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UNLV Innovation: The Research Magazine of the University of Nevada, Las Vegas

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SCIENCE = ART

*A new exhibit proves the two
can be one and the same*

A REASON TO SMILE

*A treasure in your teeth
may someday save your life*

BLAST FROM THE PAST

*A musician is bringing
baroque sounds back*

UNLV Innovation

THE RESEARCH MAGAZINE OF THE UNIVERSITY OF NEVADA, LAS VEGAS

RESEARCH

for a

REGION

*From health disparities to social injustices,
UNLV researchers are tackling some of the toughest
challenges our community faces*

PERSPECTIVE: SIX DECADES OF RESEARCH



Future Forward



LEN JESSUP
UNLV PRESIDENT

UNLV CELEBRATES ITS 60TH ANNIVERSARY this academic year. Milestones like this tend to put everyone on campus in a reflective mood as we think back to our beginnings, take stock of where we currently stand, and look toward our future goals.

Although much has changed since those early days—just check out some campus pictures from the 1960s—we still celebrated many firsts this year: a new Baroque Fest that brought a unique musical experience to the community, a new exhibit that showcased science and math imagery as art, the inaugural class of students in UNLV's new School of Medicine, and more.

We're also celebrating the arrival of a new key member of our leadership team: Mary Croughan, UNLV's new vice president for research and economic development. Croughan is a seasoned administrator and researcher from the University of California system with more than 30 years of experience in higher education, and we look forward to seeing where she will take our current research and economic development efforts.

So many of those efforts require an integration into and collaboration with our community. This connection enables UNLV research, scholarly, and creative activities to stimulate diversification in our community; enrich our region's cultural vitality; create synergistic partnerships, collaborations, and pipelines; produce a powerful STEAM (science, technology, engineering, arts, and mathematics) workforce; and bring new products and services to market.

I can't say for sure exactly what the next 60 years will bring in the way of UNLV innovations, but I have every faith that these innovations will impact the lives of those in our community for the better. In the meantime, I hope that you will celebrate with us what we've already accomplished together; that you will enjoy this cross-section of research, scholarly, and creative activity happening in each of our colleges and schools in response to the issues our community faces today; and that you will continue to share with us your goals for and vision of tomorrow.

Dr. Len Jessup
UNLV President



MARY CROUGHAN
UNLV VICE PRESIDENT
FOR RESEARCH
AND ECONOMIC
DEVELOPMENT

AS UNLV'S NEW VICE PRESIDENT for research and economic development, I'm delighted to share the latest issue of *Innovation* magazine with you.

Our 2017 issue focuses on a subject that's close to my heart: community-centered research. As an epidemiologist, I have studied health issues such as infertility, pregnancy, and primary care in the hopes of improving the lives of those around me. That goal continues as an administrator at UNLV, where I'm working to improve the research infrastructure and support so we can increase the quality and quantity of research conducted at UNLV. The better the research that we conduct, the better we will be able to address issues in our community, the state, and the nation.

One type of support that is mission critical for achieving this goal is mentorship. Mentorship has made a tremendous difference in my life, from the social justice and service components of my parents' careers to the dozens of mentors in teaching, career development, research, and administration who helped me grow toward the position I hold today.

I plan to pay it forward here at UNLV through creating and building upon programs that foster strong mentoring relationships among our researchers. With increased interdisciplinary collaboration, grant-writing partnerships, and improved research infrastructure, we become more competitive for the funding required to conduct impactful research and build a stronger campus even better equipped to address the issues of our larger Nevada community.

Please feel free to contact me directly at mary.croughan@unlv.edu to share your thoughts on what our community needs as well as your ideas on how we can work together to address those needs from a research perspective and beyond. There is much we can accomplish through collaboration.

To learn more about our goals and our latest research endeavors, visit unlv.edu/research.

Dr. Mary Croughan
UNLV Vice President for Research and Economic Development

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Editor-in-Chief
Raegen Pietrucha
raegen.pietrucha@unlv.edu

Consulting Editor
Cate Weeks

Editorial Interns
Alexandra Karosas
Rachel Glaze

Contributing Art Director
S. A. Lien

Photographers
Josh Hawkins
R. Marsh Starks
Aaron Mayes

Contributing Writers
Tony Allen
Marian Alper
Afsha Bawany
Shane Bevell
Vaneh Darakjian
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Stan Smith
Pashtana Usufzy

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Mary Croughan

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A severe shortage of health care providers. A high domestic violence fatality rate. Unequal access to education. Poor mental health care. Inadequate support for people with autism. Nevada faces all these challenges and more. Find out what UNLV researchers are doing about it in our cover story on page 22.

Breast Cancer Deaths Are Higher in Southern Nevadans

According to the American Cancer Society, breast cancer is the second most common cancer after skin cancer and the second most deadly cancer after lung cancer. Largely due to increases in screening and improvements in treatment, mortality rates have declined overall by 36 percent since their peak in 1989, but these gains have not been realized uniformly across all regions or all racial/ethnic groups in the U.S.

Paulo Pinheiro (associate professor of epidemiology in UNLV's School of Community Health Sciences) and students Karen Callahan (recipient of the Stacy Darling Scholarship), Nevena Cvijetic, and Rachel Kelly collaborated with the Nevada Central Cancer Registry and the Sylvester Comprehensive Cancer Center of the University of Miami Miller School of Medicine to produce a telling study on breast cancer rate disparities among women in Nevada. The researchers obtained registry data on women diagnosed with breast cancer between 2003 and 2010, making linkages with the National Death Index as well as the Social Security Administration Masterfile to minimize the number of missing deaths, thereby improving the accuracy of survival data. A survival rate was then calculated for the entire state and stratified by race/ethnicity.

Of the 11,111 cases of breast cancer identified from 2003 to 2010 in the Nevada Central Cancer Registry, most cases were from Southern Nevada (68 percent). Almost one-third of all cases occurred in women under the age of 55. The overall five-year survival rate in Nevada was 84.4 percent, significantly lower than the U.S.' overall survival rate of 89.2 percent. Women from Southern Nevada with breast cancer had a 16 percent higher risk of death than women from the state's second highest population center, northwestern Nevada.

The strongest predictor of breast cancer

survival is stage at diagnosis, which has been linked to mammography screening. Nevada is in the lowest quartile for state mammography rates at 73 percent, compared to the U.S. average of 80 percent.

By race/ethnicity, survival was highest for Asian (non-Filipina) women, at 89.5 percent. Filipinas and blacks showed a disadvantage in survival compared to all other racial/ethnic groups analyzed, at 76.6 percent and 76.0 percent, respectively. The researchers found that black women are likely to suffer from lower

survival rates primarily because they are more likely to have aggressive tumors and are typically diagnosed at later stages. The disparity for Filipina women was largely attributable to late-stage diagnosis as well, though Filipinas also are more likely than other Asian groups to experience obesity, which is linked to lower breast cancer survival.

The researchers' results were published in "Worse Breast Cancer Outcomes for Southern Nevadans, Filipina and Black Women" in Springer's *Journal of Immigrant and Minority Health*.

Epidemiologist Paulo Pinheiro and his team discovered that the survival rate for Southern Nevadan women with breast cancer stands nearly 5 percent below the national rate and is especially low for the state's black and Filipina women.



UNLV Students Take the ... Cup?

In search of relief from achy joints? Wish you could architect the perfect vacation experience? Interested in combining your love of video games and winning big money by exploring the emerging esports industry? Student entrepreneurs from UNLV have got a business plan for that.

Of the more than three dozen teams competing in the 2017 Donald W. Reynolds Governor's Cup Collegiate Business Plan Competition, which is designed to foster economic development and creative learning by encouraging multidisciplinary student teams from Nevada universities and colleges to use their ideas and talents to create tomorrow's businesses, eight finalists emerged from UNLV's Lee Business School.

Ultimately, one UNLV undergraduate team and two graduate-level teams took home three of the contest's seven awards, walking away with more than \$55,000 in cash and prizes to be used to bring their ideas to market. Teams RAD and Window Magic placed first and second at the graduate division, respectively, and GameTrainer placed second at the undergraduate level.

The Resilient Arthroplasty Device (RAD) is a new and patented technology that will revolutionize how the orthopedic community treats and approaches knee pain and total knee arthroplasty (replacements). Window Magic is a custom experience developer with a focus on the hospitality industry that enhances or completely alters the view out of any resort suite window using current OLED technology. GameTrainer is an esports website where users learn how to improve at video games and get trained and coached by top-ranking competitive players.



The Donald W. Reynolds Governor's Cup awarded more than \$55K in seed money to three UNLV teams for their health care, hospitality, and esports business ideas.



Esports Experts

According to a report from research group Newzoo, there are about 148 million esports enthusiasts, and the industry is expected to generate \$1 billion in revenue by 2019.

The UNLV International Gaming Institute (IGI) is on the front line of the trend, helping students, faculty, and the gaming and resort industry learn about esports and capitalize on it.

Last fall Robert Rippee, director of IGI's Hospitality Lab, launched the Esports Lab, the first class that any university has offered of its kind focusing on the business elements of the phenomenon. The Esports Lab focuses on designing and developing hypothetical business models to show how esports can work in a modern resort-casino setting. Students are tasked with exploring events, profitability, loyalty, and customer engagement.

Rippee expects esports to revolutionize casinos as it has his classroom, part of which will be converted to a permanent multiuse esports facility soon.

"Esports is the hottest topic in every board room on the Strip," Rippee said. "It just made sense to me that UNLV should play a leading role in advancing knowledge-based research and economic modeling to support the industry and allow them to make better decisions."

Speaking of leading roles, Brett Abarbanel (IGI's director of research) and Jennifer Roberts (associate director of IGI's International Center for Gaming Regulation) founded the nonprofit Nevada Esports Alliance (NVEA) this February along with founding members Seth Schorr (CEO of Fifth Street Gaming and chairman of the Downtown Grand) and Chris Grove (of Narus Advisors and Eilers & Krejcik Gaming). The NVEA is educating the region about the esports phenomenon, providing relevant research and resources that promote the development of best practices at the intersection of the esports and regulated gambling industries, such as casino integration of esports, legal and regulatory processes, game development, and competition infrastructure.

"Esports has had significant global impact," Abarbanel said. "We're aiming to foster Nevada's role in this domain by bringing together stakeholders from all areas of esports, including industry, regulatory, academic, and more."

And this October, Abarbanel contributes her esports expertise to *Gaming Law Review and Economics' (GLRE)* dedicated esports issue, for which she'll serve as guest editor. This special issue of *GLRE*, a peer-reviewed journal addressing important regulatory and economic issues facing today's gaming industry, will be among the first to take an in-depth look at esports through scholarly articles, opinion pieces, and more.



UNLV International Gaming Institute's Robert Rippee (top left), Jennifer Roberts (top right), and Brett Abarbanel (bottom) take the lead in researching esports, a new trend that turns video-game playing into a spectator sport.



A new research tool spearheaded by the UNLV University Libraries' Cory Lampert (left) and Silvia Southwick (right) helps the world discover more connections among the region's Jewish community.

Closing the Degrees of Separation

Former U.S. Congresswoman Shelley Berkley is the daughter of George Levine, who was captain of the Sands Copa Room in the Rat Pack days, which “Mr. Entertainment” Jack Entratter indelibly infused with Vegas-style glamour as an executive at the Sands Hotel and Casino. And the linkages go on ...

You may not have been able to determine these connections, however, if it weren't for UNLV University Libraries' new Navigator tool. Navigator is an online research browser that uses linked data embedded in the Libraries' Southern Nevada Jewish Heritage Project digital collection to create visualized

links between people, organizations, and communities; allowing users to physically see relationships as well as observe how those connections have evolved over time.

“When you use online search engines to conduct an internet search, you get a long list of search results without any context,” said Cory Lampert, head of UNLV University Libraries' digital collections. “With nonproprietary linked open data, there is no ambiguity and connections between people, organizations, and communities are automatically linked for users, which leads to richer discovery of information.”

Linked data is created when



previously isolated or inaccessible information trapped in online documents and databases is cracked open and transformed into an open web data format that computers can organize automatically. Linked data extends the reach of information, enabling it to express the interconnectedness of people, places, and things more thoroughly, frequently, accurately, and—in the case of the UNLV University Libraries—visually.

“This will be the way that people search for information going forward,” Lampert said. “Smarter results sets can save users time and provide them with new ways to dive into just the aspects of the data that are meaningful to their research.”

The UNLV University Libraries ranks as the 15th most productive academic library for academic research in the nation, according to a study published in the May issue of *College and Research Libraries*, the bimonthly scholarly research journal published by the American Library Association's Association of College and Research Libraries. The ranking is based on the total number of peer-reviewed academic research articles published by library faculty between 2003 and 2012.

Lampert and recently retired metadata librarian Silvia Southwick have led UNLV University Libraries' linked data charge, using the Southern Nevada Jewish Heritage Project as the pilot project to build Navigator. In addition to making it easier for researchers to explore the digital collection and visualize findings, Navigator connects the collection to libraries, universities, and other information repositories so anyone anywhere can access the information anytime. Materials in the Southern Nevada Jewish Heritage Project digital collection are discoverable through a quick keyword search via its local website, linked data search engines, linked data browsers, and topical or regional aggregators.

“The project opens up our data for further discovery,” Southwick said. “The true realization of this project's success will come as we continue to connect to other repositories with more of our data published online and made easily discoverable.”

Drumroll, Please ...

The NASA Award Goes to UNLV!

In February NASA announced the winners of its Fiscal Year 2016 Small Business Industry Awards at its Washington headquarters, naming UNLV and Teledyne Brown Engineering as the winner of the Mentor-Protégé Agreement of the Year award for their partnership.

The award stems from the successful collaboration between UNLV and Teledyne Brown Engineering through NASA's Mentor-Protégé Program—the first of its kind between a Marshall Space Flight Center (MSFC) prime contractor and a minority-serving institution. The agreement was entered into by UNLV, NASA, and NASA large prime contractor Teledyne Brown Engineering in 2015.

The program provided two UNLV students and a postdoctoral candidate with the opportunity to work with NASA and Teledyne Brown Engineering in Huntsville, Alabama, on multimedia training development for International Space Station Payload Ground Support Personnel and Payload Developers on the Mission Operations & Integration (MO&I) contract. Upon graduation, one of the students joined the MO&I team to continue this exciting work.

UNLV was nominated by Teledyne Brown Engineering as the Small Business Subcontractor of the Year for FY2016 at NASA's MSFC and previously received a Small Business Subcontractor Excellence Award as well as a NASA Mentor-Protégé Program Participation Award from NASA.



UNLV engineer Robert Schill takes the guesswork out of deactivating explosive devices.

New Patent Covers ‘Explosive’ Subject

Given how commonplace the use of explosive devices has become in fields such as construction, mining, demolition, and more, the need for an effective method to deactivate such devices—particularly in a safe and controlled fashion—becomes clear.

Robert Schill—director of the Center for Energy Materials Interaction Technology Initiative of Nevada (EMITION), professor of electrical and computer engineering, and an expert in areas including electromagnetics and plasma physics—has been working on this problem and was awarded a patent for his solution to it.

Many of today's explosive devices are triggered electrically or electronically and can be difficult to transport or manipulate. Schill's patent, “Diminishing Detonator Effectiveness Through Electromagnetic Effects” (#9,448,042), covers the apparatuses and methods for deactivating or hindering the performance of these sensitive detonation devices, thereby reducing intentional and accidental triggerings of detonators. His solution takes the guesswork out of disabling explosive devices that can employ any number of activation methods, such as movement or timing, by attacking the heart of the problem—the detonator element itself—and reducing its functionality.

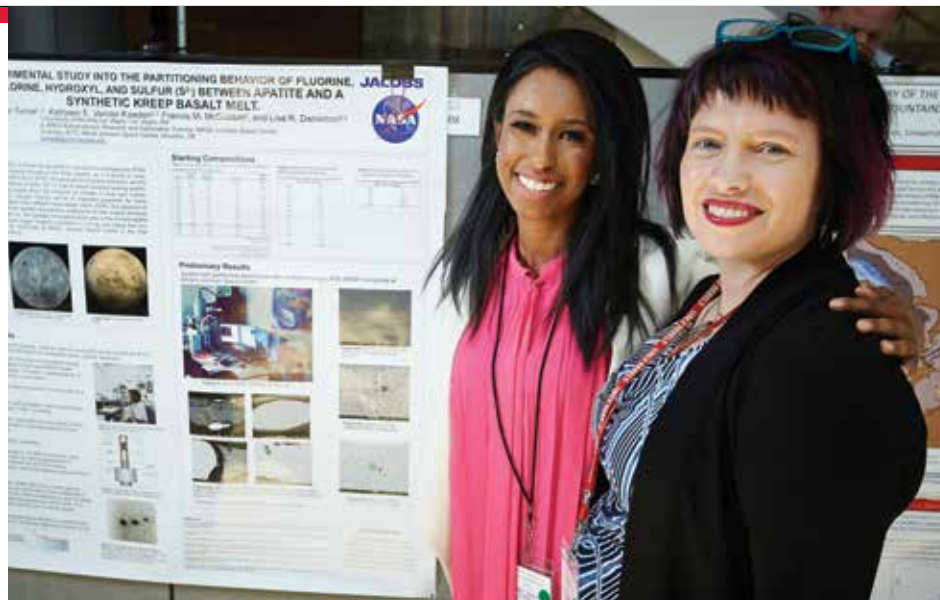
“When we talk about explosives, we're talking about potentially life-or-death situations,” said Zach Miles, UNLV's associate vice president of economic development. “Explosives safety is mission critical, and Schill's patented work is a compelling addition to UNLV's portfolio.”

Life on Our Planet and Beyond

When most of us venture out into our natural surroundings, we're busy simply enjoying it. UNLV's geoscientists, on the other hand, see something much deeper when they look at the rocks and trees around them.

UNLV geoscientists Christopher Adcock, Oliver Tschauner, Elisabeth Hausrath, Arya Udry, Minghua Ren, and a team of international researchers looked at the shock-induced dehydration of minerals in meteorites, including those from Mars, and have concluded that our early solar system may have had more water than previously thought, which has important implications for the origins of our solar system and the possibility of life outside of Earth. The article detailing their findings, "Shock-Transformation of Whitlockite to Merrillite and the Implications for Meteoritic Phosphate," was picked up by the prestigious academic research journal *Nature Communications* this spring.

Speaking of the possibility of life on other planets, Amber Turner, a first-generation UNLV senior majoring in geology, began working alongside Lisa Danielson, UNLV Graduate College Alumna of the Year and geoscientist, at Jacobs/NASA this spring to explore whether or not humans might someday have a relocation option. As a high-pressure experimental petrology intern, Turner studies what happens to minerals when they are exposed to high pressures and temperatures in magmatic (magma-related) systems on the moon and Mars. These experiments reveal insights on petrogenesis, the geologic history of rocks, which will ultimately help scientists determine whether humans will be



UNLV geoscientists and students like undergraduate Amber Turner (left, with alumna Lisa Danielson) are studying our planet and others to understand the impacts humans are having on Earth and the possibilities of life beyond it.

able to live on planets like Mars in the future.

That possibility may be more critical to our long-term survival than we've thought. UNLV geoscientist Matthew Lachniet, Ph.D. student Jonathan Baker (recipient of the Bernada French Scholarship), and other researchers recently found evidence of nearly continuous warming from the end of the last Ice Age to the present in the Ural Mountains in central Russia, contradicting the current belief that northern hemisphere temperatures peaked 6,000 to 8,000 years ago and cooled until the pre-Industrial period. Their research, published in the top geoscience journal *Nature Geoscience*, also indicates that winter temperature variations in continental Eurasia are warmer today than any time in the past 11,000 years. Along with human-caused warming from greenhouse gases, summers and winters

are expected to continue heating up.

In the meantime, the signing of a new five-year funding agreement awarding \$1.5 million per year from the U.S. Department of Agriculture Forest Service's Forest Inventory and Analysis (FIA) program to UNLV means good news for forests across the United States, which help reduce the effects of climate change. Led by James Pollard, UNLV's program director for the partnership, the joint venture ensures that 16 UNLV researchers can continue studying and developing the best information-management systems for collecting, compiling, and distributing data to policy makers, researchers, interest groups, industry, and the general public. The data informs forest-product economics, wildlife habitat modeling, efficacy and sustainability of management practices, threat assessment, conservation education, and more.

Super Six

What do a heist thriller, the evolving human diet, water quality, consumer behavior, literature, and Mars have in common? All were the foundation of research awards UNLV faculty garnered this year.

The Nevada System of Higher Education (NSHE) Board of Regents selected two high-achieving UNLV faculty for Regents' Awards, which honor accomplishments that increase NSHE's

stature in five areas: teaching, academic advising, creative activities, research, and early-career (or "rising") research.

Artistic director and professor of film **Francisco Menendez** received a Regents' Creative Activities Award, which came with a \$5,000 stipend and a medal. Menendez joined UNLV in 1990 and has received two Charles Vanda Awards for excellence in the arts. In 2008, Menendez was approached by Academy Award-winning producer and director Roger Corman.

Corman suggested that Menendez write and direct a film that Corman could serve as executive producer on. The feature *Stealing Las Vegas* is now in commercial distribution in countries around the world. Several UNLV faculty and students appear in the credits for the film, whose proceeds return to UNLV.

Lincy Assistant Professor of Anthropology **Alyssa Crittenden** received a Regents' Rising Researcher Award, which came with a \$2,000 stipend. Crittenden joined UNLV in 2011.

