New Scorpion Species Discovered

Two UNLV graduate students have discovered a new species of scorpion in Death Valley.

Doctoral student Matthew Graham first encountered the specimen as he was conducting an inventory of scorpion species in Death Valley as part of a collaborative project with UNLV professor Jef Jaeger and the National Park Service.

The Ph.D. candidate from the UNLV School of Life Sciences nearly dismissed the specimen as a juvenile of a common species in the area. But the insect was especially small, about the size of a thumbnail, and something about its claws just wasn’t quite right.

When Graham brought it back to UNLV, he identified it as a member of the genus *Wernerius* but wondered why it was more than 400 kilometers from its usual home. He knew of only two species of the rare genus: one from along the Colorado River and one in Joshua Tree National Park. The specimen sat for several months in his office as he got back to his studies and teaching duties.

Curious about his bizarre find, fellow Ph.D. candidate Michael Webber, who worked in a cubicle in the same room as Graham, asked if she could take a closer look at the scorpion.

Graham and Webber each bring a different expertise to their collaboration. Graham studies the biogeography of scorpions of the American West, so he knew that the tiny scorpion from Death Valley was definitely out of place. He uses the DNA from scorpions to investigate how geologic and climatic events have influenced the evolution of desert organisms. Webber is an ecologist who studies the reproductive biology of scorpions and different aspects of their behavior.

“The first thing we did was a literature search,” Webber says. “We knew it was of the *Wernerius* genus because of the unique spine on its tail, so we looked up published descriptions of the other two species – *Wernerius spicatus* and *Wernerius mumai* – and compared them to the Death Valley scorpion.”

She noted that the Death Valley specimen had a distinct tail, pincers, and reproductive organs. “Differences in anatomical characters like these can indicate that you are dealing with a different species,” Webber says.

After describing the specimen in meticulous detail, the pair submitted a paper to a scientific journal for review. They submitted their findings to *ZooKeys*, a peer-reviewed, open-access journal that supports free exchange of ideas and information in systematic zoology, phylogeny, and biogeography.

The team named the scorpion *Wernerius inyoensis* because it was found in the Inyo Mountains. Graham hasn’t found another of this new species, but he continues to search. He hypothesizes that it could live completely underground and might emerge to the surface only rarely.

“Some would argue that the more species we find, especially new venomous animals like scorpions, the better our chances are for discovering new biochemical tools that could aid in human health and medicine,” says Graham, who grew up collecting scorpions, reptiles, and amphibians as a hobby. “It’s also cool to show the world that there are still places to explore and new things to discover.”

Medication Errors by Both Domestically and Internationally Trained Nurses Studied

UNLV researchers will compare medication errors made by internationally educated nurses and those educated in America in a new study that aims to improve patient safety.

The team will investigate whether language and cultural barriers impede nurses’ ability to provide quality care. Researchers will examine medication data from about 2,000 nurses in nine Las Vegas hospitals, examining information such as how errors occur, if the correct medication and dosage levels were administered, and if the medication was given at the proper time.

Results from the study could be used to help form national regulations and requirements for nursing education and training.

“Our ultimate goal is to help im-
prove patient safety and quality of care in health care delivery at hospitals and other health care settings,” says Jay Shen, an associate professor of healthcare administration and policy at UNLV. “If we can determine why and how nurses are making these errors, hospitals can come up with suitable intervention programs to reduce medication errors and improve patient safety.”

The two-year, $300,000 study is funded by the National Board of Nursing and is being led by Shen from UNLV’s School of Community Health Sciences and Yu (Philip) Xu, a professor with the School of Nursing. UNLV’s research team will partner with hospitals to examine recent medication error data. Participating hospitals will hire data collectors to assure that the information is accurate and the identity of individual nurses is protected. The hospitals will receive funding from the National Nursing Board to assist with the data collection.

“This is a labor intensive endeavor that deals with important information, and we are pleased that the hospitals realize the significance of this research and how it could potentially improve patient safety and quality of care,” Shen says.

Nationwide and in Las Vegas, the healthcare industry is experiencing an unprecedented nursing shortage, resulting in the recruitment of internationally educated nurses. In Las Vegas alone, researchers estimate that up to 40 percent of registered nurses were educated outside the U.S. Nationwide, approximately 15 percent of all registered nurses were educated outside of the country, according to health care industry estimates. This percentage is on the rise; the Health Resources and Services Administration has predicted that 800,000 nurses will be hired in the United States by 2020 to fulfill current staffing needs.

This is the second major study UNLV researchers have conducted on how the population of internationally educated nurses adjusts to the American healthcare workforce.

