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Cultivating Research

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Cultivating Research

Call it watering the green spots. ¶ UNLV's Faculty Opportunity Awards program provides seed funding for faculty researchers with promising ideas and a desire to pursue additional funding from government agencies, foundations, or private industry. ¶ The program has supported a wide variety of campus research projects involving multidisciplinary teams, single investigators, and other faculty working to develop intellectual property.

By Charles E. Reineke

SEED MONEY UNLV's Faculty Opportunity Awards provide funding for researchers looking to advance ideas that will attract larger grant dollars to university programs.

Most successful Faculty Opportunity Award (FOA) recipients receive from $5,000 to $20,000 each. For the university, these investments yield impressive returns, according to Thomas Piechota, vice president for Research and Economic Development. During fiscal years 2012 and 2013, for example, the program's $600,000 awarded generated almost $4 million in external funding, a return of $5.70 for every dollar invested, he notes. ¶ "We believe in investing in research at UNLV," says Piechota "These Faculty Opportunity Awards are generating real results in the form of proposals for external funding as well as publication of research findings and development of intellectual property with commercialization potential. We have some very gifted researchers who need a modest investment in order to gather data or information; in turn, this can produce huge returns in the form of scholarship, grants, and industry-sponsored research for UNLV." ¶ Below are four examples of projects that recently received Faculty Opportunity Awards.

ELISABETH HAUSRATH

GEOSCIENCE

ELISABETH (LIBBY) HAUSRATH GREW UP in the desert, a circumstance that made it easy for her to appreciate how water, our planet's most important chemical compound, profoundly affects even the most moisture-challenged of locales.

For Hausrath, now an assistant professor of geoscience at UNLV, that appreciation eventually led to a doctorate focused on aqueous geochemistry from Penn State. Because her studies there happened to coincide with the Mars Rover landing — an event that proved the now desertous Red Planet may have once been wet — she quite naturally began to think about slipping the surly bonds of Earth (figuratively) to conduct her research.

Today, due in part to her UNLV Faculty Opportunity Award, Hausrath is working to interpret data from NASA's Mars Exploration Program to investigate how soil and water might have once interacted on the surface of our solar system's most-Earthlike neighbor.

"My research program aims to better understand chemical weathering and soil formation on Earth and on Mars," she says. "The Mars Exploration Program results in increasing amounts of fascinating data from Mars. Our goal is to help interpret and understand these data and their implications for Mars as a potentially habitable planet."

Funding from the Faculty Opportunity Award, Hausrath says, was key to laying the scientific groundwork necessary for attracting the extramural support that such time-intensive research demands.

"In order to get larger, multi-year grants, it is really helpful to have preliminary data — at least a few results showing that an idea is promising — and that the proposed research approach is appropriate," she says. She currently has two multi-year proposals pending with NASA resulting from the FOA award and is very hopeful that they will be funded.

The internal award has also allowed her to publish more widely in her field and to more fully support students working in her laboratory.

One particularly fruitful area for Hausrath and her team involves analyses of clay minerals. Because these minerals — also known as hydrous aluminium phyllosilicates — form in the presence of water, they are of intense interest to scientists studying habitability.

"Our research on transitions in clay-mineral chemistry, particularly the work of Ph.D. student Seth Gainey and master's student Michael Steiner, is yielding fascinating results that may help us better interpret the potential habitability of clay-mineral-containing Martian environments," Hausrath says. "This project is providing new insights that could lead to further studies conducted at UNLV or other institutions."

Her work has implications closer to home as well, she adds, ticking off a list of investigations that have also generated enthusiasm among the funding agencies supporting her work.

OTHERWORLDLY INVESTIGATIONS
Data from NASA's Mars Exploration Program is helping Elisabeth Hausrath understand how soil and water might have once interacted on the surface of our solar system's most-Earthlike neighbor.

R. MARSH STARKS

"I am part of a group that recently received funding from NASA EPSCoR to look at snow dynamics," says Hausrath. "My part of this will be to examine interactions between microorganisms and minerals in the nutrient-poor environment present on glaciers, which may also be an analog to Mars. I am interested in impacts of minerals, particularly phosphate minerals, on prebiotic chemistry."

She and her former doctoral student Chris Adcock recently published a paper in *Nature Geoscience* examining phosphate release from minerals important on Mars, which has implications for the possible origin and persistence of life on Mars.

"My current Ph.D. student Courtney Bartlett and I will be continuing work on these projects, and I'm excited to be expanding both of these parts of my research program."