She's spent the last decade researching the evolution of the human diet and how it affects family development to forward our understanding of how we evolved and what makes us unique. She's received several grants, including funding from the National Science Foundation. Her work on the gut microbes of Tanzania's Hadza hunter-gatherer group has garnered worldwide attention and has been featured in media outlets including *National Geographic*, *Science*, *New York Times*, *Wired*, NPR, and more.

The UNLV Executive Vice President and Provost's Office selected four standout faculty members for Barrick Scholar Awards, which recognize UNLV faculty members who have produced a significant amount of high-quality, interdisciplinary research or creative output recognized by scholars and journals within and outside their primary disciplines.

Seyhmus Baloglu, professor and Harrah Distinguished Chair in the William F. Harrah College of Hotel Administration, received a Barrick Distinguished Scholar Award,

Collateral Damage From Cosmic Rays Increases Cancer Risk for Mars Astronauts

In 2014, UNLV scientist Francis Cucinotta, a leading scholar on radiation and space physics, first shared his research with *Innovation* magazine on astronauts' cancer risk. This summer, his findings from a related project were published in *Scientific Reports*. They predict a dramatic, nearly twofold increase in cancer risk for astronauts traveling to Mars or on long-term missions outside the protection of Earth's magnetic field.

"Exploring Mars will require missions of 900 days or longer and includes more than one year in deep space, where exposures to all energies of galactic cosmic ray heavy ions are unavoidable," Cucinotta explained. "Current levels of radiation shielding would, at best, modestly decrease the exposure risks."

Previous studies have shown the health risks to astronauts from galactic cosmic ray exposure include cancer, central nervous system effects, cataracts, circulatory diseases, and acute radiation syndromes. Conventional risk models used by NASA and others have assumed DNA damage and mutation are the cause of radiation cancers, based on studies employing high doses of radiation where all cells are traversed by heavy ions one or more times within much shorter time periods than will occur during space missions. Cucinotta's new findings reveal that a nontargeted effect model—where cancer risk arises in bystander cells close to heavily damaged cells—would result in a twofold or more increase in cancer risk compared to the conventional risk models.

"Galactic cosmic ray exposure can devastate a cell's nucleus and cause mutations that can result in cancers," said Cucinotta, who recently received a five-year, \$3.02 million grant from the National Cancer Institute for a project studying radiation cancer therapy. "We learned the damaged cells send signals to the surrounding, unaffected cells and likely modify the tissues' microenvironments. Those signals seem to inspire the healthy cells to mutate, thereby causing additional tumors or cancers."

Cucinotta said his findings demonstrate a tremendous need for additional studies focused on cosmic ray exposures to tissues that dominate human cancer risks. He also recommended that such studies begin prior to long-term space missions outside the Earth's geomagnetic sphere.



Scientist Francis Cucinotta developed a new predictive model showing that radiation from cosmic rays extends from damaged to otherwise healthy "bystander" cells, effectively doubling astronauts' cancer risk.

which provided \$5,000 in recognition of his lengthy service in academia after receiving his terminal degree. Baloglu came to UNLV in 1996 and is one of the college's most frequently cited authors, with more than 10,000 citations to date. One area of Baloglu's research focuses on consumer behavior in hospitality and tourism; little was known about consumers' perceptions of hotel brands or customer loyalty prior to the late 1990s.

Dennis Bazylnski, professor of microbiology in the School of Life Sciences, also received a Barrick

Distinguished Scholar Award. He joined UNLV in 2006. An elected fellow in the American Academy of Microbiology, Bazylnski researches a bacteria that orient themselves with the Earth's magnetic field, which has implications in the debate about life on Mars. His interdisciplinary work has resulted in several publications, including articles in *Science* and *Nature*. An internationally recognized scientist, Bazylnski's work has been cited more than 10,000 times.

Julia Lee, former professor of English in the UNLV College of Liberal


Arts, won a Barrick Scholar Award, which acknowledged the achievements she made in her academic career and carried a stipend of \$2,500. She joined UNLV in 2013. Lee studied the intersection of African-American, Caribbean, and British literature, exploring the boundaries of race and culture. Her research agenda included a mix of peer-reviewed books and articles, essays, interviews in public venues, and conference presentations. She has been featured in national and international media,

including *The Atlantic* and *The Huffington Post*, for her groundbreaking research in race and cultural studies, and she collaborated with acclaimed novelist Jamaica Kincaid on two projects.

Daniel Gerrity, professor of engineering in the Howard R. Hughes College of Engineering, won a Barrick Scholar Award. He joined UNLV in 2012. A former postdoctoral researcher for the Southern Nevada Water Authority, Gerrity studies water reuse; the rise of antibiotic resistance; water quality; the social and

environmental implications of homelessness; and innovations at the nexus of food, energy, and water systems. He's produced 30 peer-reviewed journal articles with 858 citations. His work has opened the door to numerous interdisciplinary collaborations with peers on campus, at other institutions, and in the private sector in the areas of engineering, life sciences, nursing, film, education, and sociology.

All of these professors were recognized at UNLV's Academic Achievement Awards Ceremony in April.

A portrait of Sarah Tanford, a woman with short brown hair and black-rimmed glasses, smiling slightly. She is wearing a colorful, patterned jacket. The background is dark and out of focus.

Sarah Tanford's research through simulated online review sites demonstrates the impact consumer opinion can have on the service industry.

Placing Faith in Virtual Strangers

“I’ve heard good things,” a friend says after learning of your tentative vacation plans at a certain beachside resort. You smile, but you’re still gripped with doubt. After all, this is your one big trip this year, and it needs to be postcard-perfect.

Refusing to leave your booking decision to chance, you take to your laptop to consult a more reliable friend: your favorite travel review site. Here, you scrutinize amenities and weigh the opinions of a mostly anonymous lot whose experiences may very well become the blueprint for your vacation.

But while we consumers are empowered by online travel reviews, the service industry continues to struggle with trying to figure out just what, exactly, we want.

That’s where UNLV Harrah College of Hospitality professor Sarah Tanford comes in. A well-known expert in the area of hospitality consumer behavior, Tanford’s research has been featured in several journals, at conferences, and in news outlets such as the *New York Times*. Over the past five years, she’s been plumbing the depths of online travel review sites, examining a number of elements to evaluate how various options might influence customer decisions. By constructing mock review sites that allow customers to provide feedback on fictional hotels and restaurants, Tanford is able to test how prospective travelers react when choosing where to stay and what to eat.

“Simulating the online travel review space means that I can control the variables, which cannot be done using real sites like TripAdvisor and Yelp,” Tanford said. In the virtual world she’s created, Tanford can control the way photos appear; test the effectiveness of different styles of rating systems; and experiment with the way sustainability,

JOSH HAWKINS

reputation, location, price, and more are communicated and promoted.

Having previously worked as a manager in the casino industry and a senior analyst in travel distribution marketing, Tanford knows the stakes are particularly high in the self-conscious world of hospitality.

"There's a thing called the negativity bias," said Tanford, whose work is heavily rooted in social psychology theory. "Even a single negative review in a series of positive reviews can cause someone to choose a different hotel or restaurant."

Positive reviews, on the other hand, have a measurable effect when it comes to price: "People are actually willing to pay more for a resort with positive reviews while remaining hesitant to book a negatively reviewed resort, even at a steep discount," she said.

But why, in light of your friend's glowing endorsement of the beachside resort, would you feel the need to seek the opinions of strangers in the first place?

It's our affinity for word-of-mouth interaction, Tanford said—one of the most persuasive forms of communication, according to research she and others have conducted. "Even though these reviewers are strangers, we think of them as just regular people like you and me. Their word-of-mouth advice is viewed as more objective than advertisers or professional travel experts. Like you, these travelers have invested time and money selecting an experience that matches their expectations. Their perspectives feel like free advice, a glimpse behind the curtain."

That being said, Tanford's research shows that the online review is just one of many tools in a consumer's decision-making arsenal—though she does admit that sometimes customers fall into the trap of blindly following the pack.

"The bottom line is, consumers should consider their specific needs when making travel choices," Tanford said. "Online reviews are just one piece of the puzzle." After all, that trip—however terrific or terrible—will be yours, not theirs.



UNLV @ CES

For the first time in its history, UNLV exhibited at the Consumer Electronics Show (CES), which regularly attracts more than 175,000 techies from around the world. UNLV students, faculty, and administrators got to show off just how the Rebel spirit drives innovation.

On display was an engineering student team's invention: a smart microwave that works through technology designed to read a special QR code on food packaging, which in turn instructs the device on how to prepare what's inside.

Although a love of technology initially inspired attendees to come to CES, UNLV's kinship with the community deepened as handshakes were extended, conversations began, and food was shared. President Jessup made many new connections ... and might have even found a couple of future UNLV students along the way.



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TOOTH CRACKER 500



Dentists Get Cracking on the Stem Cell Front

UNLV RESEARCHERS DEVELOPED A METHOD FOR EXTRACTING TOOTH ROOT PULP THAT QUADRUPLES THE NUMBER OF STEM CELLS THAT CAN BE HARVESTED AND REPLICATED TO TREAT A VARIETY OF MEDICAL CONDITIONS.

STEM CELLS. FEW RESEARCH DISCOVERIES hold as much promise of single-handedly expanding medical treatment options as they do. Miraculously able to act as transformers—either re-creating or morphing into a variety of cell types found within the organisms they originate from—stem cells offer humanity hope for new, more effective therapies against a number of chronic and terminal diseases. And finding them is surprisingly easy.

“Stem cells can be extracted from nearly any living tissue,” said Dr. James Mah, director of UNLV’s advanced education program in orthodontics, doctor of dental surgery, and dental researcher. “In fact, stem cells can even be found in tissues of the deceased.”

But in spite of all their potential, there’s a catch: “The biggest challenges with stem cells are gathering enough of them to work with and keeping them

COURTESY POUYA MONTAZ

viable until they are needed,” Dr. Mah said.

He and UNLV biomedical sciences professor Karl Kingsley—along with a handful of undergraduate, graduate, and postdoctoral dental students—decided to take on this challenge, cutting their teeth in stem cell research by exploring those pearly whites in new ways. In the process, they developed a new method for extracting large numbers of stem cells they could then preserve from a surprisingly abundant source: wisdom teeth.

“More and more adults—approximately 5 million throughout the country—have their wisdom teeth, or third molars, removed,” Kingsley said. “Extracting teeth is relatively common among patients undergoing orthodontic treatments. And the majority of those teeth are healthy, containing viable tooth root pulp that offers opportunities for reproducing cells that have been damaged or destroyed by injuries or disease.”

A TOUGH NUT TO CRACK

Tooth root pulp is home to two types of prized stem cells. The first, pluripotent stem cells, have the ability to become any cell in the organism from which they’re drawn. The second, multipotent stem cells, transform into specific types of cells within that organism.

Knowing where to find these cells was one thing. Recovering them, the researchers knew, would be another.

Common methods for extracting root pulp involve drilling into, removing the top of, or shattering the tooth. Each method has its detriments, Dr. Mah said, all of which lead to a low stem-cell recovery rate: damaging heat from drilling, corrosive elements in the water teeth are rinsed in, contaminating enamel particulates, and more. So the researchers sought to discover how to extract pulp in a manner that consistently produced a higher yield.

“Initially, the answer seemed simple: crack the tooth in half like a nut and remove the pulp,” Dr. Mah said.

Unfortunately, teeth have irregular surfaces and nonuniform shapes, so cracking teeth usually produces the same shattering effect as a hammer, thereby reducing the number of viable stem cells.

Alumnus Happy Ghag, then a dental student working with Dr. Mah and Kingsley on the project, thought he might have a solution to the dilemma. He approached Mohamed Trabia (UNLV Howard R. Hughes College of Engineering’s associate dean for research, graduate studies, and computing) and Brendan O’Toole (Mendenhall Innovation Program director and mechanical engineering researcher) to discuss fracture analysis.



“Happy had reviewed fracture mechanics literature and decided on a technique that scored the tooth to enable a clean break, similar to the process for custom-cut glass,” O’Toole said. After a few discussions, some of Engineering’s personnel helped Ghag fabricate the device.

The completed instrument, which the research team facetiously dubbed the “Tooth Cracker 5000,” uses a clamp to hold a tooth in position for a cutting tool to score the surface and a blade to crack it. The result: a perfectly halved tooth, with immediate access to undamaged and uncontaminated root pulp.

For O’Toole, this was just another successful collaboration between the two units, as Mechanical Engineering had been interacting with the School of Dental Medicine’s orthodontic program for a few years.

“Orthodontics, by definition, is a bioengineering topic,” O’Toole said. “They design and place mechanisms in people’s mouths that help move teeth into optimum position. The interaction between our departments makes a lot of sense.”

With the Tooth Cracker 5000 complete, Dr. Mah and Kingsley tested the fracture rate of 25 teeth, achieving a 100 percent rate of success. The fracture idea and design prototype had worked perfectly.

EXCAVATING FOR SUCCESS

Now that the researchers had cracked the challenge of accessing the root pulp, it was on to determining how many viable stem cells they could recover from the fractured teeth. Average pulp recovery rates employing common extraction methods (e.g., shattering, drilling, etc.) come in at around 20 percent, Dr. Mah noted.

It was time to test the mettle of their new fracture method. Dr. Mah and Kingsley dyed 31 fractured teeth pulp samples to highlight any viable stem cells the teeth contained. Dead cells would turn blue when exposed to the dye. Living cells would appear clear.

They looked under the microscope. Eighty percent of their extracted cells remained clear after the dye was introduced.

“Saying the test results were promising is a gross understatement,” Dr. Mah said. “We realized we’d invented an extraction process that produced four times the recovery success rate for viable stem cells. The potential application is enormous.”

REPLICATING FOR A RAINY DAY

After mastering fracturing and extraction, it was time for the team to determine what kind of stem cells could be harvested and how best to store them.



EXTRACTING HOPE

UNLV researchers James Mah (left) and Karl Kingsley (center) sought and found a unique method for extracting and preserving large quantities of dental stem cells, which they hope will someday be used to treat a number of illnesses. The Tooth Cracker 5000 (above), a device invented by School of Dental Medicine alumnus Happy Ghag (not pictured) and UNLV engineering researchers, cracks source teeth in a way that ensures the stem cells inside remain undamaged and uncontaminated.

Normal cells within the body typically die after 10 replications or passages, whereas stem cells can replicate indefinitely, Kingsley indicated. To isolate the stem cells from the rest of the root pulp, the researchers harvested cells from the pulp and cultured them on a petri dish. Once the cells covered the dish, they split the culture in half and repeated the process between 10 and 20 times.

By the end of the culturing, all nonstem cells had expired. Kingsley captured the remaining stem cells and collected their ribonucleic acid (RNA), which is converted into proteins that become biomarkers his team could use to characterize each stem cell type and its respective rate of replication.

“Scientists around the world are trying to figure out what type of stem cells can be coaxed into becoming new cells or different tissue types,” Kingsley said. “We already know some populations of dental pulp stem cells can be converted into neurons, which could become therapies for cognitive diseases such as Alzheimer’s or Parkinson’s.”

Kingsley noted that teams of scientists around the world are working with animal models to test using stem cells to treat neurological conditions. Early indications, he said, are positive. Although there is still a need

for additional tests, Kingsley indicated that the next logical step in this research would be to test stem cells in humans to treat any number of chronic illnesses people face.

“There are potential applications of stem cells for multiple diseases, including cancer, arthritis, and lung disease,” Kingsley said. “The next challenge is reliably collecting the stem cells early enough and storing them successfully so they can be used when needed.”

PRESERVING THE PRIZE

According to multiple studies, the number of pluripotent stem cells found in teeth decrease dramatically after adults reach the age of 30, Kingsley said. However, people could donate stem cells found in their teeth much like they may donate their blood prior to a surgical procedure or preserve their umbilical cords. If people elected to have their wisdom teeth removed or were having a root canal performed, their stem cells could be harvested at that time and stored for future use.

Creating that possibility has led Dr. Mah and Kingsley to the next step in their research: the cryogenic process.

“There is no standard cryogenesis, or freezing process, for storing stem cells,” Kingsley said. “There are multiple organizations that collect

and freeze teeth for future studies and use, but there is no evidence about the long-term effects of cryopreservation. We can’t answer yet just how long the cells will survive.”

In 2011, alumna Allison Tomlin (then a student) studied different populations of stem cells and their viability after being thawed. Every year since, Kingsley and his team have thawed a portion of Tomlin’s sample and evaluated the viability of remaining stem cells. Initial findings—which Kingsley, Tomlin, and R. Michael Sanders (clinical sciences professor in the dental school) published in their *Biomaterials and Biomechanics in Bioengineering* article “The Effects of Cryopreservation on Human Dental Pulp-derived Mesenchymal Stem Cells”—indicate that rapidly dividing cells have higher rates of viability year after year compared to slower dividing cells. If these results remain constant, the stem cells could be sorted before the freezing process based on when they might be needed.

“The work Dr. Kingsley and I are doing is part of a paradigm shift,” Dr. Mah said. “Our fracturing process could hasten the collection and cryogenesis process, thereby preserving a high stem-cell count that furthers research into how using these cells can aid healing and potentially cure diseases.” ■

—Kevin Dunegan



Science Comes to the Canvas

UNLV's inaugural scientific art exhibit, *Inquiry: The Art of Scientific Discovery*, displayed the beauty of science and the artistic vision of even the most lab-bound of scientists.

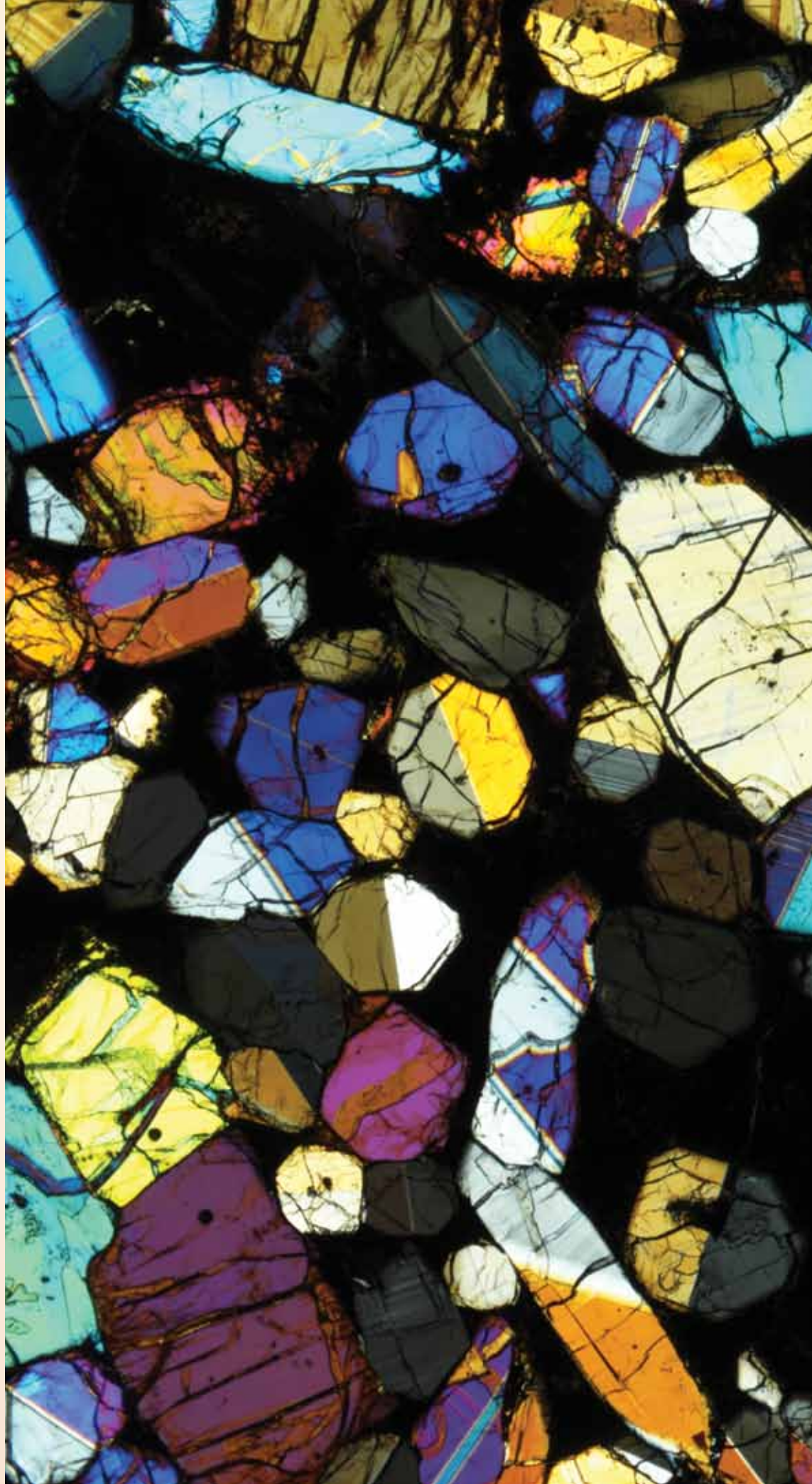
BY SHANE BEVELL
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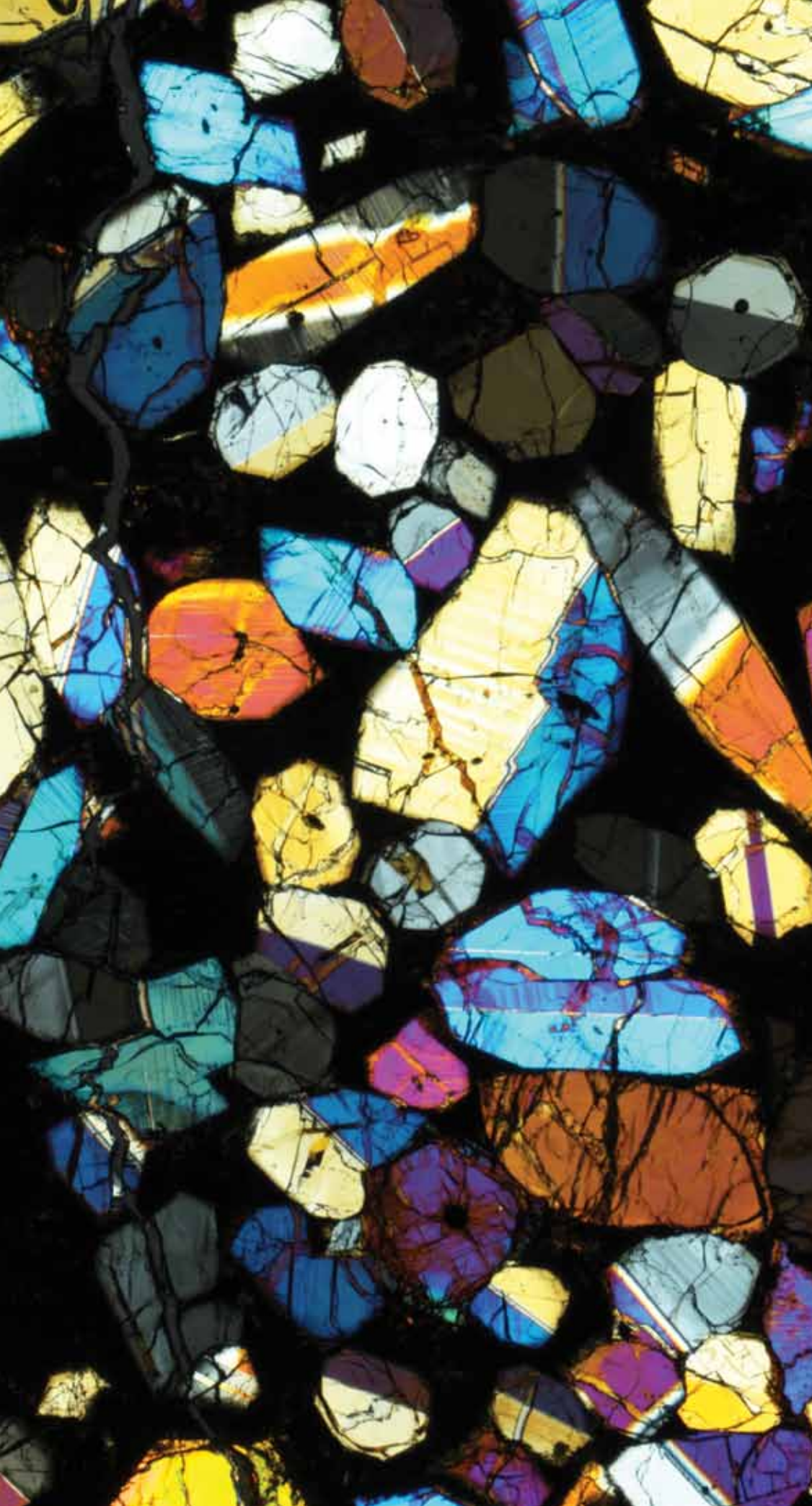


