

Pittinger, who assumed leadership of the Research Foundation in May 2006, is still excited by the opportunities presented both at the research park and at the Research Foundation. He is actively implementing many projects, including real estate development of the research park and the creation of business partnerships that will benefit the university.

Pittinger, who most recently served as executive vice president and chief operating officer at the Baylor College of Medicine before joining UNLV, brings to his new role here varied management experience in a number of fields, including health care, academic medicine, managed care, pharmaceuticals, and higher education.

He has served as vice president for operations in the clinical sciences and product development division of Merck & Co.; as global clinical research operations officer for Eli Lilly and Co.; as senior vice president at the University of Pennsylvania Health System and CEO of the Hospital of the University of Pennsylvania; and as chief operating officer at the University of Michigan Medical Center's Department of Medicine.

At Michigan, Penn, and Baylor, Pittinger gained experience in large-scale site and facility development, helping to guide building projects of more than $1 billion at each institution.

Pittinger's first order of business at the UNLV

PHOTOGRAPH: GERI KODEY

Bud Pittinger, executive director of the UNLV Research Foundation, at the site of the UNLV Harry Reid Research and Technology Park

Research Foundation is putting such experience to work developing the research park. The U.S. Bureau of Land Management completed the transfer of the research park land to the UNLV Research Foundation in May 2005, and Pittinger has worked since he arrived to establish a research-based business incubation environment there.

The plan for the park, Pittinger explains, is to provide research space to attract research- and development-focused high-tech companies that seek to work in partnership with UNLV and its faculty researchers.

This will mean greater opportunities for faculty to become more directly involved in the development of products in their research areas, Pittinger says. There will also be educational and employment opportunities for graduate students and greater access to UNLV's centers of excellence by the private sector.

Additionally, the commercialization process is capable of producing a considerable revenue stream for the university and its faculty, Pittinger says, adding that the research park will also provide highly valued, state-of-the-art laboratory space. Once developed, it will also contribute to the economic diversification of Southern Nevada.

"We want to attract high quality companies that are compatible with our research priorities and culture," Pittinger says.

The key in the short term, Pittinger says, is taking a systematic approach to the process of establishing partnerships and developing the research park.

"First, it's important that we identify where the university's strongest research programs and related faculty are and which have the most potential," he says. "We are in that process now, and once we have determined those research strengths, we will have a portfolio of assets to bring to the table to discuss with prospective private-sector partners."

The next step is reaching out to the business community – in Southern Nevada, the state, and the U.S. – to locate companies with an existing affinity for those strengths and to begin exploring the possibilities with them, he adds. He notes that he is making contacts with such businesses through close working ties with the Nevada Development Authority and UNLV's own Research Foundation Board of Directors.

He will be reaching out to the university community as well to demystify the processes of building business relationships while seeking private and government resources to support and fund faculty research and education activities conducted primarily at the park.

"I am absolutely committed to enhancing communication with faculty and staff about what the Research Foundation does," he says. "The campus community must know that the Research Foundation will protect their interests in these business relationships. We are here to support the faculty and to further the endeavors of the university."

In addition to building the research park, he says, the Research Foundation will support the university's technology transfer effort. Pittinger will work with the university's technology transfer office to encourage UNLV faculty to protect their intellectual property and to help them explore opportunities to bring their discoveries to the marketplace and society. Additionally, Pittinger says he will continue to support the transition of the Research Foundation's funded research projects into university academic programs.

While he acknowledges that there is much to be accomplished, Pittinger is clear that the successful development of the UNLV Harry Reid Research and Technology Park will benefit all involved partners. It is a long-term project he embraces with enthusiasm.

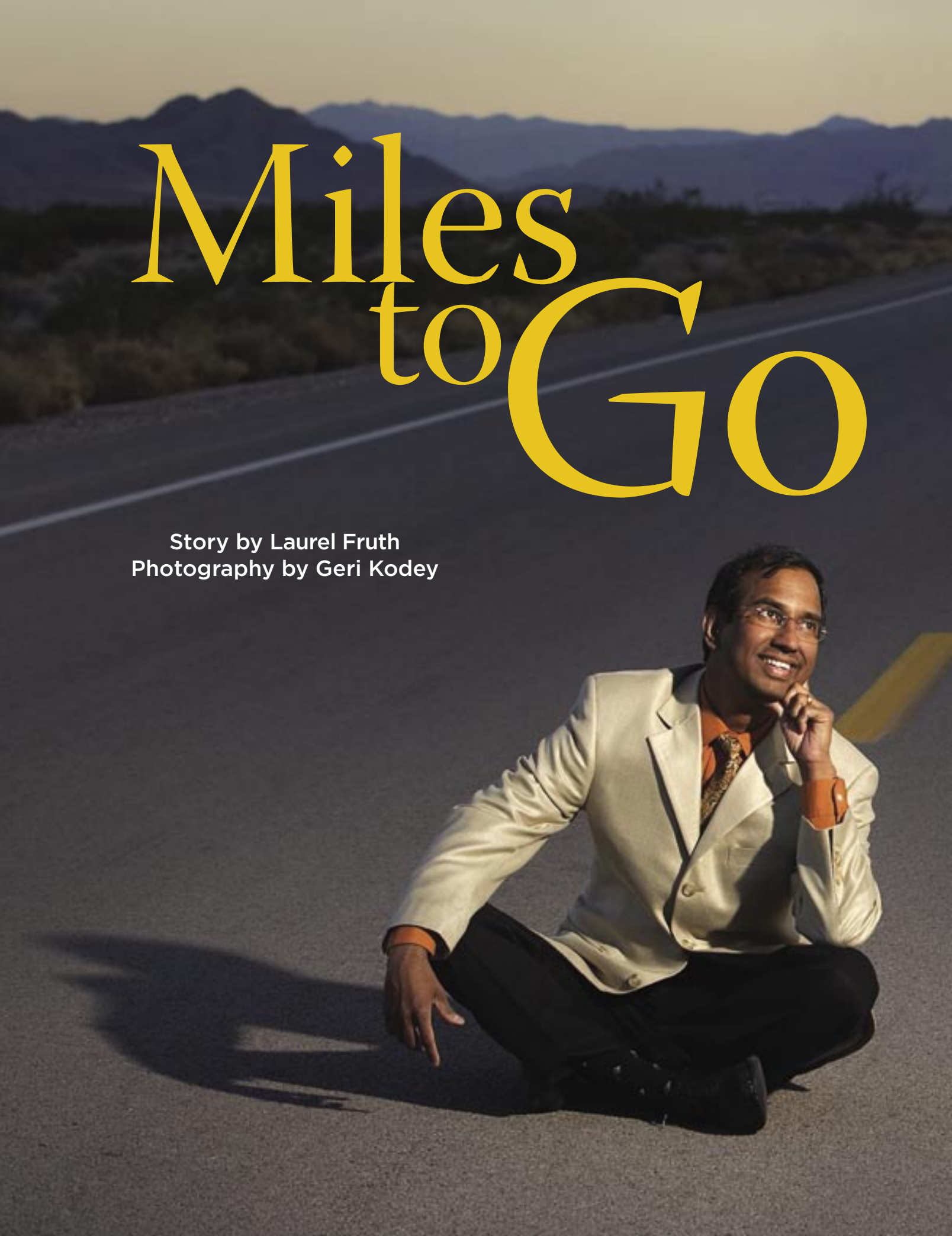
"In many of the development projects I have undertaken, the site was landlocked," he says. "There was barely an acre or two upon which to build, let alone 115 acres available to create 3.2 million square feet of research space. The research park site here holds so much promise. I would have to say my enthusiasm for this project – for building both the facilities as well as the research housed there – is unbridled. And it is my hope that the rest of the campus community shares in this commitment."

