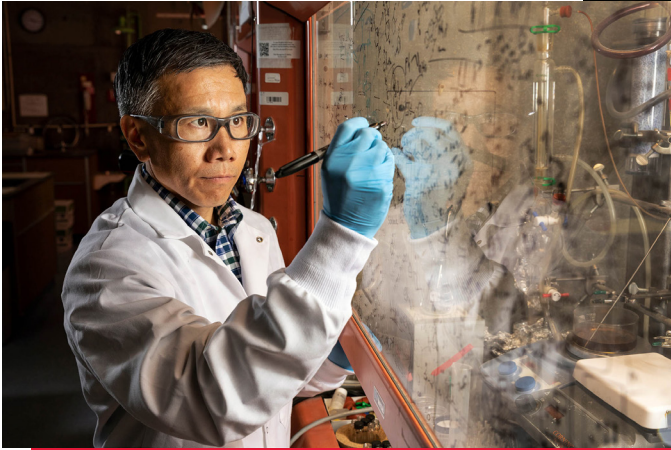


UNLV | COLLEGE OF SCIENCES



50 YEARS
COLLEGE OF
SCIENCES

SPRING 2019

College of Sciences Celebrates 50 Years

The UNLV College of Sciences is celebrating its 50th anniversary in 2108-19. In 1958, UNLV's College of Science and Mathematics was formed. The following year, Robert Smith began serving as the founding dean with nearly 500 undergraduate and 41 graduate students enrolled. Fifty years later, the college has grown to approximately 2,500 undergraduate students and 250 graduate students.

During the semester, the college hosted five public lectures, one in each of the core academic areas. Those lectures included:

Jan. 31: Dr. Jason Steffen, Department of Physics and Astronomy, "The Search for Distant Worlds."

Feb. 28: Dr. Clemens Heske, Department of Chemistry and Biochemistry, "How a Particle Accelerator Can Help to Make Solar Cells Better."

March 28: Dr. Nora Caberoy, School of Life Sciences, "Eyes Wide Open: The Race to Find a Cure for Alzheimer's Disease."

April 25: Dr. Arthur Baragar, Department of Mathematical Sciences, "Circle Packings and the Markoff Equation."

May 16: Dr. Steve Rowland, Department of Geoscience, "Ice Age Mammoths of Southern Nevada."



**Founding dean
and mathematics
professor
Robert B. Smith**



UNLV Attains Highest Status as Research University

UNLV's drive to rise among the nation's top public research universities took a major step forward when it was elevated to R1 "very high research activity" status by the Carnegie Classification of Institutions of Higher Education.

R1 is the gold standard for university research classifications, and out of 4,000 institutions nationwide, UNLV now is one of just 130 with the distinction. UNLV had been classified as "high research activity," or R2, in Carnegie's last update in 2015.

The news comes as UNLV continues to press forward on its Top Tier Initiative, a campuswide strategic plan to join the ranks of the nation's top public universities in research, education, and community impact by 2025. This plan includes earning the top classification by Carnegie.

According to Carnegie's classification website, data from the National Center for Education Statistics and National Science Foundation (NSF) surveys is pulled to determine the classifications. The organization calculates research activity in a variety of categories, including but not limited to doctoral degrees granted, NSF-reported research expenditures, and the number of post-doctoral and non-faculty researchers.

The College of Sciences has nearly \$11 million in research expenditures annually and is proud to play an important role in this R1 designation.

NSF-reported research expenditures are on the rise at UNLV, from \$42 million in fiscal year 2015 to \$66 million in 2017. The university has also grown its doctoral programs across the disciplines and is awarding more doctoral degrees overall, moving from 124 research doctoral degrees in 2013-14 to 162 degrees in 2017-18.

UNLV joins 18 other institutions, including the University of Nevada, Reno, as new arrivals to Carnegie's top classification for 2018.

Original story published at unlv.edu/news

Tiny Footprints, Big Discovery: Reptile Tracks Oldest Ever Found in Grand Canyon

UNLV GEOLOGIST INVESTIGATING 310 MILLION-YEAR-OLD FOSSIL TRACKWAY FROM ANCIENT REPTILIAN CREATURE

Hundreds of hikers each day pass by the fallen boulder along the Bright Angel Trail in Grand Canyon National Park.

It might otherwise go unnoticed except for the 28 indentations — sloping footprints left behind by a small, reptile-like creature about 310 million years ago — that cover the rock's expansive surface.