PRIME MOVER
Jason Steffen,
Inquiry curator
and UNLV physics
and astronomy
professor, steps
back from the
action for a
moment to enjoy
the science-driven
spectacle.

There is tremendous beauty in our world, from the birth of distant galaxies to the smallest details of life on Earth. Often, though, it can be overlooked because of the technical nature of science.

This spring, however, researchers from the UNLV College of Sciences had the opportunity to showcase the artistic side of science through an exhibit of captivating images they'd collected or created as part of their academic work. Here, we revisit some of the pieces that were on display in *Inquiry: The Art of Scientific Discovery*, which ran from the beginning of February through the end of March, to enjoy their beauty and learn more about the science behind them.





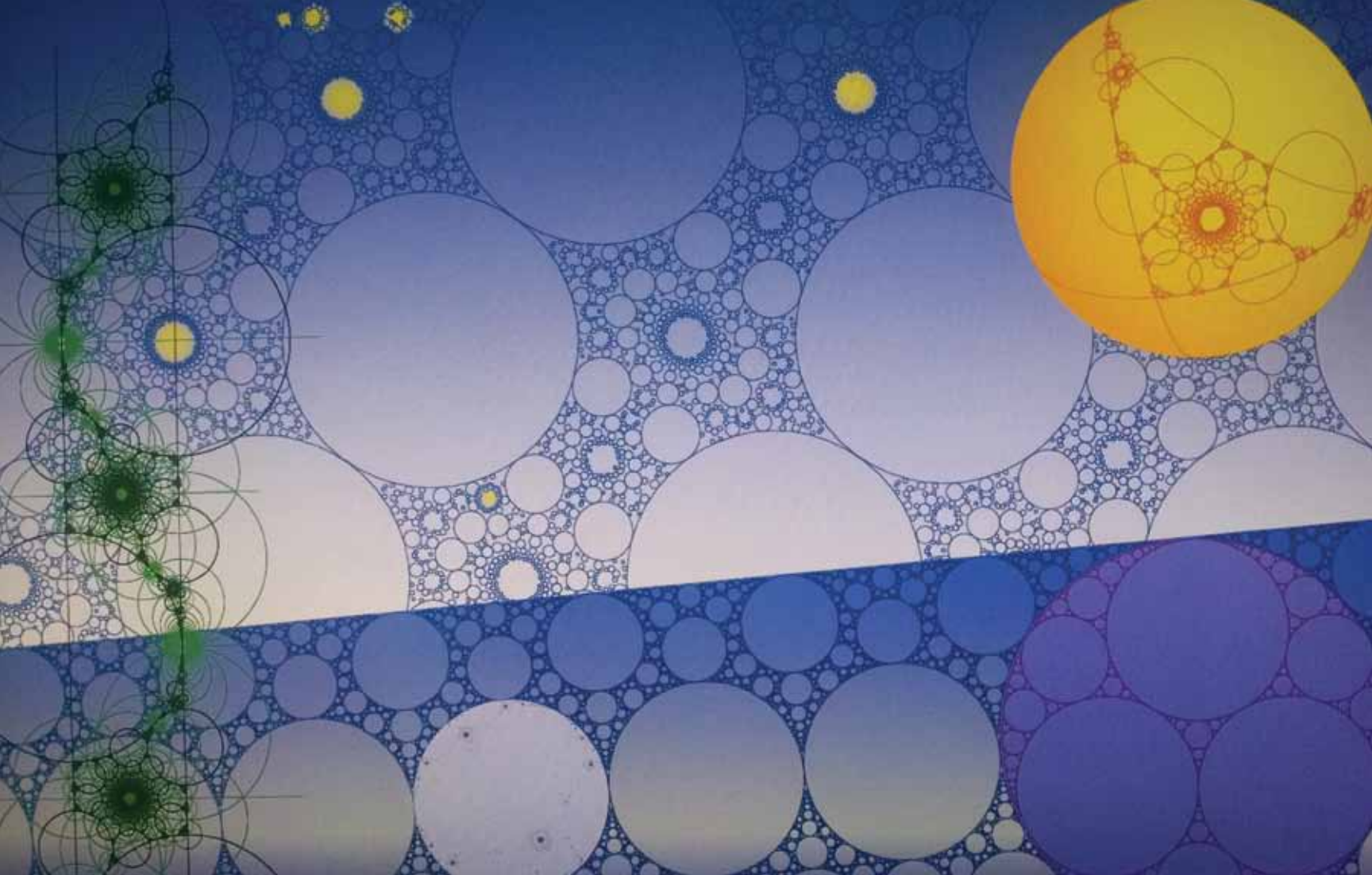
MARTIAN METEORITE, NAKHLITE MILLER RANGE

Arya Udry
geoscience professor

Udry researches Martian meteorites—more specifically, nakhlite meteorites, a type of Martian meteorite similar to terrestrial volcanic rocks on Earth. Nakhlite meteorites are 1.3 billion years old, and although they originate from an unknown location on Mars, they are our only window into understanding how the Martian crust and mantle evolved.

They can also be rendered quite colorfully, as you can observe here in this 30-micrometer-thick slice of a nakhlite meteorite, on loan from the NASA Johnson Space Center, that was discovered in Antarctica's Miller Mountain Range in 2009 during NASA's Antarctica Search for Meteorites expedition. Nakhrites are made of several minerals, including pyroxenes—black minerals that are abundant in basalts like Hawaii's volcanic rocks. Through a microscope's polarizer lens, however, these dark rocks can be depicted colorfully to help researchers more easily distinguish all the different minerals composing the meteorite.

This sample is part of a comprehensive study that aims to understand how these Martian rocks formed.



STARRY NIGHT: A VAN GOGH-INSPIRED COLLAGE OF MATHEMATICAL OBJECTS

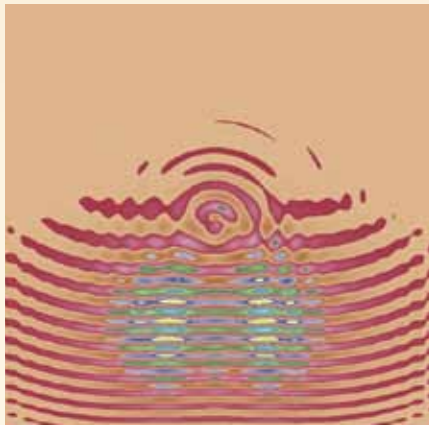
Arthur Baragar
mathematics professor

Baragar, an expert in arithmetic and algebraic geometry, has a particular fondness for studying surfaces with a large amount of discrete symmetry, or features that remain unchanged during some type of transformation within a system. To better understand the complexities of these symmetries, he studies objects that exist in multiple dimensions. Several two-dimensional cross sections of these objects are assembled here in a whimsical tribute to Vincent van Gogh's masterpiece *Starry Night*.

Here, the patterns of the moon, detail in the foreground, and tree visually represent the math behind a type of four-dimensional cone. In the foreground on the right is an object studied by René Descartes called an Apollonian packing, which is an infinite configuration (or fractal) of

circles such that any three mutually tangent (or touching) circles in the configuration will also be mutually tangent to a fourth circle in two different ways. The sky of Baragar's *Starry Night* is a two-dimensional cross section of a four-dimensional generalization of the Apollonian packing involving tangential hyper-spheres—spheres that inhabit more than three dimensions. To understand the three-dimensional cross section pictured in Baragar's sky, imagine that each circle represents a sphere. The largest spheres are laid out in an infinite, cannonball-like stack. Where the circles converge to a point, like at a star, we're observing a point of tangency between two spheres: one in front of the picture and the other behind it.

Besides taking us on an artistic and mathematical journey, Baragar's *Starry Night* illustrates this intriguing generalization of the Apollonian packing once thought not to exist. Baragar's continuing work has demonstrated that the properties observed in a three-dimensional Apollonian packing are similar in the fourth, fifth, and sixth dimensions as well. He is currently exploring the properties of Apollonian packings in the seventh dimension.



THE MOLECULAR AHARONOV-BOHM EFFECT

Bernard Zygelman

physics professor

Physicists like Zygelman have known for some time that nature, at the microscopic level, is governed by the laws of quantum mechanics, the branch of physics that studies atomic and subatomic behavior. To understand the topology (the global properties of a physical system) for atoms and molecules as well as how those atoms and molecules interact with each other, researchers often resort to lab experiments. But for extreme environments like the emptiness of intergalactic space that are impossible to re-create in a lab setting, computer simulations are necessary.

Zygelman's image is a computer-generated, color-coded contour map/ visualization of numerical data obtained with the help of the UNLV National Supercomputing Institute's Cherry Creek II supercomputer. It depicts the Schrodinger wave function, an expression of how a wave function for a physical system evolves over time, for an atom that has collided with and scattered off of a molecule. The zipperlike pattern on the left side portrays a phase dislocation line, which is a one-dimensional curve embedded in three-dimensional space. This pattern is evidence of the Molecular Aharonov-Bohm (MAB) effect, a unique topological effect of molecules in scattering situations that has been widely contested in the field because of how difficult it has been to prove through experiments. Zygelman's numerical simulation, illustrated through his art, offers proof of these topological features.

Researchers believe that such topological properties of matter can be exploited by computer manufacturers to build gates, the building blocks of digital circuits, in quantum computers. Zygelman's figure was the cover photo of the Jan. 28, 2017, issue of *Journal of Physics B: Atomic, Molecular and Optical Physics*.



David Hatchett

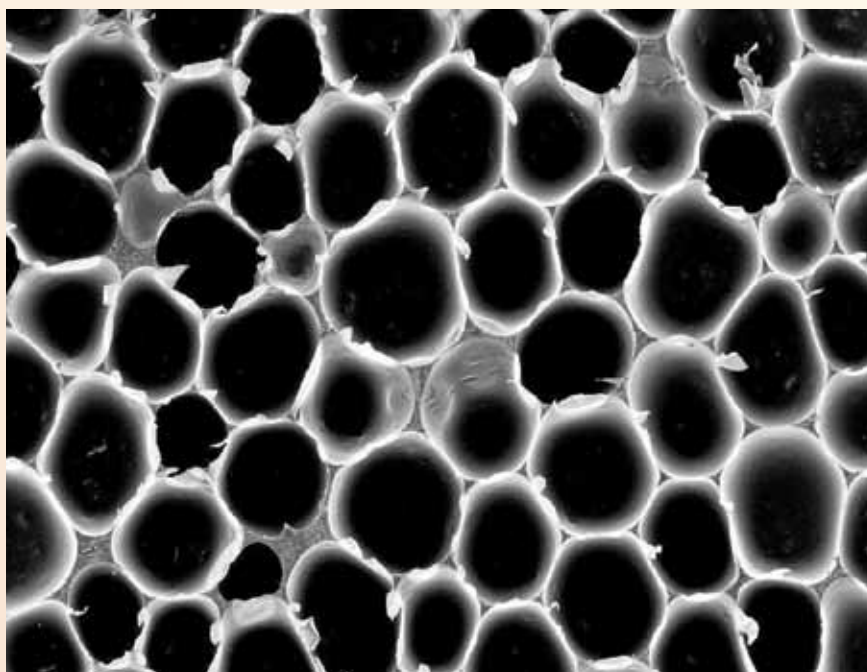
POLYURETHANE FOAM

David Hatchett
chemistry professor
Gayani Kodippili
alumna of UNLV's
graduate program in
chemistry

Hatchett and Kodippili worked with mechanical engineering professor Brendan O'Toole and his group on a collaborative project evaluating the physical and chemical properties of shock-isolating foams from the nuclear stockpile. Hatchett and Kodippili observed the chemical properties of various foams using microscopy, while the engineering team measured physical parameters such as density, rigidity, and strength of the materials.

Shown is a polyurethane foam sample used to encapsulate nuclear warheads, one of more than 1,000 images taken of various foams during the course of this research. This foam was prepared using inject-molding equipment, and the image of it was taken using an optical microscope set on a black-and-white scale.

Samples such as the one presented here helped the researchers evaluate chemical changes in foam due to increasing temperatures associated with a nuclear warhead's thermal decay. Their finding: A decrease in chemical linkages correlates with losses in a foam's structural rigidity.





FIVE QUESTIONS WITH JASON STEFFEN, *INQUIRY*'S CURATOR AND UNLV PHYSICS AND ASTRONOMY PROFESSOR



What was your inspiration for spearheading *Inquiry*, and why was 2017 the right time?

Someone had come by my office and said, "I had no idea that this research was going on here." I've heard similar sentiments from people I've given physics department tours to. Outsiders are often amazed by the research going on across the College of Sciences when they hear about it. On campus, many science and math classes don't provide students with the opportunity to see just how cool this stuff really is. I wanted to create a forum where everyone could learn how UNLV is expanding human knowledge through our research and see some of the amazing stuff that we see as we work. I thought an art exhibit would be a perfect way to do so.

Once the idea came, we just started working on it. Spring 2017 was the first time that there was a gallery available to display our art.

How were the final pieces chosen?

We had several interesting submissions, and many people submitted more than one piece. Eventually we narrowed it down by selecting pieces that showcased a wide variety of research and pushing some of the tough decision-making to professors, asking them to pick a single piece they found compelling.

Any surprises along the way?

Next time we will take a more streamlined approach, especially with respect to printing the pieces. We faced a bit of a learning curve this year with

regard to proper file sizes and types, printing materials, etc. The rest of the process went quite smoothly, thanks to Jerry Schefcik, the galleries director at UNLV.

What feedback did you receive on the exhibit?

The feedback was very positive. The amazing artwork was responsible for that. I particularly liked that everyone I spoke with had a different favorite.

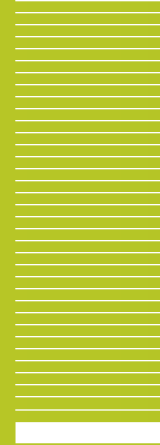
Will we be seeing an exhibit like this again at UNLV?

The plan is to do this every few years—often enough that there's some memory of the last show and a chance for most students to participate, but not so frequently that it gets old and boring.

—Raegen Pietrucha

Our Region's Helping Hands

**UNLV researchers work to
brighten the future for Nevada,
its neighbors, and beyond.**



Did you know that from 2014 to 2015, Nevada had the second highest percentage of English language learners in the nation—students who participated in language assistance programs to better meet learning standards—but ranked last in the nation for K-12 public school quality? Did you know that in this same time period, 11.1 percent of children ages 3-21 with disabilities who received special education services in Nevada had autism? Did you know that in 2016, Nevada ranked third to last for mental health care? In fact, Nevada currently ranks 37 in the nation in health care overall and, to complicate matters, has a comparably low rate of funding from the National Institutes of Health compared to other states. And consistently, Nevada ranks first in the nation for domestic violence fatalities. These challenges need to be addressed and solutions found.

While Nevada faces several challenges, there also are exciting opportunities. In my new role as UNLV's vice president for research and economic development, I already see how united we are as a community in our desire to find solutions to these and other social, educational, and biomedical challenges we face as a state.

I believe that some of the most valuable research we can do is the kind that is in service of others: our family, friends, neighbors, colleagues, and community. UNLV is listening, looking for these opportunities, and actively engaging in community-centered research—asking what you really need and seeking answers to the questions you have.

I'm proud to report that UNLV researchers from many disciplines and at all levels, from faculty to undergraduates, are studying subjects like education, domestic violence, and health care as well as the comprehensive set of factors that can be undertaken at a societal level to reduce disparities and address social injustices in Nevada and beyond. Like a huge puzzle, each researcher is bringing their piece—their unique perspective—to the table. Through collaboration, everyone is coming to see the different pieces that make up an eventual whole: a solution to the problem at hand.

Before you flip the page to learn more about some of the community-centered research taking place at our university, please know that we hope to be the organization you point to and say, "UNLV is the reason my life is better." —*Mary Croughan*



Mary Croughan
UNLV Vice President for Research
and Economic Development

INSIDE

BACKPACKING THROUGH NEW RESEARCH TERRITORY

A new project spurred by UNLV Graduate College's Rebel Research and Mentorship Program explores how this piece of gear might help children with autism.

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Two economics researchers capitalized on a dynamic that occurs organically in nature to illustrate how infants' proximity to wildfire smoke pollution while in utero affects birthweight.

JOINING FORCES FOR OUR HEALTH

The Mountain West Clinical Translational Research Infrastructure Network helps 13 universities support the faculty and research that will improve human health in seven states.

INSIDE THE CLINICAL SIMULATION CENTER

Step into a custom-designed training center in Southern Nevada where manikins talk, blood is made by the gallon, and life-saving skills are researched and mastered.

STRENGTHENING SUPPORT STRATEGIES FOR DOMESTIC VIOLENCE SURVIVORS

New research highlights the complexity of communication between domestic violence survivors and shelter staff, providing insights that can further improve these relationships.

BREAKING THE LANGUAGE BARRIER

Doctoral candidate Eshani Lee's research ensures college chemistry knowledge doesn't get lost in translation.

DID YOU KNOW?

According to Easter Seals, 5,946 (or 11.1 percent) of children ages 3-21 with disabilities who received special education services in Nevada in 2014-2015 had autism. UNLV researchers Janet Dufek, graduate student Jeff Eggleston, and undergraduate Mieke Mamauag are studying how a simple piece of school gear—a backpack—might assist in the therapy of children with autism. And in October 2016, the UNLV School of Medicine and the Grant A Gift Autism Foundation joined forces to open the UNLV Medicine Ackerman Center for Autism and Neurodevelopment Solutions, which offers a broad range of autism and neurodevelopmental care, including diagnostics, treatment, behavioral support, and more.



Backpacking Through New Research Territory

A new project spurred by UNLV Graduate College's Rebel Research and Mentorship Program explores how this piece of gear might help children with autism.

While millions of children begrudgingly lug hefty backpacks filled with school supplies, snacks, and other belongings, one group of UNLV researchers is asking whether those same bulky sacks could someday serve a higher purpose: aiding in the therapy of children with autism.

Through the UNLV Graduate College's Rebel Research and Mentorship Program (RAMP), Janet Dufek, associate dean and professor in the School of Allied Health Sciences; Jeff Eggleston, a doctoral student in the Kinesiology and Nutrition Sciences department; and Mieko Mamauag, an undergraduate student in the same department, have teamed up to find out.