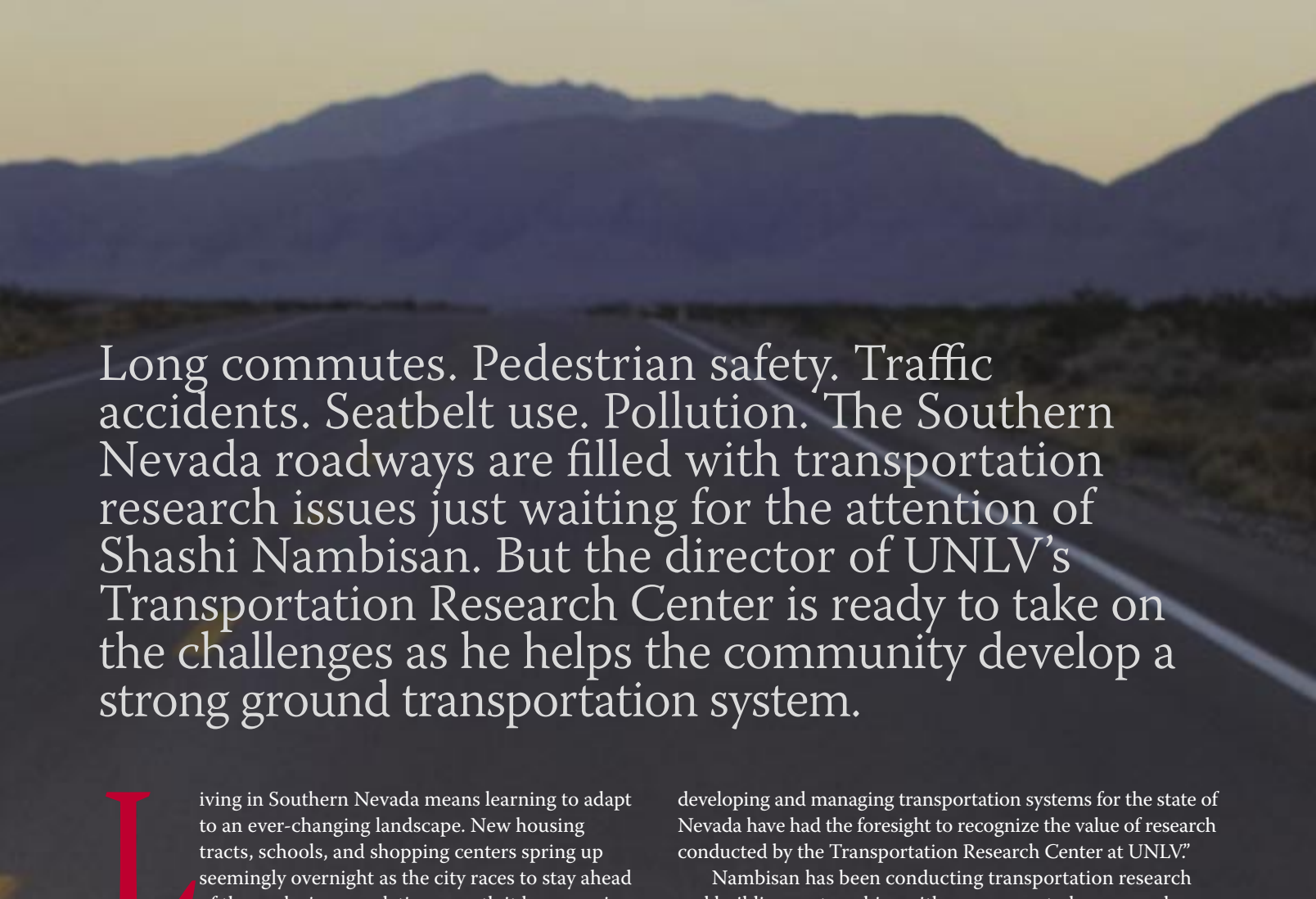
"We are here to support the faculty and to further the endeavors of the university."

—Bud Pittinger, executive director of the UNLV Research Foundation

Miles to Go

Story by Laurel Fruth
Photography by Geri Kodey





Long commutes. Pedestrian safety. Traffic accidents. Seatbelt use. Pollution. The Southern Nevada roadways are filled with transportation research issues just waiting for the attention of Shashi Nambisan. But the director of UNLV's Transportation Research Center is ready to take on the challenges as he helps the community develop a strong ground transportation system.

Living in Southern Nevada means learning to adapt to an ever-changing landscape. New housing tracts, schools, and shopping centers spring up seemingly overnight as the city races to stay ahead of the explosive population growth it has experienced in recent years.

And nowhere is that growth more evident than on the roadways.

Data from the Nevada Department of Motor Vehicles indicate that in 2005 there were approximately 675 vehicles for every 1,000 people in Clark County. With approximately 5,000 people per month moving to the area, the resulting addition of vehicles to Las Vegas roadways contributes to the city's dubious distinction as one of the top-20 most-congested urban areas. Additionally, a recent study published by the Texas Transportation Institute ranked Las Vegas as the 10th worst city for peak-period traffic congestion and the 39th worst in terms of annual hours of delay per traveler.

Civil and environmental engineering professor Shashi Nambisan empathizes with motorists who complain about long commutes and an overburdened transportation infrastructure. But as the director of UNLV's Transportation Research Center, Dr. Nambisan knows that a robust, efficient transportation system doesn't materialize overnight.

"It takes many, many years – perhaps 15 to 20 years – to develop a strong transportation system to meet the needs of a large metropolitan community that is facing the kind of growth Las Vegas is," Nambisan says. "Because Las Vegas is still growing, we can make changes now that will affect transportation outcomes in the future. And we're fortunate that those in charge of developing and managing transportation systems for the state of Nevada have had the foresight to recognize the value of research conducted by the Transportation Research Center at UNLV."

Nambisan has been conducting transportation research and building partnerships with government planners and engineers in Nevada since he joined the UNLV faculty in 1989.

One of the founding members of the TRC, Nambisan has served as principal investigator or co-investigator on more than 130 sponsored projects, garnering nearly $10 million in research funding for UNLV. He has authored 24 peer-reviewed articles and 55 conference publications, and he has made more than 145 professional presentations. Nambisan is also the recipient of numerous awards, including the UNLV Outstanding Faculty Member Award, the Nevada Regents' Graduate Academic Advisor Award, and the 2003 Institute of Transportation Engineers District Six Outstanding Educator Award.

In recognition of his prolific research record, Nambisan was awarded the prestigious Harry Reid Silver State Research Award in 2005. Additionally, his work with colleagues in the TRC was acknowledged later that year with the passage of a federal highway bill designating UNLV as a national University Transportation Center. The federal designation provides grant funding of $500,000 per year over a four-year period to address surface transportation issues, including research, workforce development, and education. In addition, several local municipalities have joined with the Regional Transportation Commission of Southern Nevada to provide the required match of $500,000 annually for this program.

Nambisan is pleased with the University Transportation Center designation because it provides long-term funding and

Nambisan guides engineering graduate student Ancilla Kaiparambil, who works as a research assistant at the TRC. "Our graduates often have multiple job offers from local and national organizations and compete successfully for scholarships and awards," says Nambisan.

further strengthens UNLV's national visibility and reputation.

"National attention is important because it demonstrates that UNLV is a strong competitor for federal funds," says Nambisan, who earned a Ph.D. in civil engineering from the University of California, Berkeley. "The UTC designation will enable us to offer fellowships to attract top students to our program. In addition, the designation demonstrates that the work we do here at UNLV is valuable and significant. We credit our congressional delegation and Senator Harry Reid and his staff for calling attention to our efforts."

The Transportation Research Center is currently working with the U.S. Department of Transportation and other partners in Nevada to implement projects through the new UTC. Nambisan says UNLV has created a sub-division for the newly recognized center within the TRC to address issues typically handled by university transportation centers. The four-year funding will provide long-term stability for the center and will allow for the formation of new partnerships within the state.

Nambisan cites a proposed joint project with UNR's School of Medicine and the Lou Ruvo Brain Institute as an example of such partnerships; the project will address the transportation needs of those afflicted with dementia and other neurodegenerative diseases. According to Nambisan, this is a good example of the type of project that UNLV's University Transportation Center should undertake.

"When the highway bill goes up for re-authorization in four years, we hope we will have demonstrated that we have been very good stewards of the resources provided and that we have used the resources in such a way as to merit renewal of the center," Nambisan says.

In the meantime, the Transportation Research Center will continue to work on its many ongoing projects with federal, regional, and local partners as well. One such project is the pedestrian safety study sponsored by the Federal Highway Administration (FHWA). Las Vegas is one of three cities in the country selected by the FHWA as sites for the study of high-risk pedestrian areas within urban boundaries and the effectiveness of specific countermeasures implemented to improve pedestrian safety. Results from the Las Vegas study will be compared to those in the cities of Miami and San Francisco to determine if safety strategies that work here also work in other urban settings. Findings of this research will ultimately be used in the selection, implementation, and evaluation of safety improvements across the country.

Improving safety is also the focus of a series of projects the TRC is undertaking with the Nevada Office of Traffic Safety. Nambisan says the goal of these projects is to enhance pedestrian, motor vehicle, and bicycle safety through community-based engineering, education, enforcement, and emergency medicine efforts. Examples of some of these projects include surveying the use of seatbelts, child-safety seats, and bicycle helmets throughout the state; analyzing statistics on traffic crashes involving pedestrians; and participating with more than 40 local agencies in a Safe Community Partnership Program to review safety data and identify the most pressing safety needs for Clark County.

The Regional Transportation Commission of Southern Nevada (RTC) has also developed a long-standing research partnership with Nambisan and his colleagues at the TRC. The projects for the RTC have addressed transportation planning and operational needs, as well as safety-related initiatives.