"It's the oldest trackway ever discovered in the Grand Canyon in an interval of rocks that nobody thought would have trackways in it, and they're among the earliest reptile tracks on earth," said Steve Rowland, UNLV professor of geology who is studying the fossil trackways.

Rowland, who presented his findings at the recent annual meeting of the Society of Vertebrate Paleontology, said he's not prepared to say that they're the oldest tracks of their kind ever discovered, but it's a possibility, as he's still researching the discovery.

"In terms of reptile tracks, this is really old," he said, adding that the tracks were created as the supercontinent Pangaea was beginning to form.

Rowland was first alerted to the tracks in spring 2016 by a colleague who was hiking the trail with a group of students. The boulder ended up along the trail after the collapse of a cliff.

A year later, Rowland studied the footprints up close.

"My first impression was that it looked very bizarre because of the sideways motion," Rowland said. "It appeared that two animals were walking side-by-side. But you wouldn't

expect two lizard-like animals to be walking side-by-side. It didn't make any sense."

When he arrived home, he made detailed drawings and began hypothesizing about the "peculiar, line-dancing gait" left behind by the creature.

"One reason I've proposed is that the animal was walking in a very strong wind, and the wind was blowing it sideways," he said.

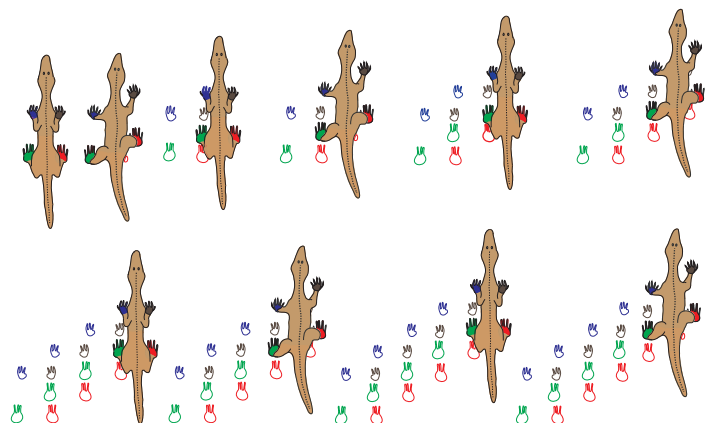
Another possibility is that the slope was too steep, and the animal sidestepped as it climbed the sand dune. Or, Rowland said, the animal was fighting with another creature, or engaged in a mating ritual.

"I don't know if we'll be able to rigorously choose between those possibilities," he said.

He plans to publish his findings along with geologist Mario Caputo of San Diego State University in January. Rowland also hopes that the boulder is soon placed in the geology museum at the Grand Canyon National Park for both scientific and interpretive purposes.

Meanwhile, Rowland said that the footprints could belong to a reptile species that has never yet been discovered.

"It absolutely could be that whoever was the trackmaker, his or her bones have never been recorded," Rowland said.



An illustration by Rowland of the reptile-like creature making the tracks.

Deep Space X-Ray Burst Gives Astronomers New Signal to Detect Neutron Star Mergers

TWO DENSE, CITY-SIZED STARS COLLIDED IN A GALAXY FAR, FAR AWAY; THE RESULTING X-RAYS GIVE ASTROPHYSICIST BING ZHANG AND INTERNATIONAL TEAM OF ASTRONOMERS A NEW WAY TO SPOT WHEN IT HAPPENS AND A RARE GLIMPSE INTO HOW NEUTRON STARS FORM.

An international team of astronomers, including faculty and alumni from UNLV, has discovered a new way to spot when collisions occur in distant galaxies between two neutron stars – incredibly dense, city-sized celestial bodies that possess the most powerful magnetic fields in the universe.

A bright burst of X-rays captured by NASA's Chandra X-ray Observatory in a galaxy located 6.6 billion light years from Earth likely signaled the merger of two neutron stars into a new, heavier and freakishly magnetic neutron star – known as a magnetar – and offered astronomers a rare glimpse into how neutron stars are made. The team's findings were published in the journal *Nature*.

Detecting Neutron Star Mergers

When neutron stars merge they produce jets of high-energy particles and radiation. If the jet is pointed toward Earth, a flash, or burst, of gamma rays can be detected. If the jet is not pointed in our direction, scientists look for other signals, including the detection of gravitational waves.

With the observation of a bright burst of X-rays, astronomers have now found another signal, one that validates predictions first made in 2013 by UNLV astrophysicist Bing Zhang, a member of the research team and one of the study's corresponding authors.