Their research project, "Examining the Influence of Backpack Weight on Trunk and Stride Kinematics Among Children With Autism Spectrum Disorder," explores whether children with autism experience movement challenges when walking with a backpack on. But the word "challenges" may be a bit of a misnomer. Such challenges may prove harmful, but they may also prove helpful, should they make children with autism more efficient walkers.

"In the scientific community, there are two schools of thought with this clinical population: One is that if you give them a more difficult task, they will focus on it and improve performance," Dufek said. "The other is that it is so foreign to them that they're all over the place with their movements. But if we can direct the focus of a child with autism, that could be a great thing."

According to 2014 data from the Centers for Disease Control and Prevention, about 1 in 68 American children has autism. In 2004, just 10 years earlier, the prevalence was 1 in 125. This growth, the Autism Speaks organization indicates, makes it one of the fastest-growing developmental disorders in the United States.

The RAMP team's research not only raises awareness about a disorder whose prevalence is rapidly escalating but also tackles it from a biomechanics angle that to date has rarely been studied. According to the researchers, children



Mieko Mamauag (left) and Jeff Eggleston (right)

with autism may experience trips or stumbles more frequently when faced with walking obstacles like stairs, curbs, and unfamiliar surfaces. Through their research, the group hopes to determine if the added weight of a backpack can help these children walk more safely and efficiently.

Employing weighted objects in therapeutic treatment plans for children with autism is nothing new. Weighted vests, blankets, and more have been utilized by children with autism, under the assumption that the added mass benefits them from a behavioral perspective, encouraging calmness and focus. How weighted wearables might affect their motor skills, however, is largely uncharted territory.

"In the biomechanics world, there's no other group that is examining these data the way we are," Eggleston said. "If we can use a backpack to mitigate potential walking hazards—the tripping, the stumbling—and in turn [the children's] behavior improves too, we address two issues with one intervention."

Additional perks of the object they've placed their hopes in: Most children already use backpacks (versus weighted vests, which could draw attention to a wearer), and anything already lying around the house can be placed inside a backpack to weigh it down, saving families money.

A total of 11 children with autism between the ages of 5 and 17 participated in the project's initial data collection phase, which spanned four months. The researchers began by weighing the children. Next, the researchers placed reflective markers on the children's trunks and lower extremities. Then, the children walked—first without weight in the backpack they were wearing, then while carrying 7.5 percent of their body weight in the backpack, and finally carrying 15 percent of their body weight in the backpack. Ten infrared cameras placed around the laboratory captured the children's steps and produced three-dimensional representations of their movement patterns that the researchers will later analyze using computer software.

Whereas current autism therapy approaches are based primarily upon psychologists' observations, the RAMP team's work has the potential to serve as a quantitative diagnostic tool—one that could enable early intervention.

Mamauag, who hopes to open a physical rehabilitation center of her own one day, is particularly excited about the project's promise. "Hopefully, in the future, I can utilize what I learn from this research project in my practice and better treat patients," she said.

Eggleston and Mamauag presented the RAMP team's findings at the Northwest Biomechanics Symposium in May at the University of Oregon. —*Vaneh Darakjian*

RAMPing Up Research

Launched in the spring of 2016, RAMP teams a UNLV faculty member, graduate student, and undergraduate student together on a research, scholarly, or creative project. RAMP's 2016-17 cohort included six pairings of graduate and undergraduate students with a faculty member.

Along with the benefits gained from working side-by-side with their faculty mentors, graduate students gain mentorship skills, as they are also responsible for serving as mentors to their undergraduate counterparts, and undergraduates gain new research skills and an additional adviser by participating in the program.

Dufek, Eggleston, and Mamauag have found their research together rewarding in a number of ways.

"I'm very passionate about research and getting students involved in it," Dufek said. "Certainly the most rewarding part for me is seeing the research growth—seeing that light bulb come on for the undergraduates and observing the maturation of a doctoral student's research."

Eggleston noted the direct impact the RAMP team's research has already had on the parents of the children who participated in the project. "We hear a lot of, 'We've been on waiting lists and waiting lists, and we appreciate that you're doing research and trying to learn more,'" he said. "For me, it's rewarding [to know] the parents of these kids are so grateful that we're actually doing something."

Mamauag pointed to the practical application of what the RAMP project has provided her. "Learning the research process from the beginning has been very rewarding," she said. "What I learn in class, I'm actually using in research."

Where There's Smoke

Two economics researchers capitalized on a dynamic that occurs organically in nature to illustrate how infants' proximity to wildfire smoke pollution while in utero affects birthweight.

When researchers seek to determine a single or primary cause for a human health problem, they know they're battling uphill. Our environments are complex, multifaceted, and permeated by a seemingly infinite number of factors that could shape us. Rare is the circumstance that is so ideal, at least from a researcher's perspective, that one can sift through the noise and emerge with a definitive root of an issue.

That is, of course, unless nature is on your side—as was the case for UNLV economics professor Shawn McCoy and his University of Pittsburgh economics colleague Xiaoxi Zhao.

It's hard to imagine anything positive coming out of wildfires. They've become six times more likely to occur and four times as large since the 1980s, McCoy said, due to climate and population changes. And yet for his research, which demonstrates that proximity to smoke pollution causes lower infant birthweight, wildfires proved to be a sort of equalizer.

"Wildfires are a meaningful topic to research in and of themselves, but they also help solve this causality problem that is difficult in our studies of pollution," McCoy said. "Two features make fire pollution different from that of, say, an industrial plant: the random timing of fires and their random location, in that wind patterns on any given day drive the direction and concentration of smoke. This sets up a quasi-experimental research design wherein a fire happens randomly and by chance and randomly and naturally assigns treatment and control groups, because only a certain segment of the

population will be exposed to the smoke."

Several studies have established correlations between pollution sources and negative public health outcomes, McCoy said. However, prior research hasn't entirely been able to clearly demonstrate a direct causal relationship. One reason for this, according to McCoy, is the number of factors that could be involved in past research scenarios.

"Suppose we build an industrial plant," McCoy said. "Once that plant is built, we need to think about the economics of that problem, which is that people don't like to live next to plants. Holding everything else constant, home prices will drop in the surrounding area because of that, which could induce geographical sorting, wherein households with lower income might migrate into the areas surrounding the plant, and households with higher incomes may leave. When that happens, it becomes harder to determine if changes in health outcomes occurred because of plant pollution, geographical sorting dynamics, or even something else."

The random timing and location of wildfires mitigate these dynamics, making it ideal for

McCoy and Zhao's research. Wildfire smoke is similar to other sources of ambient air pollution; its particulate matter can be so small that it passes through the heart and lungs, disrupts fetal nutrition, and slows fetal growth. Within this framework, birthweight becomes a useful metric to track because of its link to short-term outcomes, such as one-year mortality rates, as well as long-term outcomes such as educational attainment and earnings, McCoy said.

McCoy and Zhao leveraged geographic information systems (mapping software) to identify ignition sources and smoke paths and plotted the home addresses of infants born during a time that would place them in the smoke's path while in utero. They then compared the birthweight of those infants to a control group outside of the smoke's path.

The researchers' results indicate that wildfire smoke leads to a 4 to 6 percent reduction in birthweight, and these effects are most pronounced among mothers exposed to smoke during the second or the third trimesters of pregnancy. They also found that these effects attenuate (or diminish) with respect to distance



from a wildfire, becoming ineffectual three miles and further from the burn source. In contrast, the researchers found that even if infants had been close to a wildfire while in utero, there was no statistically significant effect on their birthweight if they were outside the smoke's path.

"One really neat thing about this research is that I can do more than tell you what the effect

DID YOU KNOW?

Birthweight is linked to short-term outcomes (such as one-year mortality rates) as well as long-term outcomes (such as educational attainment and earnings), said UNLV economics researcher Shawn McCoy. And as he's discovered through his research, wildfires can affect birthweight. Although California might be the first state to spring to mind when people think of wildfires, Nevada has its fair share. In fact, two of the state's most massive and devastating wildfires occurred in July 2013 in Southern and Western Nevada. The Carpenter 1 Fire on Mt. Charleston, just west of Las Vegas, consumed more than 43 square miles that year, according to the National Incident Management Team. Western Nevada's largest recorded wildfire, the Bison Fire, consumed more than 40 square miles, according to NBC.

of being exposed to the smoke is or not," McCoy said. "I can tell you how that effect varies based on where an infant is relative to the source of pollution. Beyond that, we now have the evidence that reinforces earlier findings on the effects of ambient pollution at large and can say that these effects are very likely real, not just loosely correlated or tied up with other economic issues like household migration dynamics."

McCoy's hope is that this research will help inform policymakers of the potential economic and health consequences of wildfires, the magnitude of this type of disaster, and the mechanism behind wildfires—all of which

enable people to better target the problem.

"There's a lot of evidence to suggest that homeowners don't fully acknowledge the risks associated with natural disasters—in particular, the risks associated with wildfire," McCoy said. "One way to address this problem is to inform the public of risks through information-based regulation, such as posting billboards of people standing on cars during floods to discourage them from attempting to drive through inundated areas in the future. The idea is, if you give people this information, it can affect how they evaluate disaster risks, and it will likely have a spillover effect in terms of how they manage those risks." That being said, McCoy noted that a one-time exposure to this type of information likely won't be enough to have a lasting impact, so regulators should share this type of messaging often.

McCoy and Zhao's research findings have been detailed in their article "Wildfire and Infant Health: A Geo-Spatial Approach to Estimating the Health Impacts of Ambient Air Pollution and In-Utero Stress," currently under review by a top industry journal. —*Sara Gorgon*

Meet the Postdoc: Stephanie McLaughlin

This scholar's psychotherapy research inspired her to pursue mental health care improvements in Las Vegas.

Stephanie McLaughlin is one of more than 40 postdoctoral scholars who currently call UNLV home. These recent Ph.D. graduates come from universities around the world to work with UNLV's faculty and continue to build their resumes and publication records in preparation for the eventual transition into full-time research positions within or outside academia. McLaughlin came to UNLV from Brigham Young University to work in the clinical psychology department, with a focus on group psychotherapy.

What are you working on at UNLV?

My primary responsibilities surround the development of the adult group psychotherapy program at The Partnership

for Research, Assessment, Counseling, Therapy and Innovative Clinical Education—also known as The PRACTICE—a community mental health center that provides affordable, evidence-based mental health care to the Las Vegas community. My work includes co-leading psychotherapy groups, supervising master's and doctoral-level students, monitoring client outcomes in treatment, and consulting with other providers to help maximize treatment effectiveness.

What are your long-term goals?

My long-term goals include continuing to develop as a clinician, particularly for group therapy. The more therapy groups I have been involved in and research I have reviewed, the more I am convinced of the utility of the group format for psychotherapy. For instance, I have observed the benefit clients experience as they offer each other support and new ways of approaching stressors they are managing in their daily lives, offering perspectives I may have never thought of on my own.

I have thoroughly enjoyed the program-development and teaching components of my fellowship, and I hope to perform similar tasks at a future position. I would also like to stay involved in research. I have an interest in monitoring outcomes in psychotherapy—better

understanding whether and why clients get better, worse, or stay the same during a course of treatment.

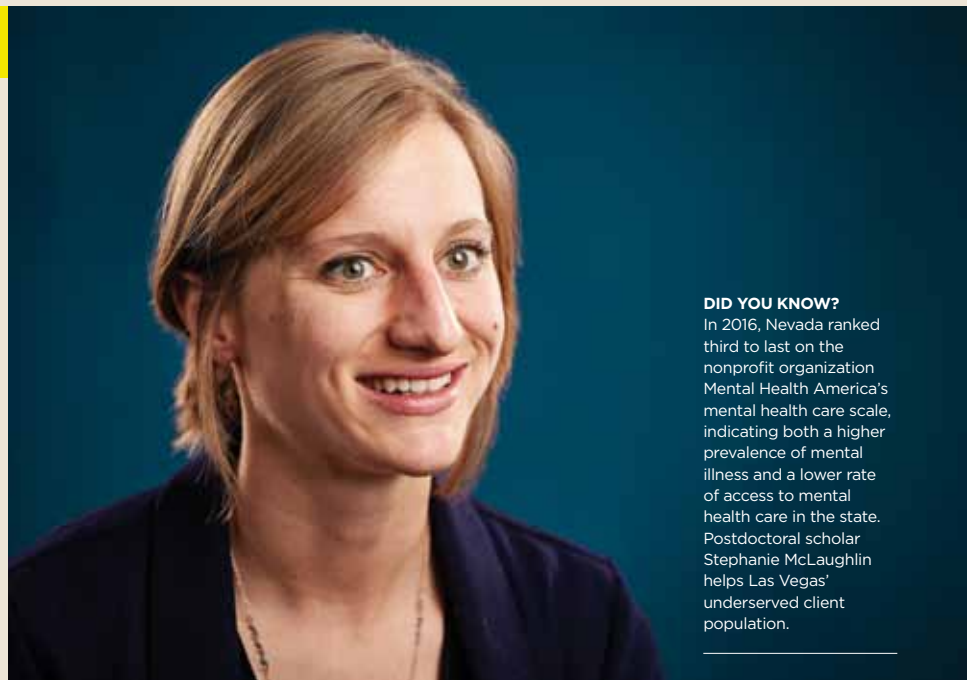
How do you see your postdoctoral position at UNLV helping you reach your goals?

In so many ways, and for that, I'm grateful! My supervisors Michelle Paul (director of The PRACTICE) and Noelle Lefforge (a UNLV psychology professor) and my colleagues at The PRACTICE have been incredibly supportive of my training experience and ideas. Also, the dedication of the staff and clinicians to providing quality services to clients has been invigorating.

This fellowship has given me the opportunity to collect information about outcome-monitoring systems that can be used at community mental health centers like The PRACTICE. This has given breadth to my knowledge surrounding how clinicians can optimize patient care.

Also, I work with a diverse and underserved client population at The PRACTICE, which has been a rewarding and thought-provoking endeavor. The learning and personal growth I have received from the clients I work with cannot be overstated. The experience has motivated me to continue to engage in efforts to increase the Las Vegas community's access to quality mental health care.

—*Vaneh Darakjian*



DID YOU KNOW?

In 2016, Nevada ranked third to last on the nonprofit organization Mental Health America's mental health care scale, indicating both a higher prevalence of mental illness and a lower rate of access to mental health care in the state. Postdoctoral scholar Stephanie McLaughlin helps Las Vegas' underserved client population.

Joining Forces for Our Health

The Mountain West Clinical Translational Research Infrastructure Network helps 13 universities support the faculty and research that will improve human health in seven states.

There's a reason for the phrase "There's strength in numbers," and it's especially true with respect to research. In the last four years, UNLV and 12 other universities in seven Mountain West (MW) states have had the opportunity to team up in new ways and find out how much they could accomplish together, thanks to a five-year, \$20 million multistate grant from the National Institutes of Health's (NIH) National Institute of General Medical Sciences (NIGMS) Institutional Development Award (IDeA) program for the MW Clinical Translational Research Infrastructure Network, or CTR-IN.

The year 2013 marked the beginning of the MW CTR-IN, which has three primary objectives: First, work together to further build the type of infrastructure and culture at all of the participating universities that leads to improved research output. Next, increase the quality and quantity of NIH grant applications in clinical and translational research to improve the rate of success in obtaining this funding—traditionally lower in the MW region compared to other regions of the U.S. Finally, use the obtained funding to accelerate research discoveries that will result in the improvement of human health across all seven participating states: Alaska,

Hawaii, Idaho, Montana, Nevada, New Mexico, and Wyoming.

"The CTR-IN is providing unique opportunities for junior faculty at our partner institutions to develop their clinical and translational research programs to the level of national competitiveness," said UNLV Senior Vice Provost Carl Reiber, who was instrumental in the development of the program, now led by UNLV School of Medicine Senior Associate Dean for Clinical Research and cancer program director Parvesh Kumar.

"Having toured many of our institutions with Dr. Kumar, it is apparent that the CTR-IN funds are supporting highly competitive science projects that will play an important role in the lives of many people across the United States," Reiber added.

As the host university, UNLV is responsible not only for ensuring the primary research objectives are met, but for fiscally managing and administering the grant as well. The opportunity is massive on several levels, given it is the largest federally funded grant UNLV has received to date and involves awarding funds to multiple universities.

The benefits of the CTR-IN have been as broad and widespread as the program intended. In addition to supporting several pilot grants for in-depth research projects, the funding has enabled the development of new multisite research projects, a mentoring program, educational training videos, biostatistical support, and more to faculty members within the participating universities. UNLV has been the proud host of several CTR-IN-sponsored grant-writing workshops, which teach faculty throughout the MW region how to write grants for NIH and other federal funding agencies. The CTR-IN also facilitates an "Advance to Funding" (ATF) program, which is a mock study section that provides specific expertise and written feedback on how to improve NIH and other federal grant applications prior to submission.

"The CTR-IN offers the unique opportunity to positively and significantly impact the careers of faculty members at 13

How has a CTR-IN pilot grant helped you?



Blakely Brown

Title: Professor, Department of Health and Human Performance, University of Montana

CTR-IN pilot grant project:

Developing and pilot-testing an after-school and home-based childhood obesity prevention intervention

Impact beyond grant project:

Better prepared to obtain additional research funding

"The CTR-IN grant program has increased my skills in managing awards and working more closely with my Office of Sponsored Research Programs. During the last phase of the CTR-IN grant, we applied for an NIH R13 grant titled 'Communities at Play,' which we were awarded. It's a three-year grant that helps us build capacity and more community collaborations for the 'Generations Health Project: An after-school and home-based childhood obesity prevention intervention' as well as enhance academic and community partnerships for preventing obesity in native and non-native children on the Flathead Indian Reservation. Since the grant, our UM-Flathead Indian Reservation partnership has received a two-year USDA strengthening grant titled 'Growing Strong Generations.'"



Susan Tavernier

Title: Assistant professor of nursing, Idaho State University

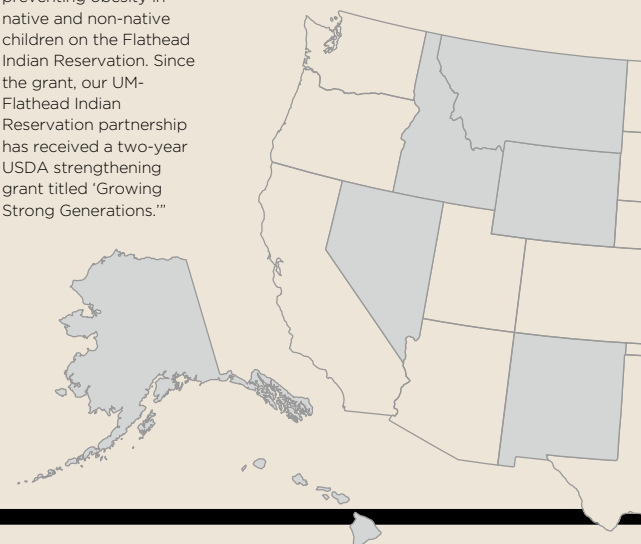
CTR-IN pilot grant project:

The patient voice in health care

Impact beyond grant project:

Led to involvement in more research projects

"The CTR-IN grant has allowed me to build my research portfolio. I was awarded funding for a companion study through the Institute of Translational Health Sciences Rising Star Award. The two studies combined provide the preliminary data I need to submit an R01 grant application. I'm also the evaluator on a \$1.5 million Health Resources and Services Administration grant now. As a direct result of a conversation about my CTR-IN pilot work that I had with a colleague who leads the nursing subcommittee of the Southwest Oncology Group, I was invited to be the nursing coordinator for one of their studies."





Jacqueline Snow

Title: Assistant professor of psychology, **University of Nevada, Reno**

CTR-IN pilot grant project:

How human food decisions are influenced by real object versus image displays

Impact beyond grant project:

Practice with grant administration and management

"The CTR-IN has helped me become better at operating and managing projects—from navigating UNR's Office of Sponsored Projects to calculating F&A (facilities and administrative costs), purchasing equipment, and annual reporting. This has highlighted the importance of effective time management to maintain research productivity along with my other academic responsibilities. As a result of the funding from the CTR-IN, I now have a well-functioning lab consisting of five PhD students and two postdocs. In sum, the CTR-IN has provided critical support that has allowed me to extend our research into the translational domain, and we wouldn't be where we are without it."



Xiaomeng "Mona" Xu

Title: Assistant professor of experimental psychology, **Idaho State University**

CTR-IN pilot grant project:

Understanding the role of self-expansion in physical activity

Impact beyond grant project:

Mentorship that resulted in higher productivity

"The mentorship piece of CTR-IN was something I wasn't particularly aware of when I applied, but it was profoundly impactful. CTR-IN provided the funding for my distance mentor, Claudio Nigg from the University of Hawaii, to come to ISU and meet in person. Because our mentoring relationship was working so well, we ended up doing a poster and symposia talking about that mentoring experience. I've been incredibly productive since I received this pilot grant, producing a lot of publications and presentations and receiving some internal grants that have helped me keep my research going. I will be going up for tenure this fall, five years into my first faculty position."

—Raegen Pietrucha

DID YOU KNOW?

The CTR-IN is funded by the National Institutes of Health (NIH) Institutional Development Award (IDeA) Program. States that qualify for the IDeA Program have comparably low rates of NIH funding compared to other states. The \$20 million in CTR-IN funding the Mountain West IDeA states received will accelerate research discoveries that can improve human health across all seven participating states: Alaska, Hawaii, Idaho, Montana, Nevada, New Mexico, and Wyoming.

major MW state universities by providing support not just for their research, but also for their professional and career development," Kumar said.