Additionally, the Clark County Department of Public Works has asked researchers in the TRC to help automate the management of public works projects. This involves developing ways that off-the-shelf technology such as PDAs and/or laptops can be used by technicians in the field to record work completed or document problems encountered on the roadways. One of the goals of the project is to help facilitate scheduling and prioritizing of public works maintenance projects.

Nambisan says he enjoys the applied nature of transportation research because it enables him to make a difference in a relatively short period of time. As an example, he describes a study on

bus turnouts that the TRC completed for the county in 1990.

"It used to be that when a bus stopped to pick up passengers, cars would line up behind the bus," he says. "We did a simple, common-sense study that demonstrated that bus turnouts could reduce congestion on the streets and also improve air quality, and the county accepted the recommendations. Now every time a major arterial is built in the county, a bus turnout is also built at prospective bus stop locations close to intersections."

Another of Nambisan's major long-term projects involves the evaluation of the risks associated with the transport of radioactive material to Yucca Mountain. Since 1989, he has guided projects that have resulted in the development and deployment of Geographic Information Systems-based technology that assists state and local agencies in assessing risks related to the potential transport of nuclear waste through the state's transportation infrastructure. This study dates back nearly to the creation of the TRC itself.

Nambisan explains that in 1988, UNLV established the Nuclear Waste Transportation Center under the stewardship of Dr. Bill Wells, then-dean of UNLV's Howard R. Hughes College of Engineering. The center was to be funded through federal legislation that provided grants for work related to Yucca Mountain. The following year, UNLV hired Nambisan, along with two other faculty members, to initiate research programs at the Nuclear Waste Transportation Center (which eventually evolved into the TRC). They were also asked to build a curriculum in transportation-related civil engineering.

"Between the time I signed my contract and when I arrived at UNLV, several federal and state policy changes had occurred, however, resulting in a dramatic reduction in the funding level that was anticipated to support the center and the transportation engineering program," Nambisan says. "So I was told that I needed to find funding to sustain and grow the center and the program."

And find funding he did, for that project and many others. Today, research funds obtained through the TRC support the work of more than 30 researchers, including 14 graduate students, five undergraduate students, five professional staff members, and nine faculty members.

Nambisan credits his colleagues in the Howard R. Hughes College of Engineering, including the faculty, professional staff, and students, for helping the TRC become the highly regarded research center it is today. He says he is most proud of the team effort that has evolved at the center and the accomplishments of the students he has worked with during the past 17 years.

"Our graduates often have multiple job offers from local and national organizations and compete successfully for scholarships and awards. I see this as one more indicator of the strength of our program," he says.

Despite the successes of the TRC, Nambisan insists there is no time for resting on one's laurels. The ongoing rapid growth of the community continues to provide ample opportunity for research and makes the Las Vegas metropolitan area an ideal spot to study transportation issues. As a researcher, Nambisan says, he appreciates the many and varied transportation challenges available for analysis in Southern Nevada. But he's quick to add that he would happily divest the town of its rankings as one of the most congested urban areas of the country for a number of reasons.

"We are naturally committed to improving the transportation system of the area; that is our primary goal. But we also live and work in the community. We have to drive home everyday, too," he says. "Not even transportation researchers enjoy a long commute."

FACULTY AND STAFF AT THE TRC

Laxmi Gewali
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Former Assistant Research Professor & Assistant Director

Maggie Saunders
Coordinator, Pedestrian & Bicycle Safety Program

Vinod Vasudevan
Transportation Systems Analyst

A Healthy Dose of Research

UNLV's School of Public Health conducts a variety of research projects to help address pressing community health concerns

Story by Suzan DiBella
Photography by Aaron Mayes

The daily headlines reflect a steady supply of issues of interest to UNLV's School of Public Health.

The feared flu pandemic, lead levels in children, disparities in the provision of health care to underserved populations, and the leukemia cluster in Fallon, Nev., are just a few of the urgent public health concerns facing the community and state.

All of them present distinct research challenges to Dr. Mary Guinan, the founding dean of UNLV's School of Public Health, and her 15-member faculty.

Perhaps the biggest challenge of all, however, is deciding which to address first, Guinan says.

"Nevada is a state with many unique public health concerns," says Guinan, a former chief scientific officer for the Centers for Disease Control and Prevention. "The state can benefit dramatically from the research and education offered through UNLV's School of Public Health, and there's much to be accomplished."

Established in 2004, UNLV's School of Public Health has enrolled more than 230 students, 130 of them graduate students, in its first two years and has garnered more than $7.1 million in external funding. Like its counterparts across the country, the school seeks to achieve multiple goals – educating the next generation of public health professionals, partnering with government agencies and community groups to examine and help address pressing health concerns, and working to inform officials involved in public health decision- and policy-making.

Research, Guinan notes, plays an integral role in virtually all aspects of the school's activities, which are guided by a commitment to community engagement.

"Public health emphasizes disease and injury prevention and health promotion in communities rather than individual health care," Guinan says. "So the research agenda for the UNLV School of Public Health will always involve a wide spectrum of health issues. But the one consistent element will be a focus on community. We will always address concerns of the community and state, as well as partner with them on important public health issues."

Guinan, who formerly served as executive director of the Nevada Public Health Foundation and the Nevada State Health Officer, notes that it is conventional, necessary, and appropriate for schools of public health to partner with various governmental agencies and citizen and advocacy groups because of the nature of public health issues. Vast amounts of data are collected by public health agencies, and faculty researchers can aid in the analysis of that data. Community groups can be extremely valuable in outreach efforts, and both agencies and community groups can open many doors for researchers.

She notes as an example one research project in UNLV's

As dean of UNLV's School of Public Health, Mary Guinan helps provide researchers with the resources and facilities they need, such as the Environmental and Occupational Health Laboratory, seen here under construction.

Center for Health Disparities Research Director Michelle Chino, left, examines data with student research assistant Rubi Miller.

School of Public Health that involves the study of elevated lead levels in a number of products and environments. UNLV researchers recently began assisting officials from the Southern Nevada Health District as they examine the homes of children diagnosed with lead exposure in order to identify and remove dangers posed from lead-based paint and other products.

"This is a very exciting partnership," Guinan says. "It's the first time that lead testing has been conducted on a systematic basis in homes in this community. It will have a profound effect on prevention of lead poisoning in children."

Community partnerships will play an integral role in all of the school's five primary disciplines, which include environmental and occupational health; epidemiology; biostatistics; health promotion; and health care administration, Guinan notes, explaining the nature of each.

Environmental and occupational health emphasizes the role of air, water, the home environment, and the workplace as critical determinants of health. Researchers in this program examine, identify, and analyze what chemical, biological, or physical agents present health risks, and then work to propose ways to minimize or eliminate those risks. The previously discussed study of lead exposure serves as an example of the kind of research conducted in this field.

In epidemiology and biostatistics, researchers investigate human disease trends and patterns through extensive analysis of data provided from a variety of information sources, including birth and death statistics, disease registries, and other public health records. To identify the patterns or concentrations of disease in a given location – such as the aforementioned high incidence of childhood leukemia in the town of Fallon, Nev. – analysis from this field of study is required.

Health promotion, as its name implies, seeks to promote healthy lifestyles and disease prevention using a combination of strategies, including health education, risk factor detection, behavioral change, and health maintenance and enhancement. One example of a health promotion project under way at UNLV involves the North Las Vegas Fire Department. Faculty members in UNLV's health promotion department have established a partnership with the organization to help firefighters adopt healthy exercise regimens with the goal of preventing heart disease.

Finally, health care administration is the study of health care delivery systems and examines the quality, nature, and extent of the relationship between the health care profession and the community. An example of the type of project undertaken in this discipline is a planned study of the cost of – and access to – health care in Nevada. The department will soon hire a new health economics faculty member who will work to help improve access to quality health care for all Nevadans, including the unusually high number of those without health insurance in the state.

Additional research being conducted by the School of Public Health faculty has attracted substantial grant funding, according to Guinan. Some examples of these projects include the following:

- Dr. Shawn Gerstenberger, the chair of the environmental and occupational health department, is leading a team that analyzes lead levels in Mexican candy sold in local stores.

"We are very enthusiastic about our ability to produce the kind of research that can inform policy-making and begin to make a difference in the lives of our state's population." – Mary Guinan, dean of the UNLV School of Public Health

Gerstenberger and his graduate student researchers have tested more than 4,000 pieces of candy and their wrappers using a sophisticated portable lead analyzer. Of approximately 100 brands tested, 25 have consistently tested positive for lead. Gerstenberger, who has received more than $1.5 million in grants to conduct his research, is working with health district officials to have the lead-laden candy removed from retailers' shelves. He is also involved in the previously mentioned effort to visit and inspect the homes of children diagnosed with lead exposure.