In 2010, Xu and Shen completed “Speak for Success,” the nation’s first research project that evaluated the effectiveness of a comprehensive language and communication training program for currently employed internationally educated nurses.

Researchers Discover Magnetic Bacteria with Potential for Emerging Biotech Industry

UNLV microbiologist Dennis Bazylinski and an international team of researchers were the first to identify, isolate, and grow a type of magnetic bacteria that could one day contribute to the emerging biotech and nanotechnology industries.

Their findings were recently published in the prestigious journal Science.

Magnetotactic bacteria are simple, single-celled organisms that are found in almost all bodies of water. As their name suggests, they orient and navigate along magnetic fields like miniature swimming compass needles. This is due to nano-sized crystals of the minerals magnetite or greigite that they produce.

The presence of these magnetic crystals makes the bacteria and their internal crystals (called magnetosomes) desirable for commercial applications like drug delivery and enhancement of medical imaging.

While many magnetite-producing bacteria can be grown and easily studied, Bazylinski and his team were the first to cultivate a greigite-producing species. The greigite-producing bacterium, called BW-1, was found in water samples collected more than 280 feet below sea level in Death Valley National Park’s Badwater Basin.

“Because greigite-producing bacteria have never been isolated, the crystals haven’t been tested for the types of biomedical and other applications that currently employ magnetite,” says Bazylinski, who has been studying magnetotactic bacteria for more than 30 years. “Greigite, an iron sulfide, may be superior to the iron oxide magnetite in some applications due to its slightly different physical and magnetic properties, and we’ll now have the opportunity to find out.”

After the BW-1 was collected, it was isolated and grown at UNLV by Bazylinski and then-postdoctoral associate Christopher Lefèvre. The bacterium was found to produce both greigite and magnetite.

A detailed examination of its DNA revealed that BW-1 has two sets of magnetosome genes, unlike others that produce only one mineral and have only one set of magnetosome genes. This suggests that the production of magnetite and greigite in BW-1 is likely controlled by separate sets of genes. This could be important in the mass production of either mineral for specific applications.

According to Bazylinski, the greigite-producing bacteria represent a new, previously unrecognized group of sulfate-reducing bacteria that breathe the compound sulfate rather than oxygen.

The study was funded in part by a grant from the U.S. National Science Foundation, the U.S. Department of Energy, and the French Foundation for Medical Research.

Partnering with Bazylinski were Christopher Lefèvre and David Pignol of the Institute of Biology and Biotechnology, French National Center of Scientific Research and University of Aix-Marseille II; Nicolas Menguy of Pierre and Marie Curie University; Fernanda Abreu and Ulysse Lins of the Federal University of Rio de Janeiro; Mihaly Posfai of the University of Pannonia; Tanya Prozorov of Ames Laboratory; and Richard B. Frankel of California Polytechnic State University, San Luis Obispo.
Stalagmites Provide Clues on the Demise of Early Civilizations

Deep in the caves of Southern Mexico, UNLV geoscientist Matthew Lachniet hopes to discover why some of North America’s most prosperous early civilizations died out.

The evidence he’s looking for isn’t among some hidden treasure that Indiana Jones might pursue or depicted in ancient cave paintings. Lachniet is looking for his evidence in stalagmites, the conical stacks of mineral deposits rising from cave floors.

These common cave formations act as ancient rain gauges that have recorded long-term climate change. Lachniet and an international team of researchers have used them to establish 2,400 years of the climate history of southwestern Mexico; this history, coupled with archaeological evidence, links the rise and fall of ancient Mesoamerican civilizations to changing rainfall.

The team’s findings were published online recently in the journal *Geology*.

Stalagmites form below stalactites, which form on cave ceilings. When tiny drops of water and calcite minerals drop off stalactites and accumulate on the cave floor over thousands of years, stalagmites develop – and much like the rings of a tree, they accurately record the rainfall history of an area.

Little is known about what contributed to the growth and downfall of the ancient Mesoamerican city of Teotihuacan, though historical evidence suggests periods of above average rainfall followed by extreme drought might have played a role.

To find the answers, Lachniet and his team collected and analyzed a stalagmite from Juxtlahuaca Cave in the Mexican state of Guerrero. The cave is located in the core region affected by the North American Monsoon, a climate phenomenon primarily responsible for rain in most of Mexico and parts of Arizona, New Mexico, and Southern Nevada.

Researchers first verified the rainfall record of the stalagmite by comparing deposits from the tip of the stalagmite with known rainfall amounts from the more recent past. Water samples were also collected deep within the caves to calibrate chemical variations in the stalagmites and unravel the climate history hidden within.