REBECCA GILL

POLITICAL SCIENCE

JUVENAL'S FAMOUS QUERY — "*SED QUIS custodiet ipsos custodes*?" ("But who will guard the guards themselves?") — has for centuries been used to highlight the difficulties of ensuring the accountability of decision makers.

But for Rebecca Gill, the question is slightly recast: How will we judge the judges?

The assistant professor of political science is leading a project that seeks to shed light on the issue, assessing how judges are selected and retained and how gender or racial bias may influence their performance evaluations.

Thanks in part to a UNLV Faculty Opportunity Award, she has the support she needs to help promote the "fairness and validity" of the processes that determine who ends up presiding in the nation's courtrooms.

Gill says she has used the award to expand upon her earlier work on formal judicial performance evaluations and their effectiveness. That work, conducted in collaboration with UNLV law professor Sylvia Lazos, raised serious questions about the problem of implicit gender and race bias in judicial performance evaluation. Gill expanded the project and recently garnered a $171,000 grant from the National Science Foundation (NSF) for it.

JUSTICE FOR JUDGES
Rebecca Gill is leading a project that will examine how performance assessments of judges are conducted and how gender or racial bias may influence such evaluations.

"Prior to the Faculty Opportunity Award, Sylvia and I had already conducted a small-scale pilot study of judicial performance evaluations in Clark County," Gill says. "However, we ran into quite a bit of pushback because of the unique situation of performance evaluations here in Nevada. That study found that rankings for female judges are significantly lower than similarly situated male judges. I really needed a broader pilot study demonstrating the generalizability of our preliminary findings to performance evaluations in other states."

Gill says the FOA allowed her to conduct a broader pilot study and to hire a research assistant to help with the labor-intensive process of collecting the expanded pilot data to support a grant proposal. In the summer of 2013, she submitted her proposal to the NSF's Law and Social Science Program, which seeks to advance scientific theory and understanding of the connections between law or legal processes and human behavior.

"Without help from UNLV," she says, "I would not have been able to conduct the broader pilot study, which was essential. Information collected in the pilot was used to establish the feasibility of this project, as well as its theoretical and practical importance to the NSF's Law and Social Science Program's mission." The expanded pilot study was also the source of the data used in two scholarly publications, one of which she co-authored with her FOA research assistant, Kenneth Retzl.

NSF funding in place, Gill says that she is now working with two full-time research assistants to collect data for the American Judicial Performance Evaluation Database, which will contain information for all the states that use judicial performance evaluations to judge the judges' qualifications and effectiveness. Such a catalog of evaluations, Gill's research indicates, will help shed light on persistent disparities — such as those noted in her pilot study — in the way judges and prospective judges are scored.

As part of her NSF grant, she will also write a best practices handbook for designing and implementing selection and evaluation programs.

Beyond her current study, she is interested in expanding her research to study the selection, evaluation, and retention of other public officials, including local and state politicians as well as public prosecutors, police chiefs, and the like.

She acknowledges that for those invested in the evaluation status quo, her plans might not be an easy sell. But there are signs of progress.

"Those who are strongly supportive of the current system of judicial performance evaluation have revisited some previously unexamined assumptions of the fairness and validity of the instruments currently in use," Gill says. *Fiat justitia.*

JANET DUFEK

KINESIOLOGY AND NUTRITION SCIENCES

INJURY FROM FALLING IS A REAL CONCERN for hospital patients, particularly older adults. But pediatric patients are at risk, too, an unfortunate reality UNLV's Janet Dufek is working to better understand.

Dufek, a professor in the department of kinesiology and nutrition sciences, has teamed up with Nancy Ryan-Wenger, director of nursing research at Nationwide Children's Hospital in Columbus, Ohio, to examine incident reports detailing falls among children in pediatric-care facilities. Their goal is to examine both why falls occur and how best to quickly and accurately evaluate the damage done.

"Dr. Ryan-Wenger and I became mutually interested in combining our academic strengths and interests," Dufek says. "Hers is in pediatrics and standards of care, mine in applying mechanics to the problem of determining magnitude of injury following a fall in a hospital or clinic. I became interested in testing new approaches to identify and reduce pediatric patient falls and how to develop a risk model to evaluate the likelihood of serious injury following a fall."

With the assistance of a UNLV Faculty Opportunity Award, Dufek says she and Ryan-Wenger were able to amass the preliminary data they needed to convince outside funding agencies that their investigation was worthy of support.

"The primary purpose of this pilot study was to obtain data in support of an external grant application being prepared and submitted," she says, noting that the research team has already received a $10,000 grant from the American Nurses Foundation and is preparing a grant proposal for an Academic Research Enhancement Award from the National Institutes of Health. "Obtaining external funding would likely have been impossible without the faculty award support used to generate the pilot data."