• Dr. Chad Cross, the director for the epidemiology and biostatistics program, is leading an effort to create the Nevada Center for Environmental and Health Surveillance (NCEHS) with a $1 million federal grant. The center will function as Nevada's principal environmental health surveillance organization. The NCEHS will compile statistical information to guide data-gathering activities to meet Nevada's need for accurate statistics relative to a broad range of health and public health-related services, financing, planning, management, and policy issues. Researchers at the center will collaborate in the development, exchange, and utilization of information to address six subjects areas: toxic substances; injury prevention and control; occupational and environmental health; biostatistics; epidemiology; and health services research.

• Dr. Michelle Chino, an associate professor of public health, and Guinan received a $1.2 million grant in 2004 from the National Institutes of Health to establish an academic center for the study of health disparities. The three-year grant has helped the UNLV School of Public Health improve its research capacity and provide outreach and education to Nevada's minorities and other medically underserved populations. The school's Center for Health Disparities, directed by Chino, has resulted from the grant.

• Dr. Linda Stetzenbach, a public health professor, is the principal investigator on three research projects involving the study of indoor air quality in education and office buildings. The projects are being funded with more than $3 million in grants from the National Center for Energy Management and Building Technologies. She and her team have also received a UNLV Planning Initiative Award for the study of the prevalence of an antibiotic-resistant bacterium in pediatric patients in the Las Vegas valley.

• Dr. Melva Thompson-Robinson, a health promotion professor, has received a $1 million grant over three years from the University of South Carolina (through the Centers for Disease Control and Prevention and the Association of Schools of Public Health) to form the Institute for HIV Prevention Leadership. The institute was established to enhance the capacity of community-based organizations to provide effective HIV prevention programs to their targeted populations. It seeks to assure the viability of minority community-based organizations, as well as other organizations that serve populations with and at-risk for HIV/AIDS. Thompson-Robinson will analyze how HIV prevention information is used and disseminated within these organizations. The goal of her research is to enhance individual and organizational capacity to function effectively and efficiently.

These are just a few of the community-oriented research projects under way in the school, according to Guinan, who is always attuned to new public health issues that the school might address. For example, she notes, she is beginning to examine ways the university could help the community if a flu pandemic were to occur. She is also considering plans for community interventions that could help prevent obesity-related diabetes.

"There are so many opportunities for UNLV's School of Public Health to help the community," she says. "We have a committed group of faculty and students with excellent academic and analytical skills who are dedicated to improving public health. We are very enthusiastic about our ability to produce the kind of research that can inform policy-making and begin to make a difference in the lives of our state's population. That is what schools of public health are designed to do."

Degree Programs in the School of Public Health

UNLV's School of Public Health currently offers a master's degree in public health and a master of education degree in health promotion. A master's degree in health care administration is expected to be offered soon, and planning is under way for three doctorates in public health. Both health promotion and health care administration offer undergraduate degrees. For more information about the School of Public Health's degree programs, visit http://publichealth.unlv.edu.

High Stakes Research

UNLV professor Bo Bernhard is counting on research to help in the prevention and treatment of problem gambling in Southern Nevada and beyond

Story by Tony Allen
Photography by Aaron Mayes

Bo Bernhard was a Harvard undergraduate in the early 1990s when he was assigned a sociology class project that seemed novel. While on semester break, he was asked to return to his native Las Vegas to conduct research on the effects of gambling on the Southern Nevada community.

Little did he know what impact the project would have on his life.

Fifteen years later, Bernhard is still studying the effects of gambling, but from a markedly different perspective: He is now considered one of the nation's foremost experts on gambling behavior.

"Growing up here, I never gave problem gambling a second thought," says Dr. Bernhard, who accepted a joint appointment as an assistant professor in the UNLV departments of sociology and hotel management in 2002. "Like many Las Vegans, I was proud to tell our city's story to my friends who visited here, and that story didn't include a downside."

Bernhard's early research revealed one possible explanation for his lack of awareness of the issue: The concept of problem gambling as a legitimate medical concern is little more than 30 years old. It wasn't until the mid-1970s that a Veterans Administration physician, Dr. Robert Custer, noticed that many patients he was treating for alcohol addiction also had gambling problems. This finding prompted him to create a specialized treatment program for problem gambling, which was introduced in Las Vegas in the mid-1980s and placed under the leadership of Dr. Robert Hunter. Nevada's first treatment facility for problem gamblers was born.

"As part of my research while at Harvard, I visited a treatment group run by Dr. Hunter, and was immediately thrown," he says. "I actually saw people there I knew personally. So I went back the next night, then the next and the next, learning more about the problem." He continued to write on the subject throughout his undergraduate education.

After graduating with honors from Harvard with degrees

in sociology and psychology in 1995, Bernhard took a break from academia to pursue a professional baseball career and even spent some time playing soccer professionally in Spain. His commitment to research trumped his love of sports, however, and he returned to Las Vegas where he went on to earn his master's degree and Ph.D. in sociology from UNLV.

His grounding in sociology, combined with his early exposure to the pioneers in the burgeoning field of gambling behavior research and his knowledge of the Las Vegas community, have strengthened Bernhard's enthusiasm for his research interest.

"My goal was to do the ultimate study on gambling in society, and Las Vegas has provided a dream laboratory for it," says Bernhard, a fifth-generation Las Vegan whose great-great-grandfather first came to Las Vegas seeking work in the gaming industry.

Though he's not sure he has yet conducted that "ultimate" study, Bernhard's exploration of the subject has been both wide ranging and productive. Since arriving at UNLV, he has been awarded two research honors, has received grants totaling hundreds of thousands of dollars, and has authored or coauthored more than 15 scholarly publications. In 2000, Bernhard was named co-director of the research committee for the National Council on Problem Gambling's Senior Citizen Problem Gambling Task Force. Most recently, he co-submitted a $3.7 million National Institutes of Health grant with Harvard Medical School to study long-term gambling behaviors.

Bernhard is also a coveted speaker on the subject of gambling behavior. He has made more than 60 presentations to a wide variety of groups; more than half were refereed conference presentations. He notes that the proliferation of the gaming industry worldwide has provided him with incredible opportunities to share his research. He has lectured on six continents and advised national governments on the positive and negative impacts of gambling on society.

Bernhard was recently invited to Russia to speak with members of Russian President Vladimir Putin's Cabinet about how that nation's alcoholism treatment programs can be extended to include problem gambling treatment.

"Growing up in the Cold War era, I never thought I'd find myself sitting in the middle of the Red Square," Bernhard says. "It's amazing how far we've come at UNLV to get to the point where we're helping another nation's government decide policy. It's a testament to the success of our research."

While the problem gambling issues of other countries are certainly of interest to Bernhard, he acknowledges that the sheer ubiquity of gaming back at home in the U.S. continues to provide him with a plethora of ideas for study.

"Gambling is the national pastime here. Year in and year out, it draws more revenue than theme parks, movies, spectator sports, and all of the other location-based recreations

combined, and it continues to soar," he says, noting that with the continuing popularity of Las Vegas and the lure of online gambling and televised poker, more people than ever are being exposed to the culture of gambling.

Bernhard and his colleagues are currently researching how gambling affects specific sub-groups of the population. He recently received a grant from the state of New Mexico, which has the largest percentage of Native Americans in the nation, to conduct the first-ever study of Native American gambling behavior.

"The explosion of tribal gaming nationwide has had a profound effect on the Native American population," Bernhard says. "We've surveyed and studied more than 600 people in an effort to understand the impact this booming business has had on local populations in tribal communities."

Bernhard is also working in partnership with Dr. Carolyn Yucha, dean of UNLV's School of Nursing, to study gambling behavior in women, principally the physiological effects women undergo while engaged in gambling.

"By utilizing the research lab at the Stan Fulton Building, as

"My goal was to do the ultimate study on gambling in society, and Las Vegas has provided a dream laboratory for it." – Bo Bernhard, UNLV sociology/hotel management professor

well as field research in local casinos, we'll be able to measure the physiological reaction of participants with and without money on the line," Bernhard says. "This will help us explain why gambling has the allure that it does."

Bernhard hopes to define not only the cultural factors associated with gambling, but also what he terms "skin-in-ward" factors.

"To truly understand any human behavior – particularly one as complex as gambling – you have to understand factors from the molecular to the global," he says. "As sociologists, we love to study 'the big picture' at the societal level. But developing research-based strategies to alleviate and treat these problems at the smallest levels has also provided us with some fascinating insights."

Bernhard believes that one critical treatment strategy will involve the use of technology, and he is beginning to address that subject in his research. He and his colleagues recently received a grant to examine the effectiveness of a "responsible gaming device," developed in Canada, that can be attached to gaming machines.