The success rates of the CTR-IN have been tremendous thus far. The ATF program has generated a 13 percent NIH funding rate and a 27 percent NIH scoring rate on the submitted grants, both of which are higher than the national average funding and scoring rates. And the 69 pilot grants awarded so far totaling about \$4.33 million have generated 35 extramural awards totaling an additional \$13.9 million in extramural funding—a rate of return of 320 percent!

"Faculty members' ability to secure such a large amount of extramural funding demonstrates the difference the CTR-IN is making at the participating universities," Kumar said. "It's spurring further research infrastructure development, which is one of our major objectives of this grant. The opportunity to help junior faculty obtain this extramural grant funding so their research can make an impact on the residents of the Mountain West region is truly a privilege and a noble cause."

At UNLV specifically, the grant has boosted campus research, as eight of those 69 pilot grants awarded so far have gone to the university. Among the recipients is assistant professor Yu Kuang in the School of Allied Health Sciences. An award of \$82,500 over roughly nine months bolstered Kuang's research, which aims to determine which combination of molecular imaging and biomarkers can provide early insight into a patient's response to chemotherapy.

Other pilot grant beneficiaries include Qing Wu of the UNLV Nevada Institute of Personalized Medicine and Department of Environmental and Occupational Health, who was awarded \$70,389 in funding from the MW CTR-IN program. Wu's work, titled "A Pilot Study to Develop Personalized Reference Values of Bone Mineral Density," is a precursor to a larger NIH grant proposal regarding the development of a more accurate predictor of osteopathic fractures in white women.

"Larger federal awards are really contingent on having proof of concept," said



Parvesh Kumar

Mary Croughan, UNLV's vice president for research and economic development. "Pilot grants like those offered through the CTR-IN enable researchers to obtain the critical preliminary data and evidence of productive collaboration that demonstrate proof of concept, which is why these types of grants are so critical."

"CTR-IN has helped our health researchers in so many ways," said Carolyn Yucha, dean of the UNLV School of Nursing. "The infrastructure and educational programming has changed UNLV's research culture and increased our ability to apply for larger federal funding. These benefits have extended across all of our 13 partner universities as well, whom we've enjoyed collaborating with in new ways, thanks to this program."

On the docket for year five of the CTR-IN grant, which ends its current run in June 2018: several more pilot grants—these ones focusing on health disparities research—and an additional multisite research project, Kumar says.

And once this CTR-IN grant has concluded? In addition to resubmitting for another CTR-IN grant in the fall of 2017, Kumar is considering co-funding opportunities with the NIH's Centers of Biomedical Research Excellence and IDeA Networks of Biomedical Research Excellence, with the goal of expanding further into translational research.

"CTR-IN is an opportunity for all of the involved universities to really help their communities," he said. "The objective of all this research funding has always been to improve the health of people living in the Mountain West region, and we will continue working toward this goal."

—Pashtana Usufzy

DID YOU KNOW?

Nevada currently ranks 37 in the nation in health care, according to *U.S. News and World Report*. The Clinical Simulation Center of Las Vegas (CSCLV) is working to help change that, training health care students within the UNLV School of Nursing, the Nevada State College School of Nursing, the University of Nevada School of Medicine, and now UNLV's new School of Medicine. Outside health-focused organizations schedule training and recertification sessions at the CSCLV for their employees as well.



Inside the Clinical Simulation Center

Step into a custom-designed training center in Southern Nevada where manikins talk, blood is made by the gallon, and life-saving skills are researched and mastered.

Welcome to the Clinical Simulation Center of Las Vegas (CSCLV), which opened in August 2009 to serve the UNLV School of Nursing, the Nevada State College School of Nursing, and the University of Nevada School of Medicine. Since CSCLV's doors opened, students have conducted nearly 4,000 simulations, exploring 76 different health scenarios in the dynamic 31,000-square-foot space.

"In addition to the schools that send their students here, outside health-focused organizations schedule training or recertification sessions for their employees, some of whom are former students," said Jackie Kinsey, director of operations and finance for the CSCLV. "Many of them have shared stories about how their CSCLV education well-prepared them for the actual emergencies they handled."

While the CSCLV is a critical training tool, it also serves an important research function, spurring new knowledge that informs and improves nursing practices. Jessica Doolen, assistant professor of nursing and educational director of the CSCLV, has been part of six research studies involving the CSCLV since she began championing clinical simulation in 2008, several of which have confirmed the importance of teamwork in health care environments.

As the primary investigator for one such study, "Simulation Teamwork and Observation for Procedural Safety," which examined how a checklist might help nursing and medical residents and students decrease the potential for central-line insertion infections, Doolen discovered that communication among colleagues went a long way toward preventing illness. After introductions were made among the simulation's various participants, the medical resident was asked to insert a central line into a manikin while the nursing student followed along with the checklist. Faculty remained outside the room, maintaining the realism of the scenario but observing participants' behaviors. Doolen's findings supported prior studies that identified good communication as key to positive patient outcomes; as it turns out, that basic introduction at the beginning of the simulation reduced the potential for medical errors to occur along the way, which could dramatically decrease negative patient outcomes if implemented in real-world health care settings.

"The key advantage to the CSCLV during skills training and research studies is the fabrication of a health care environment," Doolen said. "Each element, from the smallest Demo-dose vial to the construction of an exam room, mentally places students in scenarios they will encounter as professionals. Complementing the realism is the absence of an instructor during the scenario, which encourages the students to take action rather than look for approval."

This fall, students from UNLV's new School of Medicine joined CSCLV's ranks, where they too train for success.

—Kevin Dunegan and Raegen Pietrucha



STUDYING THE STUDIOUS

UNLV faculty research the effectiveness of the various simulation center training scenarios seen here. Tour more of the Sim Center online by visiting unlv.exposure.co.

DID YOU KNOW?

Nevada consistently ranks first in the nation for domestic violence fatalities, according to the National Coalition Against Domestic Violence. UNLV researcher Jennifer Guthrie hopes that improving communication between survivors and shelter staff could save more lives.

Strengthening Support Strategies for Domestic Violence Survivors

New research highlights the complexity of communication between domestic violence survivors and shelter staff, providing insights that can further improve these relationships.

For survivors of domestic violence, having a network of people to turn to is imperative in the healing process. But how can such a network best provide support?

Jennifer Guthrie, a communication studies professor in UNLV's Greenspun College of Urban Affairs, trained as a shelter advocate and immersed herself in field research to answer that question.

Guthrie began exploring the dynamics of interpersonal relationships as a graduate student under University of Kansas communication studies professor Adrienne Kunkel, spending nearly three years on the shelter study. For about four hours a week over a 15-month period, Guthrie and Kunkel answered the crisis hotline at a Midwest shelter, cared for and spoke with shelter residents, and conducted in-depth interviews with 28

female survivors of domestic violence.

It's difficult for many people to know what to say or how to provide effective support to survivors, Guthrie said, but the most surprising finding to emerge from the research was that communication barriers exist between survivors and the trained shelter staff hired to help them.

In the interviews, survivors revealed that they sometimes didn't feel comfortable talking to staff about their feelings and needs. "In one way, the staff member was another difficult relationship the survivor had to navigate," Guthrie said.

This upended the researchers' initial assumption that residents would naturally feel comfortable connecting with shelter staff, who are trained to help women gain independence from their abusers. These relationships, however, sometimes mirrored the power struggle that many women were just getting out of, Guthrie said. The survivors struggled to balance the need to stand on their own but also rely on staff to help manage their situations.

The fact that survivors go through several stages of physical and emotional trauma and recovery at different rates contributed to the tensions they experienced with staff members, Guthrie said. Some women immediately find resources to get back on their feet and regain control of their lives, while others have a hard time adjusting to living independently and must relearn those steps, she noted.

Survivors felt the need to prove their independence in order to obtain more help and validate that they deserved a space in the shelter, Guthrie said. If they made strides—such as lining up job interviews—the survivors thought that they'd receive more assistance from the shelter staff. If

they perceived they were falling short, however, they sensed that others would be less helpful to them. They weren't entirely mistaken in these beliefs, Guthrie indicated.

"Staff may be more sympathetic and notice the women who are picking themselves up by the boot straps," Guthrie said. "If you see a survivor who appears unwilling to help themselves, then you may be less likely to help them as well. However, survivors face countless barriers when trying to escape an abusive relationship."

Communication challenges also arose due to staff burnout. Shelters across the nation are understaffed, Guthrie noted; and employees are overworked, underappreciated, and underpaid—sometimes funded solely through grants they write themselves, which detracts from their primary role in the shelter.

Guthrie and Kunkel made several recommendations to shelter staff based on their research. Faith leaders, friends, and co-workers of survivors can also benefit from the findings. First, Guthrie and Kunkel suggested that shelter staff understand that survivors' coping strategies vary. The researchers recommended that staff humanize their relationships with the women and children by engaging in commonplace activities like play with the children. They also advised that shelters create roles dedicated specifically to listening to survivors' stories—which, although often nonlinear in nature and therefore more challenging to follow, help facilitate survivors' healing processes. Additionally, the researchers suggested eliminating the standard 30-day stay policy whenever financially feasible. Finally, Guthrie and Kunkel recommended that employees and volunteers reframe their perceptions of survivors and abusive situations. For instance, shelter staff can often feel they have failed when a survivor chooses to return to an abusive partner, only to come back to the shelter.

"It's not a failure," Guthrie said. "It's actually a success that people came back and recognized they needed help."

Guthrie and Kunkel recently shared their findings in "Survivor: Women's Stories of Navigation and Tensions in a Domestic Violence Shelter," published in the *Western Journal of Communication*. In February, their analysis won the journal's Outstanding Journal Article Award. Guthrie is continuing this research to develop and improve programs for shelter staff in the Las Vegas area. —Afsha Bawany

Breaking the Language Barrier

Doctoral candidate Eshani Lee's research ensures college chemistry knowledge doesn't get lost in translation.

One of the great promises of higher education is its potential to help students someday achieve the American dream. College is intended to be a great equalizer, offering students from even the most challenging backgrounds and circumstances a chance for upward mobility.

But this promise doesn't come without its obstacles. For students whose native language isn't English, it isn't just the subject matter of a course that can prove challenging. The very act of learning can be problematic when the language upon which learning relies is unfamiliar. And it's not only writing and literature classes that create roadblocks. It's math and science courses, too.

"The largest attrition rates in the sciences are among nonnative-English-speaking students," said Eshani Lee, a doctoral candidate at UNLV whose research focuses on chemistry education—more specifically, how nonnative-English-speaking students learn in college chemistry courses and the specific challenges they face taking exams and quizzes. At issue, Lee said, isn't how smart students are, but how scientific information is presented to them and how their knowledge is assessed.

"Many people think that if you can figure out a mathematical formula, you don't need language skills," Lee said. "But for a student to be successful in the sciences, it's important that they understand not just numbers, but the language that the numbers are imbedded in."

Lee knows what it's like to be a smart student whose language skills create barriers. Born in India to non-English-speaking parents, she moved to California

DID YOU KNOW?

The National Center for Education Statistics reports that in 2014-2015, Nevada had the second highest percentage (17 percent) of English language learners—students who participate in language assistance programs to attain proficiency in order to better meet learning standards. And Nevada's public school system currently ranks second to last in the nation, according to the Annie E. Casey Foundation. But Eshani Lee's research could improve one area of education for our state's English language learners once they reach college, helping them thrive in that setting.

when she was 12. She dreamed of being a doctor, but the academic frustrations of being a nonnative speaker of English nearly convinced her that she wasn't intelligent enough.

Lee did, in fact, get into medical school. She completed two semesters at Ross University School of Medicine before realizing that her passion was scientific research and not patient care. At that point, she matriculated to UNLV, where she earned a master's degree in biological sciences.

While working as a graduate assistant, Lee came to realize that she loved to teach, so she combined her passion for science with her love of teaching and decided to pursue a doctoral degree in chemistry education. Lee hopes her research in this field will lead to strategies that will enable teachers and students to improve learning in chemistry and, ultimately, help nonnative-English-speaking students thrive in all sciences.

"On a personal level, bright students are being discouraged from achieving STEM

(science, technology, engineering, and math) degrees," Lee said. "In order for (any institution) to be a top research university, every student needs a fair chance to succeed."

While similar studies have been done with younger students, research at the postsecondary level is rare—and for such research to focus on a hard science like chemistry, even rarer.

"Lee's research has the potential to make a significant impact on a growing number of college students throughout the country," said MaryKay Orgill, associate professor of chemical education and Lee's dissertation advisor. "This is especially true at UNLV, where, for many of our students, English is a second language."

Lee is a recipient of the prestigious President's Fellowship, funded through gifts to the UNLV Foundation. A new mother, she is profusely grateful for the support. "The fellowship helps me afford child care so I can devote time to my research," she said. "It is truly a blessing." —*Marian Alper*



Mastering the Material

KWANG KIM, WINNER OF THE 2016 HARRY REID SILVER STATE RESEARCH AWARD, DESIGNS SUBSTANCES THAT PROPEL US INTO A CLEANER, HEALTHIER FUTURE.

THE OBJECTS IN KWANG KIM'S LAB SEEM random to a layperson—gray rubbery flaps, white plastic pieces, misshapen scraps. But the NV Energy Professor of Energy and Matter in UNLV's Howard R. Hughes College of Engineering knows just how all these materials make—and even sometimes break—our world.

Kim's business is researching the substance of structures and energy systems, and without him, there's much in the way of solutions, careers, and companies that may have never materialized.

As multifaceted as the materials he studies, Kim's research accomplishments span a variety of seemingly disparate specialties. He's invented a water-repelling substance that modifies the surface of steam-power plant condensers and, in the process, improves the rate of heat transfer by 200 percent in some environments. Instead of forming a steam film as they work, the condensers form droplets of condensation. This "dropwise condensation" process could someday move beyond its current application with condensers and reshape how entire power plants are built.

Kim is also investigating a novel composite material that could be leveraged in a battery system's electrochemical cell. Such a device promises to reduce the maintenance associated with conventional batteries while expanding energy capacity and extending the battery system's life cycle.

His most recent research calling: advancing the soft robotics field by creating artificial muscle from materials that can bend, twist, oscillate, and more. This work has the potential to help millions

with health problems and disabilities.

Having dedicated more than 25 years in academia and the private sector to these endeavors, perhaps it's unsurprising that Kim has garnered UNLV's most prestigious accolade, the 2016 Harry Reid Silver State Research Award, which recognizes a researcher whose work not only addresses real-world needs and advances the field but also contributes to Nevada's growth and development. However, Kim—no stranger to recognition, as he is also a Fellow of the American Society of Mechanical Engineers and the recipient of the 2015 Regents' Researcher of the Year Award from the Nevada System of Higher Education, the 2016 Distinguished Barrick Scholar Award from the UNLV Executive Vice President and Provost's Office, and several other honors—remains humble.

"This award is more than I deserve," he said. "I'm just doing my job."

THE UNLIKELY ENGINEER

Kim hadn't initially set his sights on an engineering career. In fact, he hadn't married himself to any particular path for most of his young adulthood, even when he was actively pursuing academic degrees. At his parents' behest, Kim had applied for and was accepted to a school where he was to pursue medicine. At the last minute, he decided against going and instead attended South Korea's Yonsei University with his friend, who was interested in engineering. Kim wasn't familiar with the subject.

"I didn't plan to become an engineer," he said. "It just turned out that way." (Incidentally, Kim's friend didn't end up an engineer, taking



JOSH HAWKINS



**SIGNS OF
(ARTIFICIAL) LIFE**
Engineering researcher
Kwang Kim examines
an electroactive
polymer (i.e., artificial
muscle) sensor array as
part of his soft robotics
research.

on an automotive business instead.)

Even as he finished his master's in chemical engineering at Arizona State University, Kim wasn't sure if he would continue his studies in the field. An interest in a faculty member's projects kept him on for a Ph.D., and then Kim was off to the University of Maryland, College Park, for postdoctoral training.

"Even at that time, I wasn't quite sure what I was going to do," Kim admitted. "So I joined a small R&D company, Thermal Electric Devices Inc., with the hope that it would grow."

Although Kim was enjoying studying metal hydrides there—compounds formed between metals and hydrogen, the likes of which are most commonly used in batteries—the idea of working for a larger company continued to call to him.

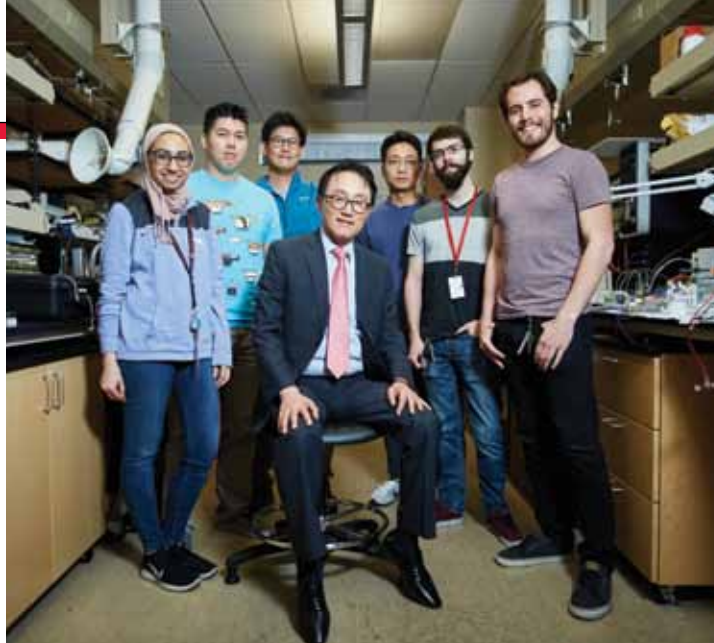
He moved on to Environmental Robots Inc., where he began investigating electroactive polymers—substances composed of large, complex molecules that change when electrically stimulated. There, Kim had his first taste of robotics work, collaborating with the Defense Advanced Research Projects Agency (more commonly known as DARPA) on a project developing soft underwater robots. He also got the chance to work alongside the late French physicist and Nobel Prize laureate Pierre-Gilles de Gennes.

Although their time together was brief—only a few days—de Gennes continues to influence and inspire Kim, who kept a notebook they'd scribbled research notes to each other in.

"I had been looking at physics in a very sophisticated manner at that point," Kim said. "I was relatively young, and my Ph.D. training instilled that in me. But de Gennes taught me how to sort out the few important factors from the complicated, to look at things in a more global and simplified manner. I was a late learner just doing things, but finally it started to click. That was a tipping point for me academically."

Kim joined the University of Nevada, Reno, shortly thereafter to work alongside his Ph.D. advisor and then-UNR professor and chair of mechanical engineering, Byard Wood. Kim became chair himself in 2007 and UNR Foundation Professor in 2011, a title he held until joining the University of Nevada, Las Vegas, in 2012.

"Both my children had moved on to college, so I'd started thinking to myself, 'What am I going to do with this empty nest?'" Kim laughed. "I started looking at other schools, including UNLV, and when I talked to the



FOSTERING FUTURE RESEARCHERS

Kim has mentored more than 120 researchers at all levels thus far in his career, some of whom have moved on to successful careers of their own in academia and private industry.

president [then Neal Smatresk] and Engineering Dean Rama Venkat, I decided to come to Vegas and build my Active Materials and Smart Living Lab here. Now that I'm regular faculty, I have time to expand my program. I have a very energetic group of undergrads, grads, and postdocs; and I'm trying to keep them busy."

THE ENDLESS QUEST FOR ANSWERS

There is certainly no shortage of work in Kim's lab, which is a reflection of his diverse research interests as well as his myriad relationships in the public and private sectors.

"As an engineer, I don't normally pick the project; I go talk to people and find out what their problems are," Kim said. "In other words, I'm not trying to sell my ideas; I'm trying to solve their problems."

Take Kim's dropwise condensation coating as an example. Kim had heard from the condenser industry for some time that steam was presenting a problem for steam-power plants. He wrote a proposal to the U.S. Department of Energy, which gave him roughly \$68,000 in 2013 to develop a solution, which Kim then patented. In 2014, Boston-based venture company NBD Nanotechnologies licensed Kim's technology and hired postdoctoral scholar Bong June Zhang, who'd worked on the coating with Kim. Kim wrote 30 technical papers on the subject.

And thanks to a \$3.8 million grant received in 2015 from the National Science Foundation's Partnerships for International Research and Education (PIRE) program, Kim, UNLV engineering professor and colleague Paul Oh, and several other researchers around the world are working to develop artificial muscle materials that can address a number of human health concerns and soft robotics-related problems. For example, conventional methods for dealing with catheters currently put patients at risk for damaged vessels, particularly when it

comes to smaller passages in the neurovascular system. But Kim developed an artificial muscle micro-catheter with controllable features that could serve as a robotic biomedical platform in treating cardiovascular diseases, strokes, and more. Thus far, Kim's artificial muscle research has generated three U.S. patents and 150 publications, including three books.

"Without any doubt, (Dr. Kim) has been one of the most productive and successful researchers at UNLV," Venkat said. "His contributions to the science and engineering community have not only resulted in his recognition worldwide but have promoted the reputation of UNLV."

Although solving complex research problems is difficult enough, Kim recognizes that his success has depended upon more than just his engineering background.