She adds that the FOA was crucial to her collaboration with Ryan-Wenger. Dufek, a fellow with UNLV's Collaborative Research and Education (CoRE) program, is an advocate

HURTFUL FALLS
Janet Dufek is examining why pediatric patients fall and how to better evaluate the damage done.

GILL: TIAN; AARON MAYES; DUFEK: R. MARSH STARKS

of interdisciplinary projects, but notes that each participant oftentimes must acquire new knowledge to conduct collaborative research.

"The Faculty Opportunity Award provided me the opportunity to work with Dr. Ryan-Wenger in an accelerated fashion to learn the new language of nursing and clinical care," says Dufek. "Our unique backgrounds have combined to generate ideas that neither of us would have independently developed."

Among these are recommendations intended to help pediatric healthcare providers do a better job in their initial assessments of injury severity. This is important, the researchers say, because no matter how careful physicians and staff may be, a small but significant number of kids will be hurt in falls each year.

"Ultimately," Dufek says, "we would like to reduce or eliminate the occurrence of pediatric patient falls in health care facilities. But that is likely an unrealistic goal. A more reasonable outcome is to develop an objective protocol to determine injury severity following a fall, one that would be used to inform standards of follow-up care."

Such a protocol is critical given the potential for further harming young patients with sometimes overly aggressive post-fall diagnostic evaluations.

"One of the undercurrents in our research is concern about exposing infants and young children to levels of radiation used in some diagnostic imaging techniques," says Dufek. "If we could more accurately determine fall severity using some form of quantitative evaluation, it is possible that children could be spared from exposure to unnecessary diagnostic radiation. We hope the long-term impact of this research has the potential to affect change in administrative policy and procedures in healthcare delivery and to reduce waste by eliminating unnecessary tests."

STRUCTURAL SUCCESS
Ying Tian is collecting experimental data that engineers need to design more resilient flat-plate design buildings.

YING TIAN

CIVIL AND ENVIRONMENTAL ENGINEERING AND CONSTRUCTION

FOR STRUCTURAL ENGINEERS SUCH AS UNLV professor Ying Tian, the problem might be best described as an architectural tug-of-war between form and function.

To create high-rise buildings with light-filled, wide-open floor plans, architects and structural engineers often use large reinforced concrete slabs — called "flat plates" — supported directly on columns.

The spaciousness of these designs can come at a price, however: Buildings using flat plates are vulnerable to catastrophic collapse caused by "punching shear failure," which occurs when the flat plates break free, appearing to "punch" their way through the supporting columns. Earthquakes can cause punching failure, as can terror bombings and ensuing fires.

Tian, who began conducting research on this subject in 2007, is seeking to better understand how fires contribute to this phenomenon with the goal of saving lives.

"I was inspired to conduct research on the effects of fire damage on flat plate building structures because of the collapse of a flat plate underground parking garage in Switzerland in 2004 due to a 90-minute fire," Tian says. "The collapse, causing the death of seven firefighters, was triggered by a punching failure of a slab at one column that immediately propagated throughout the structure."

Tian says receiving a Faculty Opportunity Award helped him to obtain data necessary to seek additional funding. "Without the Faculty Opportunity Award, it would have been difficult for me to generate convincing preliminary data to request competitive grants from extramural agencies," Tian says.

The award also helped him establish fruitful collaborations with other campus experts, such as colleague Aly Said; working together, they designed a project that used UNLV's Structural Engineering Laboratory, a facility capable of large-scale testing, to learn more about how uncontrolled fires set off punching failures.

The results will help address a significant void in the study of this area; early findings were recently published in the *International Journal of Concrete Structures and Materials*.

"We need experimental data, analytical tools, and education to design resilient structures that can survive fire events such as those that precipitated the collapse of the World Trade Center towers," says Tian. "Our results so far have clearly indicated the high risk of progressive collapse in flat plate buildings experiencing uncontrolled fires."

Building safer buildings, in other words, demands designing slabs and connections with columns that can survive brief periods of intense heat without cutting loose and "pancaking" the floors below. A related improvement would involve boosting the slabs' "shear capacity" — their ability to resist the stresses inflicted by what engineers call "extreme loading events." These improvements can't be developed, Tian says, until engineers have better data.

"I hope our tests will address whether elevated temperatures really cause decreased shear strength as predicted from some computer simulations," he says. "To date, knowledge regarding the resilience of flat plates to elevated temperature is extremely limited. Hopefully, more researchers will conduct studies like ours, since flat plate designs constitute a major class of structures widely used in the U.S. and other countries."

Ariana Goertz and Scott Lien contributed to the reporting on this article.