"It's essentially the first attempt to devise a seatbelt for gambling," he says. "Much as the automobile industry did a generation ago, the global gaming industry is increasingly looking for research-based strategies that provide safety measures to protect those who need it."

The device, which is voluntary, is activated by inserting a personal identification card into the gaming machine. The card tracks winnings and losses, almost as a bank statement does, and enables the user to block days on which he or she may be vulnerable to gambling overindulgence, such as payday or days off. (Once these days are selected, the user cannot go back and change the selections.) In addition, limits can be set on permissible monetary losses; when that limit is reached, the card will no longer permit the user to play.

The device is in the early stages of development; there are plans to incorporate new technology that would allow users to access gaming machines simply by supplying a thumbprint instead of a card.

"It's exciting to get a chance to be asked to conduct research on this technology," Bernhard says. "To be in an era in which we at UNLV can play such a central role in helping the gaming industry and governments around the world determine what works and what doesn't is remarkable."

UNLV is also playing an active role in the study of gaming and the resort industry in the country of Singapore, which recently decided to legalize resort-style casinos. The William F. Harrah College of Hotel Administration has opened a campus there, and Bernhard and his colleagues have been working with the nation's governmental officials to build a model for the growth of legalized gambling in the country. As legalized gambling in Singapore develops, researchers will be able to measure the trajectory of gambling problems within the population.

"At this early stage, research in Singapore is vital," Bernhard says. "We have a fantastic opportunity to study gambling in a society from its introduction. It is our hope that we can help the government there develop research-based policies that will benefit all Singaporeans."

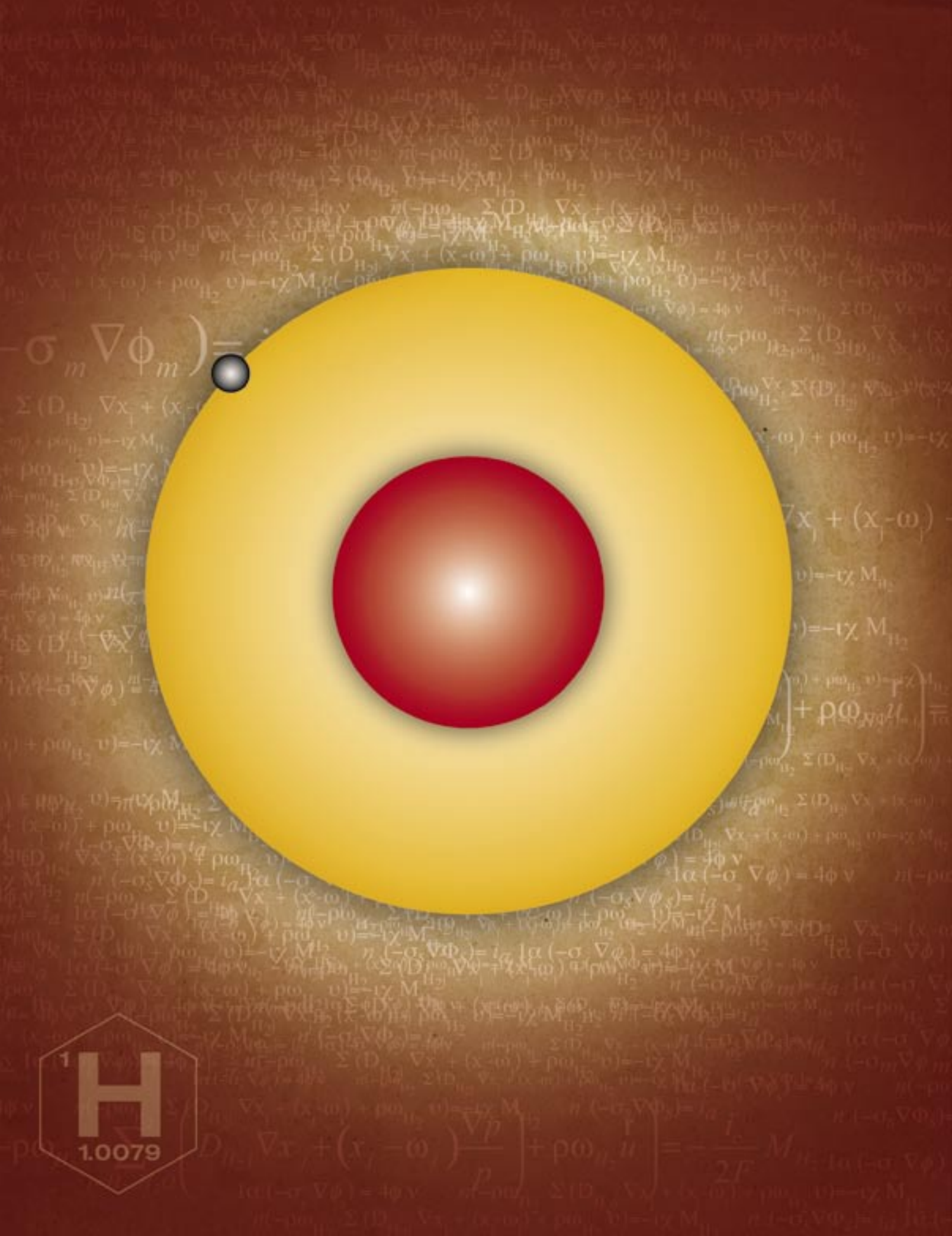
Bernhard is quick to admit that researchers have barely scratched the surface when it comes to studying gambling behavior, but he believes UNLV is well positioned to lead the way.

The fact that his research is positively affecting people not only locally, but globally, is one of the most rewarding aspects of his work, Bernhard says. He is also pleased that his research has drawn many fine students to UNLV. Since joining the faculty, Bernhard has worked with more than 40 graduate students and is currently advising six students in master's and doctoral tracts.

"UNLV's commitment to community engagement is evidenced clearly in the work that we do in gambling research," Bernhard says, noting as an example how the Problem Gambling Center, a local off-campus treatment facility started by Hunter, utilizes the research of UNLV faculty members to benefit the community.

"Our study of gambling asks questions about the impact of gaming on societies, as well as the effects of introducing gambling to various populations. At UNLV, we're building a solid research agenda that will allow people to answer those questions," he says, gratified that his research has drawn such praise and is responsible for helping so many people.

"They say of teaching that you never really know where your work's influence ends because you have the ability to touch so many lives," he says. "I believe that's true of research as well. Having that connection with the people we study is a phenomenal feeling."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The Hydrogen Fuel Equation

Hydrogen may be the fuel of the future, but myriad research challenges must be addressed before its potential is realized. UNLV science and engineering faculty are leading the effort to harness the power of nature's most abundant element

Story by Tony Allen

Consider, for a moment, the simple hydrogen atom.

It is the most abundant atom in the universe. It is contained in every living organism and in virtually everything we touch. It's in our bodies, in wood, in plastic, and in water.

But rarely is hydrogen found isolated in nature.

And there's the rub for researchers seeking a way to produce hydrogen fuel for mass consumption.

Considered by many the "holy grail" of alternative energy, hydrogen fuel is currently the buzz, garnering extensive media attention, attracting interest from private industry, and even earning mention in the President's State of the Union Address. In academe, study has been under way for some time at research universities throughout the country, including at UNLV, with the goal of producing new hydrogen fuel technology that will diminish or eliminate our dependence on fossil fuels.