"You have to build relationships, because people won't tell you their problems until they're comfortable with you," Kim said. This rule applies to the 120 research trainees—grad students, postdoctoral research fellows, visiting scholars, undergrads, and professors—Kim has mentored thus far in his career, three of whom currently hold faculty positions nationally.

"Some of my former students are working for Apple now, some are in academia, and some of them I have to make appointments with to see them," Kim said. "I don't think I taught them, but I had the privilege of working with them. They still call me here and there. That's what I enjoy the most."

The rule also applies to his peers, who admire him greatly. And with 170 journal articles, more than 160 papers in conference proceedings, 15 book chapters, nine edited volumes, and three books to his name cited between 800-900 times a year, there's certainly plenty to commend.

"Kim is an outstanding individual who has shown great leadership both nationally and

internationally in the area of bio-inspired material design, a field with enormous potential to change many aspects of our lives,” said George Lauder, Henry Bryant Bigelow Professor of Organismic and Evolutionary Biology at Harvard University.

And, of course, there’s the bunch of funding agencies and private partners that have taken notice of Kim’s research. As an academician, he has received \$15.6 million in external support (more than \$1.7 million annually since he joined UNLV in 2012) from the National Science Foundation, Tesla Motors, NASA, the U.S. Department of Energy, the U.S. Department of Defense, and more. To say his contributions to his field—not to mention Nevada’s growth and development—are significant is a tremendous understatement.

“The types and variety of partnerships that Dr. Kim has been able to foster are evidence of his talent for building impactful relationships and for connecting the research endeavor to tangible outcomes that help our communities and further develop our economy,” said Carolyn Yucha, dean of the UNLV School of Nursing. “It’s impossible to calculate the value of his efforts, but they are of tremendous benefit to UNLV and beyond.”

THE FUTURE, MATERIALIZING ONE PROJECT AT A TIME

With as massive and mind-boggling a record of accomplishments as his, it’s easy to wonder how Kim has achieved all he has. So, what’s his secret for success?

“I write everything down in my notebook and on my project board, and I go through the list. It’s organization. That’s it,” he said. “Also, I just keep trying. Rejections are natural. If you worry about failure, you care too much.”

On his list right now: 3-D-printing materials that mimic portions of mammals and fish whose purposes we don’t understand, such as a flying fish’s fin.

“3-D printing technology has made really good progress recently,” Kim said. “It became a new tool for me that I can use to put together 3-D shapes of the active materials I’ve been developing. The only challenge is that the selection and usability of the materials are pretty limited, so I’ve been spending some time creating products in my lab that can be printable.”

Also on his list: developing materials that can be animated with chemical or thermal energy but controlled by electrical or other external fields—in other words, substances that will be able to operate as animal muscles do.

“Animal muscle is probably the best actuator we know of,” he said. “But how do we make it

work? We eat, which is chemical energy, and some part is converted into energy that’s controlled by electricity—your brain. Eventually, I’d like to have a chemo-mechanical material I can control with electric, but I haven’t been able to find any materials yet.”

One more item on his agenda: Having happened to meet Harry Reid, Kim was inspired by the award namesake’s health challenge, and being the type of researcher that he is, Kim couldn’t help but think of solutions that could come from materials science and engineering. (Reid has no involvement in the award selection process and is the namesake only.)

“I met (Reid) a year or two ago,” Kim said. “He told me about his eye problem, and I told

him I knew of a material that could be made in such a way that it could be embedded outside the eye.” Undergraduate researcher Michelle Quizon is currently working on the project, which her Honors thesis centers around.

“There’s so much we can improve with research,” Kim said. “And if I make a little progress, then someone who follows could take it to the next level, and we can change people’s lives for the better. Someday, we could make an artificial heart. Or we could make a dropwise condensation coating last longer, helping to save the environment. I can’t make all those things on my own, but I am part of the journey, and I’m proud of that.” ■

—Raegen Pietrucha

Q&A With a Protégé: Michelle Quizon

The undergraduate researcher, Honors student, and recipient of the CSUN Tom Weisner Academic Scholarship, Multicultural Engineering Scholarship, and O’Rourke Plumbing Scholarship spoke with *Innovation* about her experiences working with Kim.

How did you get involved in Dr. Kim’s artificial eye muscle project and select it as your thesis topic?

I joined Dr. Kim’s lab in 2016. He was recruiting students as part of the PIRE program to go to South Korea over the summer of 2016 and study artificial cilia. My friend had him as a faculty advisor and told me about his work, so I reached out to him about the opportunity. After two weeks, I knew I wanted to keep working on the artificial muscle research he was doing, so I asked if I could do my Honors thesis with him.

What is the specific eyelid muscle research you’re conducting?

Our research is associated with eyelid muscle paralysis. My job is to find an extraneous, or external, support system that can enable eye blinking. We are trying to find ways to use ionic polymer-metal composites (IPMC), the material Dr. Kim specializes in, to facilitate eye blinking and serve as a

feasible alternative for current assistive eyelid blinking options. Our IPMC material can work efficiently in a wet environment, which will improve reliability. It also requires a low voltage, making it more biocompatible. Our solution is also customizable, in that we can personalize the geometry of every IPMC artificial eye muscle.

What’s the most interesting aspect of this research to you?

The interdisciplinary feel of it. I initially came to UNLV being a mechanical engineering major, and that will be my degree when I graduate in the spring of 2018, but through these projects, I get to see just how applicable engineering is to biology. This project solidified my aspirations to pursue bioengineering, which is the integration of the two. I want to get my Ph.D. in bioengineering, specifically biomaterials and therapeutic deliveries.

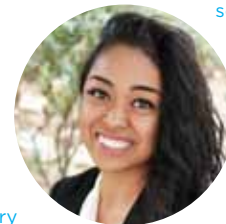
Is there anything in addition to improved eye functionality that could be gained from your research?

Compared to other parts of the body, eyelid muscles require relatively lower amounts of force. However, if this IPMC artificial muscle works, I do foresee

application on a larger scale—for example, with facial paralysis.

How would you describe Dr. Kim as a mentor?

Dr. Kim is a great mentor. He lets you be you, which I appreciate a lot. He’s very much a people person. He has a broad range of research interests, so he collaborates a lot with people within and outside his discipline and strives to connect his work with theirs. Because of my work with Dr. Kim, I was able to land an internship at Stanford this summer. I owe many of my successes to him.







BEYOND THE BAROQUE

INSPIRED BY HER RESEARCH ON THE PERIOD'S MUSIC, FLUTIST JENNIFER GRIM CREATED A FIRST-OF-ITS-KIND FESTIVAL FOR UNLV AND THE COMMUNITY.

DRIVEN BY A CURIOSITY INNATE TO researchers and artists, Jennifer Grim recently—and happily—found herself at the edge of a new realm within her discipline. Although an accomplished soloist and ensemble performer with several accolades under her belt, the flutist and UNLV associate professor of music had one specialty she'd yet to take on: the traverso, or baroque flute.

With a sound softer and darker than contemporary flutes produce, this wooden keyless instrument was played during the time baroque music was written and provides an authenticity that takes today's listeners back centuries.

From 1600 to 1750, baroque composers tapped into the Greco-Roman concept that music could communicate directly and powerfully to the senses. The baroque era gave birth to opera, new instruments, and highly emotional works. Cantatas, concertos, and sonatas became part of the musical landscape. Vivaldi, Bach, and Handel composed their way into history. Harmony came to the fore, and performances that once only triumphed in churches and aristocratic halls reached the public realm.

Grim set out to study baroque music and the traverso with some of the world's top baroque flutists, using an \$18,000 Faculty Opportunity Award (FOA) she received in 2015 from the UNLV Division of Research and Economic Development to assist in her quest. Never before had she applied for funding of the magnitude she received or immersed herself so deeply in the baroque experience.

The opportunity not only influenced Grim's approach to baroque, whether playing on traverso or contemporary flute; it allowed her to quench her thirst for new knowledge once again.

"After teaching for a decade, I had an entire six months to become a student," she recalled, "and use that knowledge toward teaching, taking in what I learned from (others') teaching styles."

The intense immersion in 17th and 18th century music took Grim to cities on both coasts and beyond. She traveled to Northern California to study with renowned baroque flutist Stephen Schultz. Then she was off to New York City, where she studied with Sandra Miller, a flutist teaching at The Juilliard School, which has a historical performance program. In Boston, Grim studied with soloist and ensemble performer Christopher Krueger. Then she went to Amsterdam, where she studied with Wilbert Hazelzet at

the Royal Conservatory of the Hague, taking private lessons and sitting in on classes. Grim not only learned the traverso along the way but also dug into music she hadn't yet experienced—mostly French baroque repertoire—as well as some of the more unfamiliar literature of the time.

For Grim, who holds a master's and DMA (Doctor of Music Arts) from Yale, the trip was invaluable.

"Experts opened my ears," she said. "The range and sound and color of an instrument shapes how you play it. Learning the historical instrument gives a better perspective. Playing on that opens up to the sounds you'd hear in Bach's time."

Grim's interest in the baroque didn't end with her trips or her traverso lessons. Upon her return, she sought to bring the baroque experience to the campus and community. Hence, Las Vegas' first-ever Baroque Festival was born.

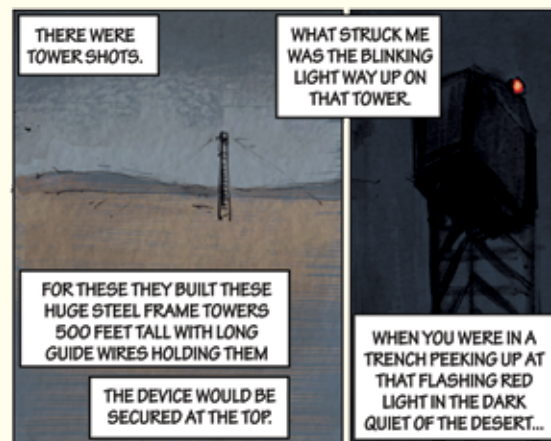
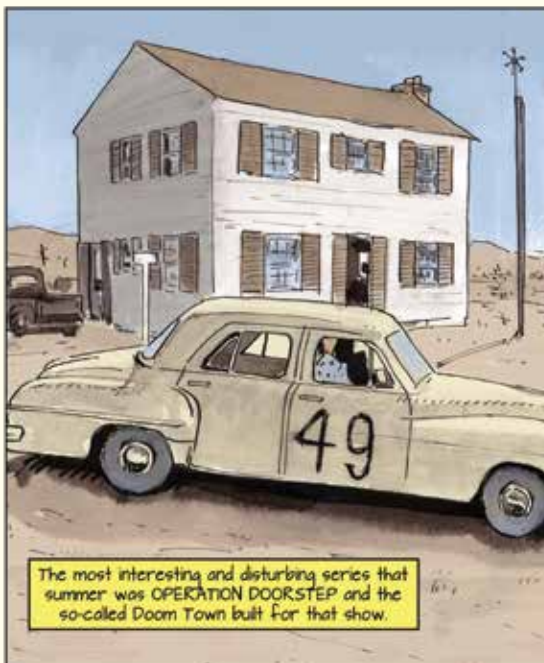
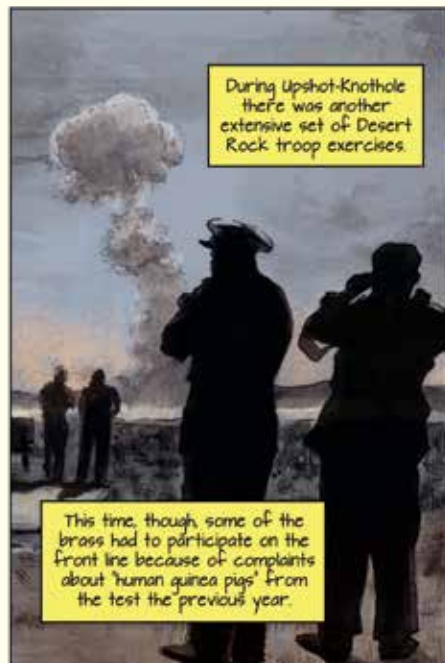
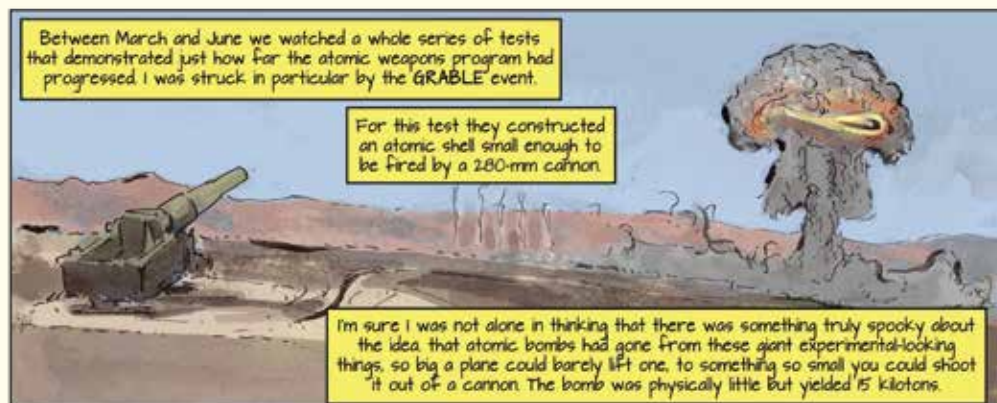
Jonathan Rhodes Lee, a harpsichordist and musicologist specializing in baroque-era music who was considering joining UNLV as an assistant professor at the time, said Grim's research and festival idea piqued his interest in the university, as it signaled to him that UNLV was a place where new ideas and efforts like it would be supported. Lee came aboard in 2016 and helped plan the Las Vegas Baroque Festival, which opened with his lecture "What Is 'Baroque' About Baroque Music?" on April 18. Lee also played harpsichord during Grim's performance of Francois Couperin's work on April 22.

"We wanted it to be a multidisciplinary event," said Grim, who also used part of her FOA funding to purchase two baroque flutes—one for the student body and one for herself. "We wanted to reach out through the music as much as we could."

The festival on April 18-23 brought the Bay-area Archetti Baroque String Ensemble, prize-winning Notre Dame University organist Craig Cramer, faculty and student performers, and even musicians interested in joining in a baroque play-along together to share and celebrate the unique musical experience.

"The expectation of the era's composers is that you will add to the music, ornament it, and make each performance unique," Lee said, noting that the Las Vegas Baroque Festival seeks to capture and honor this sentiment. "It was such a period of explosive creative fervor."

—Kristen Peterson



Atomic Testing, One Panel at a Time

DOOM TOWNS TAKES A GROUND-LEVEL VIEW OF GROUND ZERO AND PRESENTS IT IN THE FORM OF A GRAPHIC NOVEL ABOUT LAS VEGAS' POSITION IN THE ATOMIC FIRMAMENT.

PHOTOS: U.S. DEPARTMENT OF ENERGY;
GRAPHIC ART: KRISTIAN PURCELL



A Brief History of the A-Bomb

- 1942** Creation of Manhattan Project; first nuclear chain reaction, University of Chicago
- 1943** Los Alamos Laboratory established
- 1945** TRINITY, first nuclear explosion (21 kt); atomic bombings of Hiroshima (15 kt) and Nagasaki (21 kt), Japan; WWII ends
- 1946** OPERATION CROSSROADS begins U.S. postwar atomic testing in Pacific
- 1947** Atomic Energy Commission established; Doomsday Clock announced
- 1949** First Soviet atomic test, Joe 1
- 1951** Nevada Proving Grounds selected as continental atomic test site
- 1952** MIKE, first full-scale thermonuclear test (10.4 mt)
- 1957** RAINIER, first contained underground test; HOOD, highest yield U.S. atmospheric test at Nevada Test Site (74kt)
- 1958** Temporary testing moratorium

Sixty-five years ago, the exercises at Camp Desert Rock called for soldiers to charge into ground zero seconds after an atomic bomb was detonated.

In all, some 6,500 troops were sent running toward fire and haze as the ground melted to glass at the Nevada Proving Grounds, 65 miles northwest of Las Vegas. From Oct. 22-Nov. 22, 1951, bombs went off three times during the round of testing, known as Operation Buster-Jangle. Among other things, the tests were to determine the psychological effects on military personnel. Would troops still be able to function after seeing the bomb?

And then, after they went into the middle of the devastation, the radiation? They were swept off with a broom. "Looked like it came right off the rack at Sears Roebuck," one soldier described it.

For your nuclear decontamination needs: Sears! Somehow, the slogan didn't catch on.

That kind of story is part and parcel of *Doom*

Towns: The People and Landscapes of Atomic Testing, an ambitious graphic history from history professor Andrew Kirk published by Oxford Press.

Kirk served as a principal investigator for the Nevada Test Site Oral History Project from 2003 to 2008. It zeroed in on the lived experience of test site workers, those living in the area outside the gates, and others affected by atomic testing—not necessarily high-ranking personnel normally found in academic works.

Kirk's primary research field is environmental history, so the chance to write about desert dwellers who offered a rebuttal to the idea of the Mojave as an empty wasteland made *Doom Towns* a natural fit.

Originally, though, Kirk hadn't intended to write a book after helping bring the oral history into being. An editor at Oxford talked him into it with an unusual pitch: marry his past research with a graphic novel approach. The idea resonated. Just as the oral history project had given voice to those seldom asked, this

1961 Temporary testing moratorium ends; Soviet TSAR bomb most powerful in history (50 mt)

1962 Cuban Missile Crisis

1963 Limited Test Ban Treaty bans atmospheric atomic tests

1968 BOXCAR, highest yield underground test conducted (1.3 mt)

1970 Nuclear Non-Proliferation Treaty

1974 Threshold Test Ban Treaty signed

1976 Peaceful Nuclear Explosions treaty signed

1977 U.S. Department of Energy established

1979 Strategic Arms Limitation Treaty signed

1982 Nevada Desert Experience begins annual protest program

1988 Largest anti-nuclear protests at NTS

1991 Russian Unilateral Test Moratorium Announced

1992 1,030th U.S. nuclear test conducted at NTS; U.S. approves Nuclear Weapons Testing Moratorium

1996 President Clinton signs Comprehensive Test Ban Treaty (CTBT)

book could honor the art that had come from the era.

"During the oral history project, I realized that art and visual representation of work and life in atomic regions was very much a part of the historical experience and part of the culture that emerged from living in secrecy, doing this kind of extraordinary work, and living around that kind of extraordinary experimental landscape," Kirk said. "It was part of the historic record people didn't really look at."

Kirk identified U.K. artist Kristian Purcell, who had specialized in paintings of the intersection of people and technology in militarized landscapes but had never done anything in a graphic novel format.

"I had to restrain my lecturing and instead really rely on Kristian to convey themes and tone through the art. I think he did an amazing job doing that," Kirk said. "One of the things that was challenging was he was in England. I'm in the United States. I think it all really came together when we decided we would Skype. He would literally sometimes draw while I was looking. I really got a sense of his process as an artist, and I think he got a good sense of my process as a scholar. It was a collaboration to make the art and scholarship cohesive."

The result is a collection of rare primary source documents and a traditional history of the era anchored by a 100-plus-page graphic representation of the age of atmospheric atomic testing, starting with the Manhattan Project Trinity test in 1945 through the Limited Test Ban Treaty of 1963. The treaty forced nuclear testing underground until 1992, when the United States fired Operation Juno's Divider, the final nuclear test on U.S. soil. Four years later, the door was closed on the testing era through 1996's Comprehensive Test Ban Treaty.

Doom Towns tells the story through the lens of the people who were on the ground, like Dorothy Grier Whitcomb, one of the clerical workers for the Los Alamos Scientific Laboratory during Operation Ranger in 1951; and Donald English, the Las Vegas News Bureau photographer who captured some of the most iconic images of the testing era, including the mysterious Miss Atomic Bomb photo.

"At the time, there were a lot of people who were passionate and who thought it was right, and there were protestors who were passionate and thought it was wrong," Kirk said. "But the bulk of the people were doing jobs. They worked long hours in arduous

conditions, so they weren't waxing poetic about history. They were living it."

It's *New York Times* reporter Gladwin Hill that Kirk poses as a kind of Virgil of this nuclear era. Hill was the Los Angeles bureau chief for the *Times* and began covering the tests in 1951. He documented much of the era until becoming one of the first environmental reporters in the country, for the *Times*, in 1969.

"One of the things as an environmental historian I noticed was (that Hill's) perceptions of the people around Las Vegas and the nuclear testing region was pretty simple in the beginning but became more sophisticated and thoughtful as he got to know them," Kirk said. Hill, in Kirk's opinion, managed to be both in the action around him while standing a bit apart to observe. "It enabled him to articulate some of the same things I was interested in as a historian."

More than 40 graduate students worked on the project, both on the oral history and afterward. One offshoot even included middle- and high-school students from Clark County School District who were selected in 2013 to travel to the National Atomic Testing Museum's Kazakhstani counterpart, the EcoMuseum, on a U.S. State Department grant.

It wasn't just students who worked on the oral history project and the book that helped out. Kirk used some of his undergrad students as a test site of his own. "I did do some beta testing of some of the draft chapters with several sections of History 102, and they gave me excellent feedback that was as useful to me as the extensive academic peer review I got," he said.

"This was a fantastic project for student participation," he added. "There were at least eight different classes participating in some way in the research that led to the creation of the book, or on an aspect of the book itself. It was a fabulous opportunity to teach about method and about working with (UNLV's Office of Sponsored Programs) on grants toward an end that was clearly going to have an impact academically but would also matter to the community."