“Mexico may seem far removed from Southern Nevada, but the two regions are in fact linked by climate processes in the Pacific Ocean. Our new record shows that dry conditions, likely linked to El Niño processes, recurred frequently over time,” Lachniet says. “The point to be made is that civilization runs on water. Take away a water supply, and the civilization may fail.”

Lachniet and his colleagues correlated the region’s cultural milestones with measured rainfall amounts. Above average rainfall between the first and third centuries, for example, coincided with the rise of the largest early Mesoamerican city of Teotihuacan. At its peak, more than 125,000 people lived in the highly developed city.

Conversely, a 500-year drying trend, including a drought of more than 150 years, coincided with rapid population decline in Teotihuacan around 550 CE. The drought likely impacted dry-land agriculture practices in the semi-arid Mexican Highlands.

Researchers argue that another drought, this one from 690-866 CE, made it difficult for the basin area to sustain large urban areas. Archaeological evidence from this dry period also includes smashed “Storm God” artifacts, which may have signified abandonment of the civilization’s rain god.

“We can’t say with certainty that other social factors weren’t drivers of the cultural change, but we now have well-dated and robust climate information to compare,” Lachniet says.

The study was published in the journal *Geology* and was supported by grants from the National Science Foundation and the National Geographic Society. Partnering with Lachniet were Juan Pablo Bernal of Mexico’s Centro de Geociencias in Juriquilla; Yemane Asmerom and Victor Polyak of the University of New Mexico; and Dolores Piperno of the Smithsonian National Museum of Natural History.
Digital Scholarship@UNLV: Expanding the Reach of Scholarly Communication

The advent of the institutional repository – an online locus for collecting, preserving, and disseminating the intellectual output of an academic institution – has changed the research landscape in remarkable ways, according to Patricia Iannuzzi, dean of the University Libraries.

She notes that UNLV’s institutional repository (IR), called “Digital Scholarship@UNLV,” provides a global showcase of the research and scholarly endeavors of the university’s students and scholars.

“As UNLV’s research productivity accelerates and access to alternative forms of intellectual content is in greater demand, preservation and visibility of scholarship become increasingly meaningful to scholars,” Iannuzzi says. “Digital Scholarship@UNLV is an innovative solution to highlight scholarship both individually and collectively, to connect researchers, and ultimately to expand the reach of UNLV’s scholarly communication.”

Through this tool, which is hosted and managed by the University Libraries, UNLV’s scholarly output is archived in a centralized location in perpetuity and made more visible through search optimization.

Many scholarly works already exist within Digital Scholarship@UNLV, from peer-reviewed research studies to conference presentations, white papers, and student research projects. Several of these types of scholarly communication were difficult to obtain online before institutional repositories were introduced.

Through the IR, scholarly communication is literally more accessible; users are able to locate peer-reviewed, freely available materials to build upon others’ work and to complement their own scholarship.

Graduate and undergraduate research findings are being downloaded more frequently, greatly facilitating scholarship. Journal editors may elect to migrate entire journals to the host platform, which automates the peer-review process, saving time and resources.

In addition to connecting researchers and enhancing scholarly communication, Digital Scholarship@UNLV may be used as a recruitment tool. By searching the IR, prospective UNLV faculty and students are able to review intellectual output in areas of interest and gain perspective on academic rigor. The IR also provides evidence of the breadth and depth of UNLV’s scholarly output for administrative purposes such as accreditation.

UNLV students who have deposited electronic theses and dissertations, capstone projects, professional papers, articles, and/or posters can also email research links to prospective and current employers or to graduate admissions offices to highlight their work.

Faculty and students have already embraced showcasing their intellectual content in Digital Scholarship@UNLV, Iannuzzi says. Subject areas span engineering, sociology, English, life sciences, chemistry, environmental/public affairs, nursing, sustainability, and specialized research at the Harry Reid Center for Environmental Studies, Brookings Mountain West, and the Black Mountain Institute.

In the last year, Digital Scholarship@UNLV received more than 64,000 visits from 170 countries and more than 365,000 downloads. As of June 2012, there were nearly 4,700 items deposited in the IR.

“The institutional repository is a wonderful asset to the research community,” says Stan Smith, associate vice president for research. “Not only is it useful to our faculty, staff, and students, but it also expands the reach of UNLV research to a much broader audience.”

For more information on Digital Scholarship@UNLV, contact Marianne Buehler, the Libraries’ IR administrator, at marianne.buehler@unlv.edu.