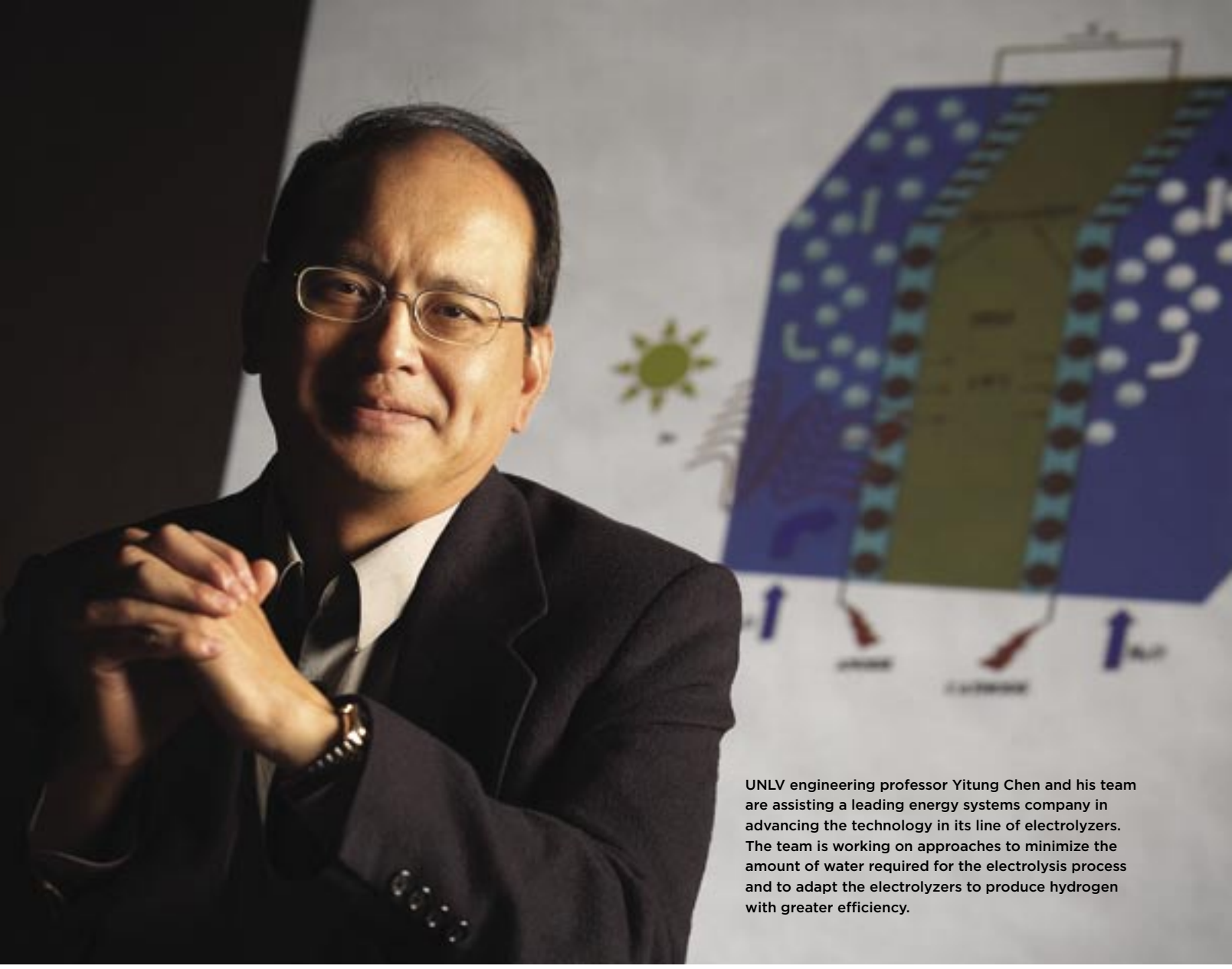
At UNLV researchers are tackling every stage of the hydrogen fuel equation, including not only production of hydrogen, but also storage, transport, and use.

"UNLV continues to perform significant research directed at making a hydrogen-based economy possible," says Dr. Eric Sandgren, dean of the Howard R. Hughes College of Engineering. "There are significant challenges that need to be addressed in order for this to happen, and our faculty and students are actively engaged in meeting those challenges."

UNLV researchers have received millions of dollars in federal grants and appropriations from the Department of Energy and other agencies in recent years to discover ways to access this source of energy, which is increasingly being recognized as the fuel of the future.

"Our research on hydrogen fuel attracts external funding critical for the support of UNLV graduate students, scientific equipment and facilities, and undergraduate research initiatives," says Dr. Ronald Yasbin, dean of the UNLV College of Sciences. "The scholars and scientists are teaching undergraduates, mentoring graduate students, and spending countless hours in laboratories and research facilities to preserve, protect, and improve our quality of life – not only in Southern Nevada, but for all our citizens."

The challenges associated with hydrogen fuel research are myriad, however. UNLV science and engineering faculty are involved in a number of projects – many involving the use of solar power to help advance hydrogen technology – that are designed to solve various intricate problems in this emerging field of research. Some highlights of major projects currently under way are outlined below.



UNLV engineering professor Yitung Chen and his team are assisting a leading energy systems company in advancing the technology in its line of electrolyzers. The team is working on approaches to minimize the amount of water required for the electrolysis process and to adapt the electrolyzers to produce hydrogen with greater efficiency.

PHOTOGRAPH: AARON MAYES

Utilizing Solar Energy

Engineering professors Robert Boehm, Yahia Baghzouz, and Yitung Chen, as well as postdoctoral fellow Suresh Sadineni, 10 graduate students, and one undergraduate, are working with the Las Vegas Valley Water District (LVVWD) in the development of hydrogen-powered vehicles – both fuel cell and internal combustion types – and a hydrogen fueling station.

The researchers are utilizing solar energy to produce hydrogen through the process of electrolysis. In electrolysis, electricity – in this case from photovoltaic, or solar, cells – is used to separate the hydrogen and oxygen. The hydrogen is then pumped into the fuel cells, where it mixes with oxygen to create energy and power the vehicle.

As part of the project, UNLV is assisting in the development of a hydrogen fueling station for the LVVWD. Researchers are utilizing different approaches to the employment of the electrolysis process to develop cost-effective hydrogen reserves. The hydrogen will then be used to fuel custom-designed vehicles for the LVVWD motor pool.

In a related study, Chen, Sadineni, and a team of students are assisting Proton Energy, a leading energy systems company, in advancing the technology in its line of electrolyzers. The team is working on an approach to minimize the amount of water required for the electrolysis process; they are also researching how electrolyzers can be adapted to yield optimal performance.

Additionally, Chen and engineering professor Samir Moujaes, along with research professors Sean Hsieh and Roger Rennels, are studying solar-powered thermochemical production of hydrogen. This project involves use of a closed chemical reaction cycle in which only water and solar thermal heat are applied, resulting in the splitting of water to produce hydrogen gas. The project team, which includes three national laboratories, two other universities, and a San Diego company, recently won one of three research awards presented by the Department of Energy.

Improving Performance

UNLV researchers are also working to make fuel cell vehicles less expensive and simpler in form. Although fuel cells utilizing hydrogen fuel are very efficient, researchers are working to configure systems that combine internal combustion engines with fuel cells to offer more effective performance. Included in this work is the use of direct injection of hydrogen into the cylinders of internal combustion engines.

Direct-cylinder injection of fuel, a process similar to that used in diesel engines, is one intermediate approach that allows for use of hydrogen in engines that contain, in large part, existing technology. This offers the possibility of improving performance and decreasing emissions.

This approach is guiding the work of a group of engineering students who are converting a water district utility vehicle, powered by an internal combustion engine, to use hydrogen fuel instead of gasoline. The engine, which is being developed with the assistance of Las Vegas-based Kells Automotive, is using the direct injection concept.

In a related study, Baghzouz and his team are converting an internal combustion engine pickup truck used by water district meter readers into a hydrogen-powered vehicle with both direct cylinder injection and fuel cell technologies. The fuel cell will be used to power the vehicle's electronic components, while a hydrogen-powered internal combustion engine provides the acceleration power.

Simplifying Hydrogen Generation

Mechanical engineering professor Yitung Chen and two graduate students are working with the Southern Nevada division of the England-based Hydrogen Solar, Ltd. to simplify the generation process of hydrogen from electrolysis. In conventional electrolysis using solar power, sunlight is converted into electricity in solar cells. Then the electricity generated is used to power the process that separates hydrogen from water. The new technology, described as the "tandem cell" by Hydrogen Solar, essentially combines the two processes in an enhanced solar cell.

Consisting of several layers of materials, tandem cells use sunlight directly to generate hydrogen and oxygen from water. A special electrolyte solution flowing through the cells is a key element in the performance of the system. Chen and his team are analyzing this process using advanced computational models to determine the most effective design.

A Lesson on Hydrogen Fuel Issues

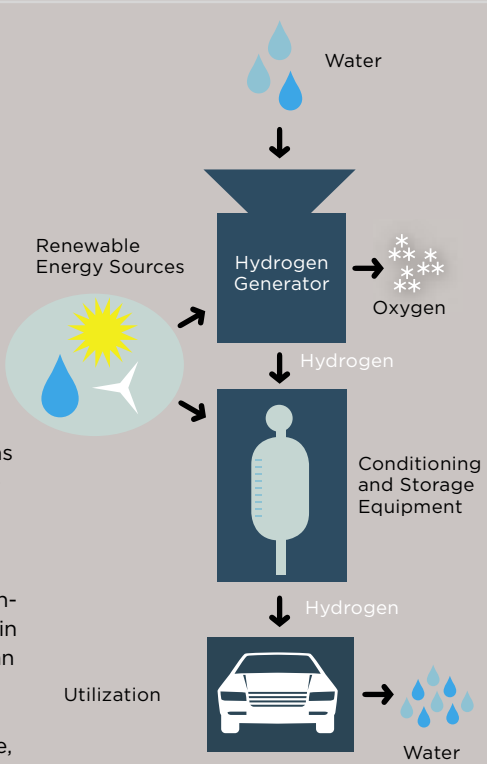
Because hydrogen is not common in an isolated form, it must be extracted from other materials in order to become useful as a fuel. Currently, the most common and inexpensive form of hydrogen extraction involves steam methane reforming, during which natural gas and steam are heated to remove usable hydrogen.