—Jason Scavone

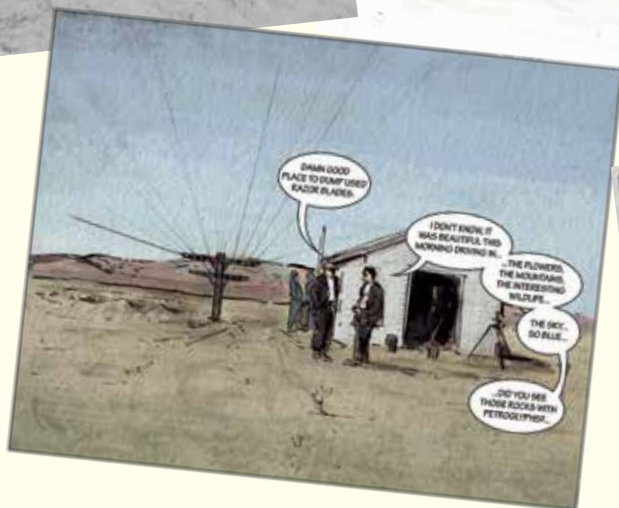


CREATIVE CHRONICLER Historian Andy Kirk decided to show and tell in *Doom Towns*, a graphic novel that takes readers on a visual journey through the history of nuclear testing in Nevada and beyond.





INNOVATIVE
ILLUSTRATOR
Artist Kristian
Purcell produced
each graphic for
Doom Towns, from
photograph to
sketch to finished
panel.



'PICTURING' THE ATOMIC AGE

MOVING BEYOND HIS PREVIOUS WORK AS A PAINTER, KRISTIAN PURCELL TOOK ON UNCHARTED ARTISTIC TERRITORY TO PRODUCE AN ENTIRE GRAPHIC NOVEL.

How did you first get interested in atomic history as an artistic subject?

I think it started with my historical interests and being somebody who's just fascinated by images. Part of the way I process what I see in photos is by working with them as paintings. You learn what makes an image when you study it this way, through an extended period looking and interpreting. Trying to pass some of that information on is what interests me as an artist.

How did you come to work with Kirk on *Doom Towns*?

I based a couple of my paintings in 2007 off of photos from a book called *100 Suns* by Michael Light, which is about atomic testing. I wasn't deeply attached to the atomic subject at that stage; I was drawn to the people watching the tests rather than the subatomic sublime of the explosions. It's always how people interact with these technologies that fascinates me. Andy found my work from *100 Suns* and contacted me to work on *Doom Towns*.

How did the process of working on this book go?

Most of my work before this was oil paintings. *Doom Towns* took me into uncharted territory because I'd never done graphic art before in that kind of detail and depth, so I didn't know how long it would take. I spent a couple of months just drawing, learning how the graphic format worked.

Andy produced scripts for every page. He put a nice example of what he would send me in the book on page

28. The ink drawing on the opposite page is a slightly more worked-up version of what I'd create. We tried to get as close to the original experience as possible. We had a massive amount of photographic information, and I would look for things from the photos to render graphically. I was quite conscious that we were portraying real events in recent history, so I knew whatever colors I chose would have an impact. Examples from artists Emmanuel Guibert and Eric Ravilious guided my decisions on the final color palette.

What's the impact of this collaborative project?

We wanted to ensure that our presentation wouldn't slant the story in one direction or the other, and I think we accomplished that. That was one of the things Andy picked up on in my paintings. In other atomic art he'd come across, the artist seemed to have taken a side in the debate. My paintings, he felt, just let the story sit with all the shades of gray in there. Our book simply says, "Here are the events," and once you've read it, then you can start making your own judgments.

You can imagine the classroom discussions that can and have come out of reading *Doom Towns*. Graphic novels are accessible and immediate, and you can get students straight into constructing meaning and asking questions: How do we interpret this history? Was it right? Was it wrong? You'd potentially have as many different points of view as you would people in the class.

—Raegen Pietrucha

A Brief History of the Making of *Doom Towns*

2003 Nevada Test Site Oral History Project launched funded by the U.S. Department of Energy, with Andy Kirk & Robert Futrell as co-principal investigators

2006 Completely digital archive of research results with full online access launched with the help of UNLV University Libraries

2010 Oral History Project wins National Council on Public History Best Research Project Award

2012 Kirk publishes "Rereading the Nature of Atomic Doom Towns in Environmental History"

2013 U.S. State Department grant sends 12 UNLV researchers and students to Soviet Test Site in Kazakhstan to create new archive of oral histories

2015 U.K. artist Kristian Purcell joins project, completing 800 pieces of original art for graphic section of book

2016 *Doom Towns: The People and Landscapes of Atomic Testing* published by Oxford University Press



GENDER SPECIFICS

ANN MCGINLEY AIMS TO INFLUENCE LEGAL DECISIONS IN DISCRIMINATION CASES BY APPLYING MASCULINITIES THEORY.

In the not-too-distant past, the idea that a straight man could sexually harass another man was unthinkable. Men who engaged in “roughhousing” or “hazing” in a physical or sexual way were just being men.

William S. Boyd Professor of Law and pioneering multidisciplinary masculinities theory scholar Ann McGinley illustrates how much times—and perspectives—have changed in her latest book, *Masculinity at Work: Employment Discrimination Through a Different Lens*. Sexual harassment and discrimination happen for reasons beyond the familiar scenario in which a perpetrator has a sexual interest in the victim, she said.

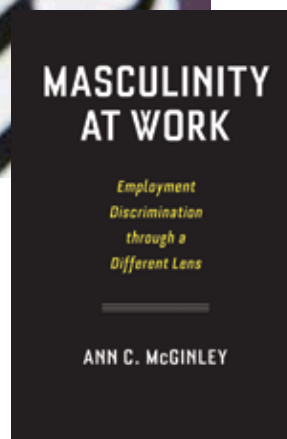
As a starting point for examining discrimination because of sex from a masculinities theory perspective, *Masculinity at Work* zooms in on the case of Miami Dolphins player Jonathan Martin, who was harassed in emasculating and sexually intimidating fashions by teammates. McGinley goes on to explore how gender affects behavior between men as well as between men and women, noting a case involving a female plaintiff who was told by male supervisors at an accounting firm to be more feminine in order to get a promotion.

“The Supreme Court agreed that it was discrimination, but it’s not discrimination to discriminate—at least the

lower courts say this—based on someone’s sexual orientation,” McGinley said. “So we’re at this really weird murky point: How do you know the difference between whether someone’s discriminating because of your sexual orientation or because you’re just not masculine or feminine enough?”

One goal of masculinities theory—which draws on humanities and both social and natural sciences to focus on the range of behaviors, definitions, and identities that inform contemporary concepts of manhood—is to clear up some of those opaque areas that enable miscreant “men being men” behavior.

“I show through the research of masculinity that men engage in these behaviors not only because of the sex of the victim but also because of their own sense of masculinity,” McGinley said. In short, when perpetrators harbor insecurities about their own gender and come face to face with individuals who don’t present or perform their gender



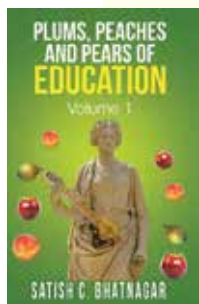
according to standards acceptable to perpetrators, it can be a recipe for a discriminatory disaster.

“Most men don’t know that gender even matters to them,” said Michael Kimmel, distinguished professor of sociology at Stony Brook University in New York and author of a foreword to *Masculinities and the Law: A Multidimensional Approach*, a 2012 collection McGinley co-edited with Suffolk University law professor Frank Rudy Cooper. “But that’s where ... the conversation starts, and that’s why I think (McGinley’s) work is valuable.”

Articulating masculinities theory is one thing. Changing attitudes within the legal system is another. While McGinley predicts judges will be resistant to masculinities theory at first, she’s confident that testimony from social scientists can bring the new ideas into the courtroom.

“(My colleagues will) use my book as a research tool,” she said, “but I’m hoping lawyers and judges will also use this book in order to take advice on how to decide cases based on looking at masculinity research.”

—Matt Keleman



OFF THE SHELF

Plums, Peaches and Pears of Education, Volume 1

Satish Bhatnagar, professor of mathematical sciences
College of Sciences
Trafford Publishing, 2016

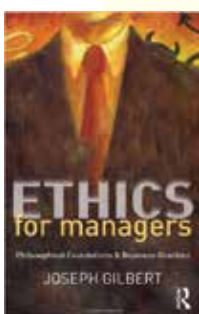
Plums, Peaches and Pears of Education, Volume 1, is a personal story (in 98 independent reflections) of Bhatnagar's life in education as a lifetime student and a full-time teacher at age 77. It is his ninth nonfiction book.



Rock 'n' Roll Origins & Innovators, second edition

Timothy Jones, professor of percussion and history of rock, and Jim McIntosh, history of rock music professor
College of Fine Arts
Kendall Hunt, 2016

The second edition of *Rock 'n' Roll Origins & Innovators* by Jones and McIntosh is a full-color edition with several updates, including a new chapter and a pairing with Napster for 320 recorded examples of significant music in rock 'n' roll history.



Ethics for Managers: Philosophical Foundations and Business Realities, second edition

Joseph Gilbert, emeritus associate professor in the Department of Management, Entrepreneurship, and Technology
Lee Business School
Routledge, 2016

Ethics for Managers: Philosophical Foundations and Business Realities explains the theory behind and practical applications of business ethics for managers. The second edition incorporates new information on the financial downturn, ethical sustainability, and global ethics.

TEXTS AND TESTIMONIES TELL THE TALE

DRAWING ON COMMUNITY PARTNERSHIPS DEVELOPED WITH YUP'IK ESKIMO VILLAGERS, A NEW BOOK COMBINES RESEARCH WITH INDIGENOUS PERSPECTIVES TO CREATE A COMPREHENSIVE UNDERSTANDING OF COLONIALISM IN ALASKA.

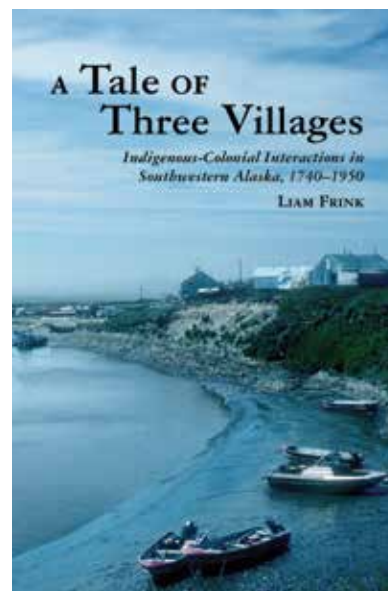
Editor's note:

Liam Frink is an anthropology professor; executive director of the UNLV Office of Undergraduate Research; and author of *A Tale of Three Villages: Indigenous-Colonial Interactions in Southwestern Alaska, 1740-1950*, published by The University of Arizona Press in 2016. He researches Arctic prehistory and colonial history, exploring technological changes and the socioeconomic contexts in which such changes take place. *A Tale of Three Villages* details how and why Yup'ik culture in three villages in the region—Qavinaq, Kashunak, and Old Chevak—changed over a 200-year period that includes life prior to and through Russian and North American involvement. The book explores trade, religion, warfare, and social negotiation from a comprehensive interdisciplinary perspective that employs archaeological, ethnological, oral historical, and archival source materials. The book also examines interactions between indigenous Yup'ik and colonists as well as intra-Yup'ik relationships.

Frink's colleague Caroline Funk, research assistant professor of anthropology at SUNY University of Buffalo, reviewed Frink's contribution to the field.

LIAM FRINK'S A TALE OF THREE Villages is a contribution of theoretical, methodological, and regional significance. Frink partners academic scholarship with indigenous voice to create an important advancement in anthropological approaches to colonial encounters in the Arctic and more universally.

Few scholars have made the effort to establish the necessary breadth of knowledge that spans multiple fields of anthropological inquiry while also developing relationships with local



communities. Frink employed participatory field research, oral history, ethnohistory, and archaeology to create nuanced interpretations of social, economic, and cultural shifts during this dynamic period of Yup'ik history that link more broadly to the history of colonialism on a global scale. In the process, Frink set a new standard for holistic research, challenging all in the field to equitably include Native perspectives and community partnerships as part of the research process and scholarly outcome.

Frink identified and systematically explored interdependent, complex historical processes as he tracked intersections between Yup'ik Native Alaskan cohorts and colonial pressures. Frink focused particularly on women and young people in his study, recognizing the power of these social groups to respond to and enact change. As a result, *A Tale of Three Villages* provides a deeper understanding of the dynamic negotiations and competitions for social, political, and economic benefits to individuals, families, lineages, and groups during the process of colonialism.

A Tale of Three Villages provides new insight into Yup'ik culture specifically but also relates to today's social negotiations. Frink explored family- and community-scale adaptations to global processes, and the patterns and systems he describes may serve to inform us about the fundamental life processes we too negotiate in our increasingly connected lives.

—Caroline Funk

IN THEIR OWN WORDS

NEW BOOK ON 19TH CENTURY MEXICAN COMMUNITY PROVES A WRITTEN TRADITION, PREVIOUSLY ASSUMED TO HAVE ENDED AROUND THE BATTLE FOR INDEPENDENCE, CONTINUED BEYOND.

Editor's note:

Miriam Melton-Villanueva is an assistant professor of history at UNLV and the author of *The Aztecs at Independence: Nahua Culture Makers in Central Mexico, 1799-1832*, published by The University of Arizona Press in 2016. Her research explores Latin-American indigenous writing and culture. *The Aztecs at Independence* uses new primary source documents Melton-Villanueva collected from central Mexican Nahua indigenous communities to explore a written tradition previously thought to have ended prior to the Nahua's 19th century fight for independence from Spain. The book allows readers a glimpse into the Nahua experience from their perspective during a transitional time in their history.

Kelly S. McDonough, assistant professor of Spanish and Portuguese and faculty affiliate for the Native American and Indigenous Studies Program at the University of Texas at Austin, read Melton-Villanueva's work and shared her thoughts on this contribution to the field.

MELTON-VILLANUEVA'S METICULOUSLY researched and highly accessible book, *The Aztecs at Independence: Nahua Culture Makers in Central Mexico, 1799-1832*, takes us down a path we thought to be impossible to trace: a journey toward understanding Nahua life in the 19th century, utilizing sources created by indigenous people themselves. This much-needed book is the result of the author's surprising discovery, transcription, translation, and painstaking analysis of more than 150 Nahuatl-language testaments that essentially "weren't supposed to exist," since the previous general consensus was that Nahuatl-language writing had ceased by the turn of the 19th century.

Melton-Villanueva's exploration of the civic cultures of ritual and writing in four *altepetl* (city-states) in the Toluca Valley offers an unprecedented glimpse into the creative ways in which Nahua culture in fact survived and adapted over three centuries of colonization and, later, its independence from Spain.

Demonstrating the interpretive power of New Philological methods for understanding day-to-day human experience through the

eyes and language of indigenous people, Melton-Villanueva educates readers about the Nahua's local cultures of writing through the identification and analysis of schools/lineages of indigenous scribes. Melton-Villanueva's careful study of the changes and continuities in language use across the collection of texts she used to write this book draws attention to the scribes' crucial role as multilingual intermediaries—indispensable interpreters of "language, laws, and devotions" (page 65)—between native peoples and Spaniards.

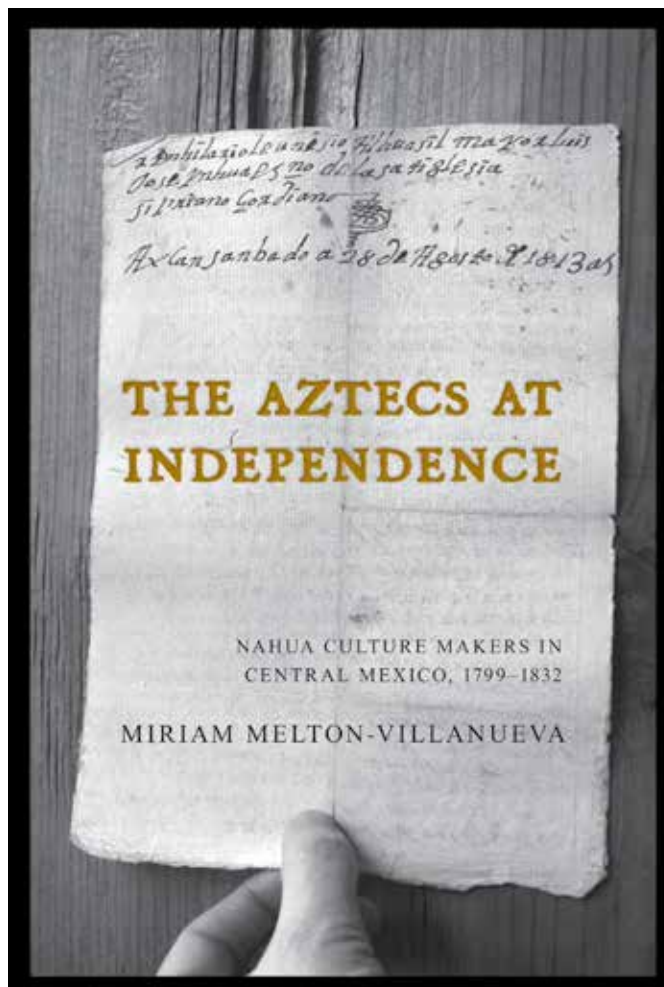
Melton-Villanueva's work discards any remaining vestiges of the notion that the Nahua passively submitted to Spanish designs. The archival materials following the lives of indigenous men who participated in the *fiscalía* (the governing body of the parish churches) paint a new picture of indigenous *fiscales*, previously considered inconsequential assistants to priests. Instead, we find that these indigenous men were important protagonists in church activities, laboring from inside the Catholic institution to carve out a space that supported the needs and survival of their community. Additionally, Melton-Villanueva reveals that not only did the

fiscales come from a wide variety of backgrounds, but they also rotated through positions in a highly organized succession, which disrupts an old narrative that framed Nahua culture as dominated by closed elite factions.

Melton-Villanueva also teases out women's important contribution to indigenous self-determination in the Toluca Valley during this period. Through her astute mining of the texts, Melton-Villanueva shines light on the pivotal role women played in maintaining and adapting ritual both within and outside the home. The book provides evidence that the majority of property holders in the community were women who wove culture-keeping and culture-making into pacts of land inheritance.

One of the major strengths of *The Aztecs at Independence* is Melton-Villanueva's refusal to fetishize indigenous continuity or change by discussing only resistance to or only assimilation into dominant culture. Instead, she lets the newly discovered archive tell us about a dynamic community that retained and innovated aspects of its culture as best served it in its specific space and time.

—Kelly S. McDonough





STUDENT-TURNED-AUTHOR

RECENT UNLV GRADUATE MANUELA BOWLES BEGAN BUILDING HER WRITING CAREER LONG BEFORE COMMENCEMENT.

Manuela Bowles (also known by pen name Manuela Williams) has managed to accomplish in a few short years at UNLV what many writers hope to achieve over the course of a lifetime—and all before receiving her undergraduate degree in English in May. In addition to the 11 individual poems and stories various literary journals have scooped up for publication, independent press Birds Piled Loosely recently published a short collection (or chapbook) of Bowles' poetry, *Ghost in Girl Costume*—placing her work alongside that of long-established poets with full-length collections under their belts.

When did you start writing, and when did you realize you wanted to pursue it as a career?

I've written stories and poems since I was a kid and was always encouraged by my parents and teachers. I actually started college as a biology major, but during sophomore year, I decided to reevaluate my career path. I switched my major to English after I took a couple of courses with English professor Amy Green, who really values students' writing and viewpoints. She helped me see the value in my own work, which

solidified that writing is what I love and want to do.

What impact do you hope your writing will have?

I hope my work will inspire people to use writing as a tool to address whatever they may be struggling with. I think writing and literature can have a big impact on society in that way. For me, writing is a mechanism of survival. The female body, the relationships we have with our bodies, and mental health issues are all of interest to me as an author.

What's next on your to-do list?

I'd like to go to graduate school for creative writing and get an education certificate. I want to work with kids to teach them about literature and writing because it's important to build that appreciation of the craft early and support them in their interests. I also want to start my own literary magazine someday. My goal is to discover new writers and showcase their work, which I already do a little bit of as a guest reader for the literary journal *Carve Magazine*, where I review and recommend my peers' work for publication.

What advice would you give aspiring writers?

Don't let anyone tell you that you can't write. Work hard, have faith in yourself, and know that your writing will eventually find its reader.

—Alexandra Karosas

EXCERPT FROM THE CHAPBOOK *GHOST IN GIRL COSTUME*:

“ghost in girl costume”

*she is allowed to cut
two eyes out of a pale sheet
slip it over her solid body
as if there is nothing
in skin to pinch*

*she is allowed to wander
musty corridors at night
making “ooooo” sounds*

*everyone will be terrified at first
but then giggle because
silly, spirits aren't real*

*but the minute I try to be something
other than slinking pastel ectoplasm
suddenly, I'm a jerk
my sad songs are ear sores
brushing an icy
tendrill across a blood-warmed cheek
unimaginable*

*I tried
a long time ago
the most odd shade of murder red lipstick
but when I pressed the color to my lips,
my non-flesh
swallowed it whole*

*for eight years I existed
with random bits of makeup
floating around in my body:
the strange lipstick, a clumpy mascara wand,
and a whole palette of plum eyeshadow*

*I try to be a little more
than what I am on a daily basis:
irrelevant fog
tapping on a girl's windshield or dust
living under a sagging bed*

*I like to think
one year, one century
I will walk into a trendy craft store and
use all my collected coupons to buy
pretty felt and hair-colored yarn*

*I will make myself a costume
and then I, too, will make “ooooo” sounds*

*everyone will wonder who the ghost girl is
and where they can get one*

how they can be one

This poem originally appeared in *The Blue Route*.