The problem is that fossil fuels are used to create it, and greenhouse gases are released into the atmosphere as a result. Hence, a significant challenge is to find another hydrogen production process that is cost-effective and friendlier to the environment.

Scientists and engineers are currently examining ways to extract hydrogen from various materials, often utilizing renewable energy to "split" water into hydrogen and oxygen. Through a process called electrolysis, electricity generated from renewable energy sources, such as wind and solar power, is used to separate the hydrogen and oxygen. The hydrogen is then pumped into the fuel cells, where it mixes with oxygen to create energy and power a vehicle. Water vapor is the only emission.

A major challenge is to lower the cost of hydrogen fuel production, therefore making it more attractive and economical to utilize in hydrogen-powered vehicles. A related issue is how to increase efficiency of its use in automobiles to enable cars to go as far on a tank of hydrogen as they can on a tank of gas.

Also at issue is the storage of hydrogen fuel for everyday use. Currently, the most common method for hydrogen storage requires large, high-pressure tanks that contain fairly small amounts of the element. Careful design approaches must be used to ensure safe use in vehicles; this includes assuring passenger well-being in the event of car crashes. Thus, researchers continue to seek safer, smaller, and more convenient hydrogen storage for use in cars.



Hydrogen Production Using Renewable Energy

Surface Science

The best way to increase the efficiency or operation of any device is to analyze how it works. UNLV chemistry professor Clemens Heske and a team of 10 post-doctoral scholars and students are working to better understand solar cells, photoelectrochemical cells (like the tandem cell), fuel cells, and electrolyzers on the most basic, atomic levels. This, in turn, will help to explain and optimize the processes that result in hydrogen production.

By utilizing technologies and equipment available only at UNLV – and by performing experiments at high-brightness X-ray sources around the world – Heske and his team work to analyze the surfaces and interfaces of materials, which will enable manufacturers to develop more efficient products.

By examining the interfaces between layers of different materials, they can identify the chemical interactions that take place and seek to discover barriers that may hinder the flow of electrical current across the interface. Then they offer suggestions as to how to improve the products.

The expertise of Heske and his team is being sought out by universities and corporations throughout the world. They collaborate with numerous organizations, including the University of Delaware, the University of Hawaii, the National Renewable Energy Lab, the Florida Solar Energy Center, and Altairnano in Reno.

Another project in the College of Sciences, led by chemistry professors Balakrishnan Naduvalath and Heske, involves a combined theoretical and experimental approach to hydrogen fuel research, emphasizing the interaction of hydrogen and other materials on a fundamental level.

'Blossoming' Technology: Educating the Public Through Art

Mechanical engineering professor Daniel Cook

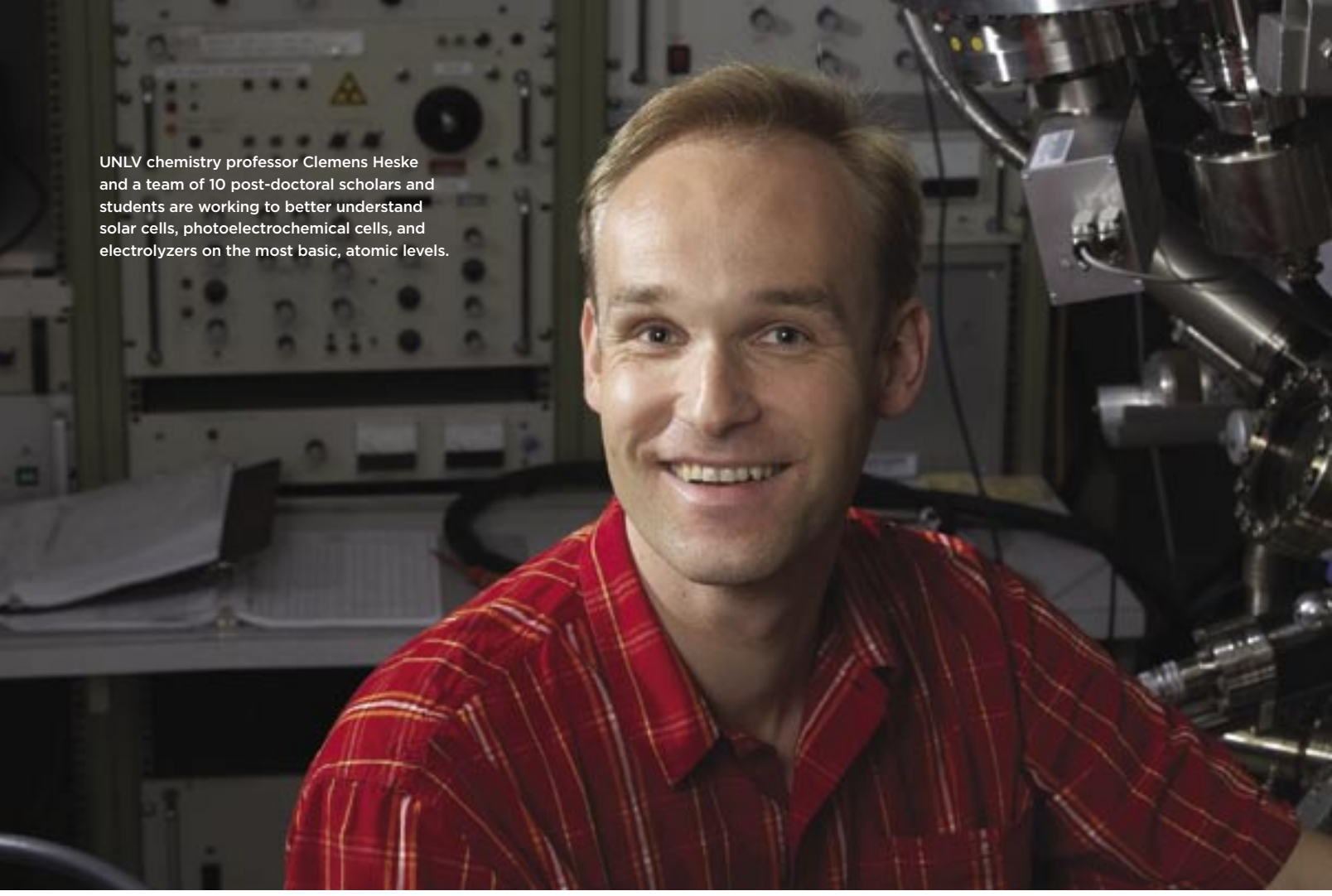
Spreading the word about solar and hydrogen power is the goal of Daniel Cook, a mechanical engineering professor who teaches courses in entertainment engineering and design at UNLV. He has created a way to use animatronic technology to educate citizens about the potential of solar and hydrogen energy.

"People don't realize that the potential for solar energy in Southern Nevada is greater than anywhere in the world," Cook says. "In fact, the raw solar energy flooding into Las Vegas is equal to the output from 55 nuclear power plants."

To illustrate this point, Cook has designed a series of sculptures that mimic flowering plants, using solar cells and hydrogen to power the moving pieces. During the day, solar cells will act as "leaves" to absorb the sun's energy and produce electricity. The electricity will be used to generate hydrogen through an electrolyzer, which then powers fuel cells to open and close the leaves of the plant. Excess hydrogen will be burned in a small flame, representing the flower's pistil. When completed, the flower sculptures will be located on UNLV's campus, as well as at various elementary and high schools throughout Southern Nevada.

"Even people who are well informed about different aspects of green energy systems do not necessarily understand how photovoltaic and fuel cells work," says Cook. "This project breaks down the solar-power generation process and equates it to the elementary process of photosynthesis. The bottom line is that if we want people to utilize new technologies, we have to explain in layman's terms how they work and their benefits."

COOK: AARON MAYES; HESKE: GERI KODEY



UNLV chemistry professor Clemens Heske and a team of 10 post-doctoral scholars and students are working to better understand solar cells, photoelectrochemical cells, and electrolyzers on the most basic, atomic levels.

The project, called "FCAST" (for fuel cell and storage technology), examines the chemical bonding that occurs between hydrogen and potential storage materials. The researchers also study the intricate details of scattering processes between hydrogen molecules and atoms. In close interaction between experiment and theory, the FCAST project seeks to increase storage capacity and improve hydrogen utilization.

Employing Nuclear Power

UNLV researchers are examining equipment components used in a process that involves nuclear power to split water and extract its hydrogen, according to Tony Hechanova, project manager in the Harry Reid Center for Environmental Studies. He is leading a team of both engineering and science faculty in this research effort.

The team is exploring the design of a component called a "heat exchanger" that is used to transfer heat from a nuclear reactor to a chemical reaction from two different acids. When water is introduced to the chemical reaction, it splits, producing hydrogen. The acids are then removed and recycled so there is no waste produced in the process.

The challenge is that the temperatures used are very high – approximately 1,000 degrees Celsius – and the acids themselves are very corrosive. Thus, the durability of the equipment used in this process is of great importance, and the researchers are studying what materials used to make the component parts hold up best during this process.

Interdisciplinary Collaboration

Many of the faculty members involved in hydrogen research on campus serve on more than one project, regularly consulting with one another and sharing insights. They also seem to share a philosophical commitment to producing an economical and environment-friendly fuel source.

"We are working together toward a common goal," says Dr. Heske. "Solar, hydrogen, wind, bio mass, nuclear, and many other energy forms can all be part of an energy mix, provided that the research today achieves the breakthroughs required for a successful implementation of the new technologies of tomorrow."

UNLV research in this field could have impacts well beyond the academic community, according to the dean of the College of Sciences.

"We are at the forefront of alternative fuel research efforts designed to solve our nation's growing energy crisis," Yasbin says. "The global economic, political, and environmental implications of this research cannot be underestimated, and I am proud that UNLV faculty are leading the way."

Revisiting the Value of Research

Sure, they're interesting research stories. But what does research really mean to UNLV, to the community, and to you? By Suzan DiBella

Like most universities, UNLV is committed to research. Simply put, we believe in the value of research, and we know that it is critical to the advancement of the institution. As are most true believers, we are compelled to share the importance of our endeavor, and we ponder how best to do so.

Certainly, the most common method of communicating the importance of research is to do precisely what we have done in this publication: write about examples of outstanding research that is being conducted. These stories are intended to educate readers about the given research topics and draw attention to the innovation, expertise, and commitment of the researchers. The thinking goes that if readers find the stories worthwhile, interesting, and compelling, then they will surely infer the inherent value of research.

Although this approach seems logical and generally successful, we wonder at times if the message is being conveyed clearly. Through the years, UNLV has publicized literally hundreds of stories about fascinating, significant research, but we sometimes still encounter uncertainty about our designation of research as an institutional priority. It appears that some still may not fully understand our commitment to the goal of becoming a major research university.

Perhaps our reliance on more subtle means of communication has not adequately produced appreciation of the research mission. Hence, we are pleased to now offer a more direct message: In summary, the conduct of research benefits students, the faculty, the public, and the institution itself in immeasurable ways. To elaborate a bit, we have developed a list of a few of the questions we hear from time to time with some brief answers.

What does research seek to accomplish?

Research seeks to advance the existing body of knowledge in virtually all disciplines. Although stereotypical depictions suggest research is conducted in laboratories, it is actually performed in virtually all subjects – from English to physics, from health sciences to history, from chemistry to criminal justice. Different methods are employed, but, at its most fundamental level, research seeks to expand understanding.

Why do faculty conduct research?

Faculty members are tasked with discovering and creating new knowledge and sharing that knowledge – as well as their systematic methods of acquiring it – with students. Faculty members who perform research gain the respect of their

colleagues, stay at the forefront of their fields, and are able to share their disciplines' latest developments with students. They tend to collaborate with scholars from other universities, consider new interpretations and methods, and bring valuable grant funding to the university.

How do students benefit?

Teaching and research are far from mutually exclusive; they are, in fact, complementary activities. Students benefit tremendously from involvement in hands-on research experiences and develop valuable practical and analytical skills from their participation. Faculty who conduct research share up-to-date information with students and give them the opportunity to explore fields of interest in greater depth. The best and brightest students are often attracted to a university because of the opportunity to work closely with faculty; as a result, outstanding research programs tend to help recruit great students at both the undergraduate and graduate levels.

How does the public benefit from research?

The public benefits when sophisticated faculty expertise is employed to improve quality of life. Research addresses a variety of pertinent local and state issues, solves practical problems, and encourages economic diversification. UNLV is particularly committed to conducting research that is beneficial to the community, state, and region.

How does research impact economic diversification?

University research creates knowledge that can lead to new technologies, commercial products, and development of industries that can have a significant impact on the economy. UNLV researchers are working to create such new technologies and intellectual property with commercialization potential. In addition to providing a revenue stream to the university, this could also bring business opportunities and jobs to our area.

How does higher education view research?

Research is critical to the advancement of UNLV's reputation among colleges and universities. Research success is a key indicator of the sophistication of a university; many believe it is the yardstick by which academic reputation is measured. UNLV continues to gain respect throughout the country because its research is highly regarded. If the university seeks to gain even greater respect in the academic community, supporting research is the way to go about it.

How is UNLV performing so far in the world of research?

UNLV has made tremendous strides in the last several years in working to build infrastructure that significantly advances the university's research agenda. One indication of our progress in research is the university's success in obtaining grant funding (discussed in this publication's Research Report). The growth in research funding indicates that UNLV faculty members are bringing in substantial external funding to conduct their research. UNLV's move into the Carnegie Foundation for the Advancement of Teaching category of "Research Universities (high research activity)" is another such indication and is excellent news. This move places UNLV in the company of many fine institutions and confirms its status as a nationally recognized research institution.

How do we improve research at UNLV?

Developments such as these demonstrate institutional research sophistication and most certainly aid the university as it endeavors to enhance its academic reputation. It is important to note, however, that these improvements are the result of strategic planning designed to build research infrastructure in recent years. The institution is just beginning to reap the benefits of this planning. Naturally, additional support of research infrastructure is necessary for the institution to continue its upward trajectory.

These short explanations only begin to provide context for UNLV's ongoing commitment to advancing research, but we hope that they open dialogue on the subject. As time goes on, we will be pleased to continue sharing news of outstanding research projects being conducted by faculty members who seek to use their time and talents for the greater good; they are, after all, at the core of the research enterprise. But we must also revisit the topic of the value of research at UNLV periodically to help build support for the research endeavor in general, as success in this area will be the force that takes the university to new levels of prestige and growth in the years to come.

UNLV Highlights

Sponsored program funding serves as one indication of research growth and sophistication

The Robert L. Bigelow Physics Building houses the High Pressure Science and Engineering Center, as well as research activities in such areas as astronomy and astrophysics; atomic, molecular, and optical sciences; and condensed matter.

UNLV is a doctoral-degree-granting institution with approximately 28,000 students, more than 6,000 of whom are graduate/professional students. The university is ranked in the category of "high research activity" by the Carnegie Foundation for the Advancement of Teaching. More than 110 graduate degree programs are offered, including 36 doctoral and professional degrees. UNLV offers a broad range of respected academic programs and is increasingly recognized as a premier metropolitan research university.

In FY2006, UNLV received more than $94 million in external funding with approximately $68 million supporting research, including significant support from a number of federal agencies:

- Dept. of Energy – $32.9 million
- Dept. of Defense – $2.8 million
- Dept. of Interior – $2.4 million
- Dept. of Agriculture – $2.3 million
- National Science Foundation – $2.3 million

Top Five Academic Areas Receiving Research-Related Support

Sciences – $19.9 million
Engineering – $16.9 million
Harry Reid Center for Environmental Studies – $6.6 million
Division of Health Sciences – $3.8 million
Urban Affairs – $3.2 million

FY2006 Funding By Sponsor Type

Federal – $68.8 million
Federal Pass Through – $19.4 million
State – $3.2 million
Foundation/Corporate – $1.6 million
Local – $1 million

Our science is saving families.

When the state of Nevada developed a new program to aid families in crisis, it turned to the UNLV Department of Social Work for help. Together, our faculty and students conducted research and interviews that uncovered how Family Preservation Services could be improved. Our continued research means this innovative program gets stronger every year. Most importantly, it means the families it helps do too.

For more information call 895-3443 or visit us on the web at www.unlv.edu.

Departments and Programs:

Communication Studies *Counseling*
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Journalism and Media Studies *Public Administration*
Social Work

Greenspun College of Urban Affairs

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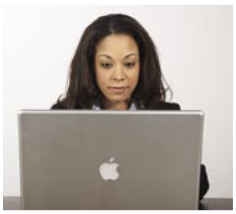


Engaging Personalities at Work

UNLV researchers view the needs of the community, state, and region as challenges that provide them with the motivation to apply their knowledge and sophisticated skills in constructive, meaningful ways. They use their expertise and creativity to conduct research that improves quality of life and transforms the community, all the while sharing their insights with students. It's really what an engaged research university seeks to accomplish — expanding understanding while serving the greater good.

UNLV – An Engaged Research University

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