2017 ANNUAL REPORT ON
UNLV RESEARCH ACTIVITY

DIVISION OF RESEARCH
AND ECONOMIC DEVELOPMENT

67%
Increase in
sponsored
program
awards over
the last
five years

THE DIVISION OF RESEARCH AND ECONOMIC DEVELOPMENT SHARES data on UNLV’s research activity to help educate our community about UNLV’s productivity and growth in this area.

UNLV celebrated one of its largest funding years on record with respect to awards. Sponsored program awards reached \$68 million in fiscal year 2017 (FY17), increasing 27.6 percent from FY16 and 67 percent over the last five years (i.e., since the downturn in 2012 following the elimination of congressional appropriations). Proposals increased about \$46 million—nearly 20 percent—from FY16. Total sponsored program expenditures grew 7.6 percent from FY16, reaching nearly \$53 million in FY17.

The various schools of health sciences, including UNLV’s new School of Medicine, received the largest amount of funding this fiscal year (\$17,561,488 combined). The Howard R. Hughes College of Engineering received the largest number of awards (127) in FY17, nearly doubling the funding amount of \$7,609,823 that it received in FY16.

UNLV’s economic development activities continue to grow. Startups quadrupled from one in FY16 to four in FY17. Nondisclosure agreements also nearly quadrupled from FY16. Licensing revenue increased nearly 16 percent from FY16 to \$292,526.25.

Another measure of university research activity is the number of doctoral degrees conferred, as doctoral programs include a strong research component that culminates in a dissertation. UNLV conferred 154 doctoral degrees in FY17.

JOSH HAWKINS

\$68M

Amount of
total sponsored
program awards
in FY17

SPONSORED PROGRAM ACTIVITY

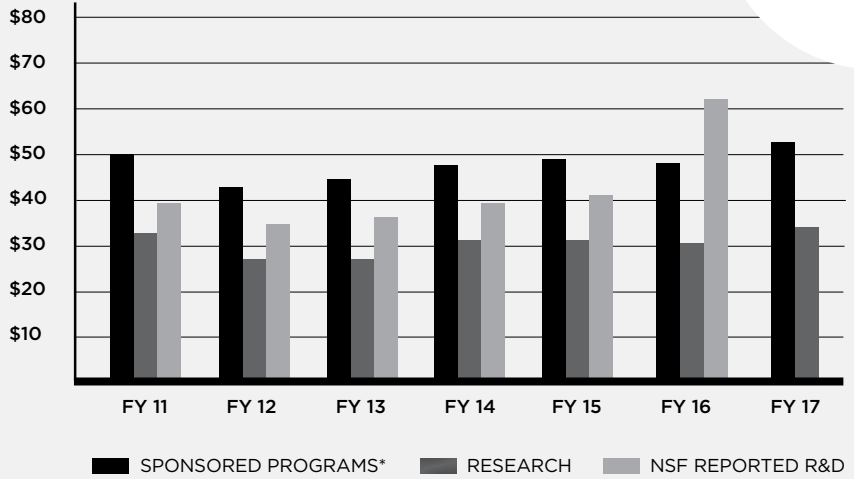
EXPENDITURES

	Sponsored Programs*	Research	NSF Reported R&D
FY11	\$50,210,861	\$32,581,329	\$ 39,526,000
FY12	\$42,924,520	\$27,072,642	\$34,543,000
FY13	\$44,593,471	\$27,649,163	\$35,935,000
FY14	\$48,144,405	\$31,027,377	\$39,448,000
FY15	\$49,262,898	\$31,641,467	\$42,000,000
FY16	\$49,202,054	\$30,530,900	\$62,825,000
FY17	\$52,929,528	\$34,329,627	**

* Sponsored programs expenditures include research, instruction/training, and other sponsored activity (e.g., public service, student services, etc.).

** NSF reported R&D expenditure data will be available February 2018.

EXPENDITURES FY11-FY17, IN MILLIONS

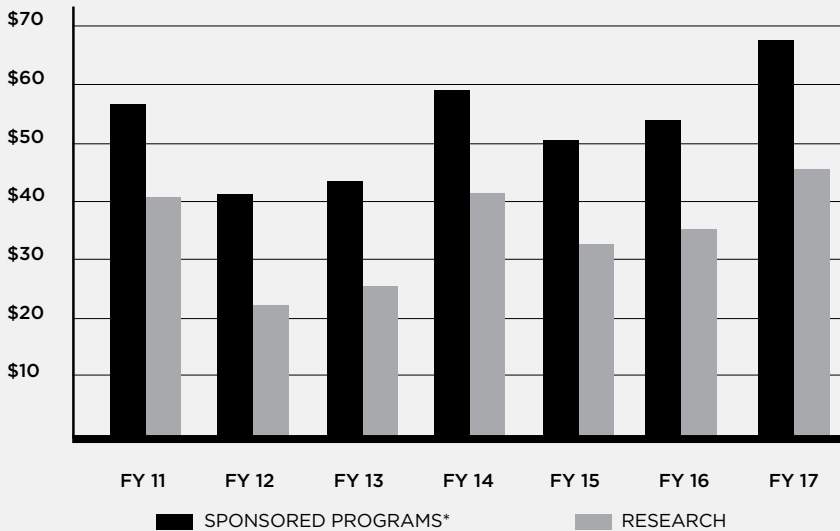


AWARDS

	Sponsored Programs*	Research
FY11	\$56,090,962	\$40,398,054
FY12	\$40,772,216	\$22,565,629
FY13	\$43,204,579	\$26,585,099
FY14	\$59,636,152	\$41,477,222
FY15	\$50,658,340	\$32,082,224
FY16	\$53,357,694	\$34,493,983
FY17	\$68,095,941	\$44,924,000

* Sponsored programs funding includes awards for research, instruction/training, and other sponsored activity (e.g., public service, student services, etc.).

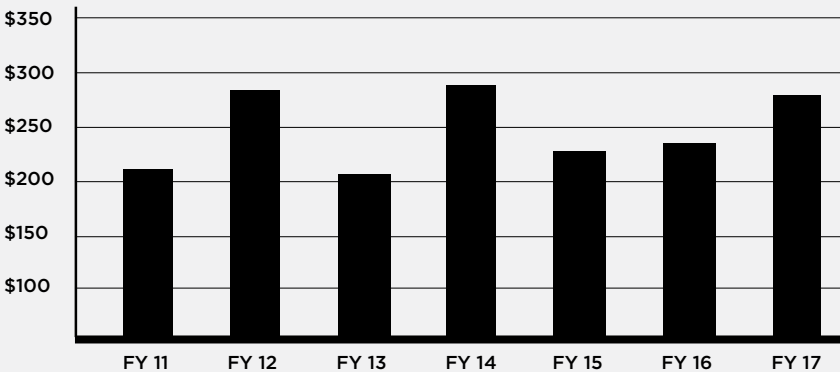
AWARDS FY11-FY17, IN MILLIONS



PROPOSALS

FY11	\$210,857,602
FY12	\$281,270,704
FY13	\$203,337,011
FY14	\$286,087,223
FY15	\$226,756,850
FY16	\$232,302,785
FY17	\$278,257,596

PROPOSALS FY11-FY17, IN MILLIONS



UNLV AWARD DATA FY17

Funding by College/Unit	# Awards	Total Dollars
Sciences	80	\$11,104,918
Student Life	33	\$15,156,419
Engineering	127	\$13,712,561
Health Sciences	77	\$17,535,890
VPRED	11	\$1,748,770
Education	29	\$3,781,352
Urban Affairs	12	\$2,371,287
Liberal Arts	16	\$1,447,266
President's Office	3	\$364,739
Provost	5	\$230,357
Fine Arts	6	\$134,248
Business	6	\$179,561
Library	1	\$210,000
Law School	2	\$26,856
Hotel Administration	1	\$18,920
VPEO	1	\$45,000
VPF	1	\$2,199
School of Medicine	2	\$25,598
Grand Total	413	\$68,095,941

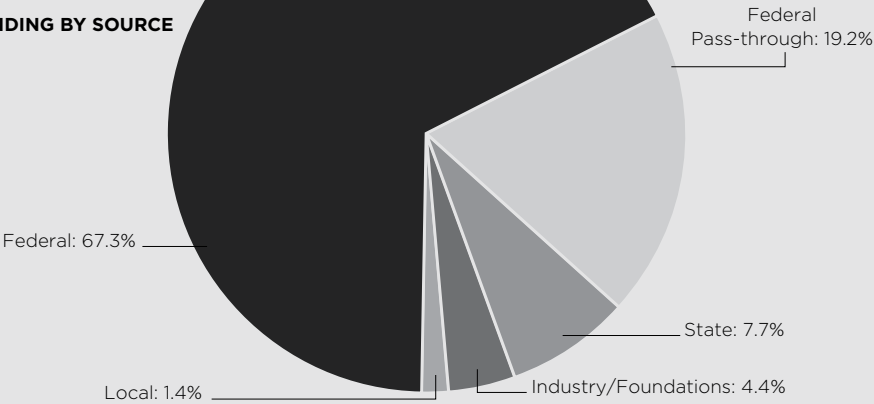
Federal Agency	# Awards	Total Dollars
Education	33	\$14,984,791
Health & Human Services	27	\$9,496,683
National Science Foundation	26	\$5,058,459
Agriculture	3	\$1,945,623
Energy	19	\$3,630,212
Defense	15	\$7,763,274
NASA	6	\$574,633
NEH	1	\$210,000
Department of Interior	11	\$640,711
Transportation	1	\$1,402,200
Homeland Security	1	\$62,500
Nuclear Regulatory Commission	1	\$66,667
Grand Total	144	\$45,835,753

\$17.5M
Total dollars from awards received by health sciences combined

SPONSORED PROGRAM FUNDING BY SOURCE FY17

Sources of Funding	# Awards	Total Dollars
Federal	144	\$45,835,753
Federal Pass-through	156	\$13,105,596
State	49	\$5,237,037
Industry/Foundations	52	\$2,977,947
Local	12	\$939,608
Grand Total	413	\$68,095,941

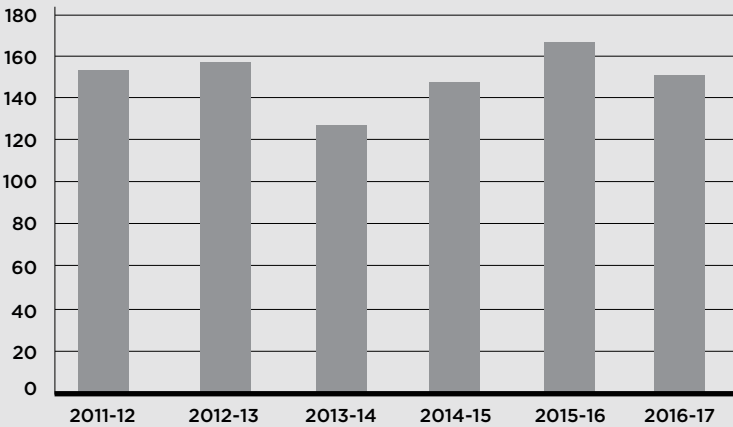
FUNDING BY SOURCE



DOCTORAL DEGREES CONFERRED AY11/12 - 16/17

Academic Year	Number Conferred
2011-12	153
2012-13	156
2013-14	124
2014-15	147
2015-16	166
2016-17	154

DOCTORAL DEGREES CONFERRED, AY10/11-15/16

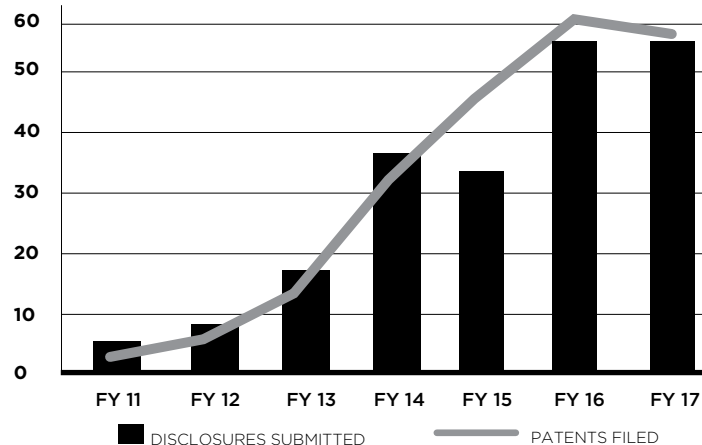


► RESEARCH DISCLOSURES, PATENT ACTIVITY & STARTUPS

FY11-17

NUMBER OF RESEARCH DISCLOSURES SUBMITTED
VS. PATENT APPLICATIONS FILED, FY11-17

	Disclosures Submitted	Issued Patents	Patents Filed	Startups
FY2011	6	2	3	0
FY2012	9	1	5	0
FY2013	18	3	14	0
FY2014	37	1	32	0
FY2015	34	1	47	3
FY2016	57	5	61	1
FY2017	57	5	58	4



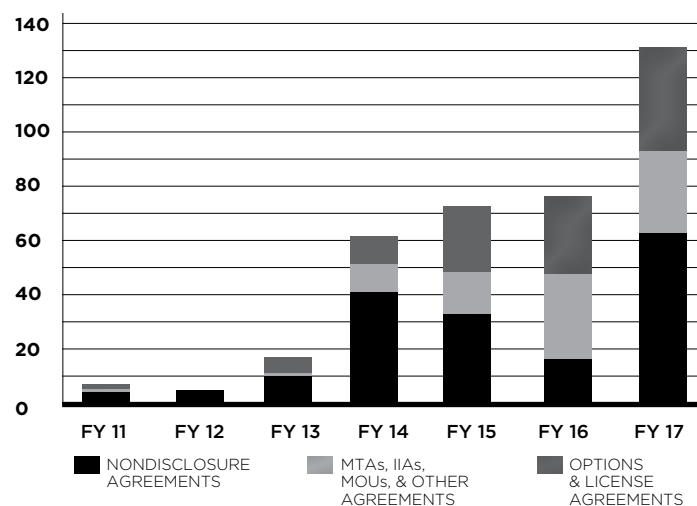
► AGREEMENTS AND LICENSING REVENUE

FY11-17

NUMBER OF AGREEMENTS EXECUTED, FY11-17

	Nondisclosure Agreements	MTAs, IIAs & MOUs	Options & License Agreements	Total	Total Licensing Revenue
FY2011	4	1	2	7	
FY2012	5	0	0	5	
FY2013	10	1	6	17	\$32,281
FY2014	41	10	10	61	\$57,986
FY2015	33	15	24	72	\$126,242
FY2016	17	30	28	75	\$252,309
FY2017	63	30	38	131	\$292,526

MTA — Material Transfer Agreement
IIA — Inter-Institutional Agreement
MOU — Memorandum of Understanding

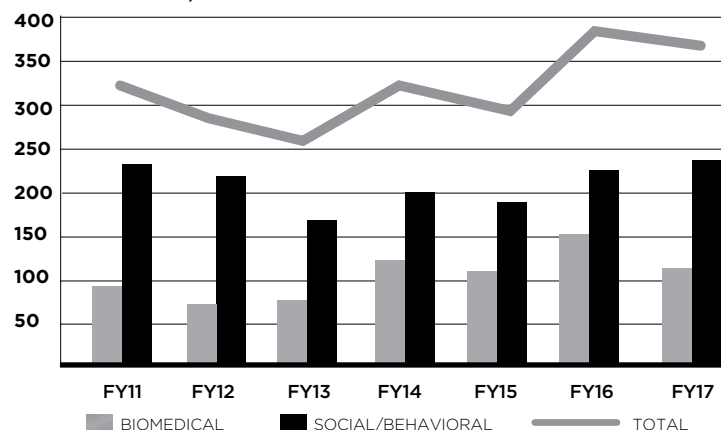


► INSTITUTIONAL REVIEW BOARD APPROVALS

FY11-17

NUMBER OF INSTITUTIONAL REVIEW BOARD
APPROVALS, FY11-17

	Biomedical	Social/ Behavioral	Total
FY2011	93	230	323
FY2012	75	214	289
FY2013	77	184	261
FY2014	122	200	322
FY2015	108	187	295
FY2016	151	227	378
FY2017	124	239	363





HOW FAR HAS UNLV RESEARCH COME?

UNLV's research efforts have consistently grown over its 60-year life span, setting us on track to someday becoming one of the premier research universities in the nation.

BY STAN SMITH

ANNIVERSARIES CALL TO MIND DESTINATIONS WE'VE reached, and this fall, UNLV celebrates reaching its 60th year. While we can be proud of all the milestones and successes we've achieved together over six decades, I'd also like to look more closely at the journey that's brought us here, as it lights the way toward the next great destination we seek before our 70th.

We are on an excellent trajectory toward joining the ranks of the nation's top research universities—what you'll often hear those of us at UNLV refer to as the "Top Tier." I believe we've actually been on the path to becoming this type of research university all along, even if we didn't have this goal in mind from the start.

One of the most defining characteristics of a top research university is the amount of research funding it generates from external sources each year. In general, top research institutions garner at least \$100 million to \$120 million in research funding annually.

At about \$60 million this year, UNLV admittedly will need to approximately double its funding to become one of the nation's top research universities. But considering UNLV received between \$10 million and \$15 million in research funding in the 1990s, we've already come a long way.

Research funding was even lower than that when I arrived in 1985. At that time, the biology department had two research "stars" who went on to become distinguished professors: animal physiologist Mohamed Yousef, who studied animals' reaction to heat and water stress, including how heat and dehydration could impact Air Force pilots; and biologist/activist Jim Deacon, who was responsible for the Devils Hole pupfish making its way onto the endangered species list. Most of the remaining biology faculty didn't conduct funded research. But by the time I was hired, every person we hired was expected to be an active researcher with grant support.

We also didn't have dedicated research labs back then, conducting research in our teaching labs instead. This meant that there were times during the school year when I couldn't keep my research equipment on the lab benches because my students were using the space to work on their assignments and experiments. However, once dedicated research labs that could house equipment and sustain continuous experiments were carved out across campus, UNLV's research productivity really took off. This is how we got from \$15 million in research

funding in the mid-1990s to around \$60 million between 2005 and 2010—a quadrupling in only 15 years.

Then the recession hit. UNLV's funding dropped to \$40 million by 2012. However, what is often forgotten about this time period is that about 40 percent of UNLV's research funding came from direct congressional appropriations (i.e., earmarks) then; our downturn was directly tied to the elimination of those earmarks in 2012.

Despite this, UNLV actually saw a steady increase in competitive grant funding through the recession years—versus noncompetitive funding such as the aforementioned earmarks, generally delegated without rigorous peer review. In university-ranking circles, competitive grant funding is the primary signifier of excellence. And now that we're post-recession, these kinds of annual increases are becoming more pronounced at UNLV.

The Experimental Program to Stimulate Competitive Research (EPSCoR), which enhances research capabilities in underfunded states, was a key catalyst in my research career. Large, multiyear grants like this provide important infrastructure in key research focus areas, with the goal of helping interdisciplinary teams sustain the original investment through competitive grants beyond the initial support. After an initial \$2 million Department of Energy (DOE) EPSCoR grant that built a free-air CO₂ enrichment site at the Nevada Test Site, we were able to acquire another \$10 million in competitive grants from the DOE and National Science Foundation over the next decade to continue the long-term experiment.

Obviously, UNLV needs to continue to leverage EPSCoR and similar programs, and our new School of Medicine will increase our research portfolio eventually, but I believe the real key to becoming a premier research university by our 70th birthday is to continue a hybrid approach of spearheading faculty-driven initiatives from our departments and executing on a campuswide strategic plan in which we identify key focus areas and make targeted, midcareer hires in those areas. Hires like Malcolm Nicol, whom UNLV recruited from UCLA to form the High Pressure Science and Engineering Center (HiPSEC)—an interdisciplinary lab that studies nuclear testing, stockpiles, and their alternatives—resulted in what is now one of the most productive and well-funded centers on campus.

We also need more research space. The Science and Engineering Building dramatically increased UNLV's collective ability to do cutting-edge, interdisciplinary research; at least one more building like this is essential to keep us on the up and up.

Where there is a will and a good hybrid strategy, there is a way. And if how far we've already come in our journey is any indicator, UNLV is speeding its way to the top.

Stan Smith has served UNLV for 32 years and counting—first as a research-active faculty member in the School of Life Sciences, then as associate vice president for research for 10 years, and finally as the acting dean of the College of Sciences before becoming professor emeritus this summer.



Sharang Chaudhry

UNLV Foundation Board of Trustees Fellow
College of Sciences

Sharang is
developing new
**mathematical
models** for
noninvasive
brain **mapping**.

His research will help
us better **visualize**
how the
brain is
wired, which
is essential for
understanding
traumatic brain
injuries
and diseases like
Alzheimer's.

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 UNLV RED

We hope you enjoy this complimentary issue of *Innovation* magazine and share it with your clients, colleagues, students, family, and friends.

UNLV engineer SJ Kim and undergraduate students Martin Jaime-Viveros and Taewoong Lee revolutionized drone research by bringing a Vegas flair to it. Their Flying Orchestra drones “dance” to the beat together, creating a new form of entertainment.

Research
That’s
Different.
Daring.
Diverse.

UNLV

unlv.edu/research