Researchers identified the likely origin of the source, dubbed XT2, by studying how its X-ray light varied with time, and comparing this behavior with predictions by Zhang for the likely X-ray signature produced by a newly-formed magnetar. XT2 matched the characteristic signature predicted by Zhang, which gives astronomers a new window into the interior of neutron stars, objects that are so dense that their properties could never be replicated on Earth.

"We can't throw neutron stars together in a lab to see what happens, so we have to wait until the universe does it for us," said Zhang.

The discovery of a remnant magnetar also disrupts a common belief among scientists that the merger of two neutron stars would only result in the formation of a black hole, either immediately or in less than a second.

"This discovery confirms that at least some of these mergers will make die-hard massive neutron stars that can survive an extended period of time," said Zhang. "If two neutron stars can collide and a heavy neutron star survives, then this also tells us that their structure is relatively stiff and resilient."

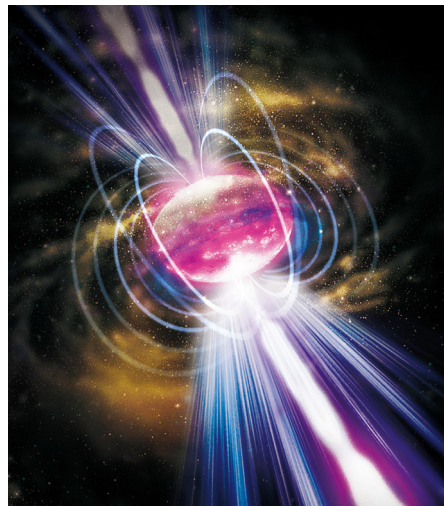
A Serendipitous Discovery

Chandra observed XT2 in March 2015 as it suddenly appeared and then faded away within hours. Researchers say it's possible the magnetar lost energy through an X-ray-emitting wind, slowing down its rate

of spin as the source faded. The amount of X-ray emission stayed roughly constant for about 30 minutes, then its brightness gradually decreased before becoming undetectable.

These images show the location of an event, discovered by NASA's Chandra X-ray Observatory, that likely signals the merger of two neutron stars. Credits: X-ray: NASA/CXC/Uni. of Science and Technology of China/Y. Xue, et al; Optical: NASA/STScI

The source is located in the Chandra Deep Field-South, which is the deepest X-ray image ever taken. Though the source first appeared in 2015, it was discovered later through an analysis of archival data.



Artist's conception of a neutron star merger event. (courtesy of Guo-Yan Wang and Cong Xu)

Continued on page 9

Tooth Fossils Fill 6-Million-Year-Old Gap in Primate Evolution

UNLV GEOSCIENTIST, STUDENT AMONG INTERNATIONAL RESEARCH TEAM BEHIND DISCOVERY OF ANCIENT MONKEY SPECIES THAT LIVED IN AFRICA 22 MILLION YEARS AGO.

Researchers have used fossilized teeth found near Lake Turkana in northwest Kenya to identify a new monkey species – a discovery that helps fill a 6-million-year gap in primate evolution.

UNLV geoscientist Terry Spell and former master's student Dawn Reynoso were part of the international research team that discovered the species that lived 22 million years ago. Understanding the evolution of Old World monkeys is important because, along with the great apes and humans, they belong to the anthropoid group of primates – primates that resemble humans.

According to Spell, the monkey fossil discovery grew out of a more extensive study of a section of sedimentary rocks in Kenya that contain a large number of different types of fossils, including several hundred mammal and reptile jaws, limbs, and teeth.

Previous studies had documented the early evolution of Old World monkeys using fossils dated at 19 million and 25 million years old, leaving a 6-million-year gap in the earliest record. However, the new fossil was determined to be 22 million years in age. Isotopic ages on the rocks were obtained in the Nevada Isotope Geochronology Laboratory on the UNLV campus.

"This adds to our understanding of the earliest evolutionary history of Old World monkeys, including changes in

their diet with time to include more leaves," Spell said.

"Monkeys originated at a time in the past when Africa and Arabia were together as an island continent. Plate tectonic motions pushed this land mass into the Eurasian land mass at 20 to 24 million years ago, and an exchange of animals and plants occurred. It is unclear if competition with newly introduced species or changing climate conditions drove changes in diet."

Scientists named the newly discovered monkey species *Alouatta* ("without loph") due to the lack of molar crests on

its teeth – a phenomenon that sets them apart from geologically younger monkey fossils.

Old World monkeys are the most successful living superfamily of nonhuman primates with a geographic distribution that is surpassed only by humans. The group occupies a wide spectrum of land to tree habitats and have a diverse range of diets. They evolved to develop a signature dental feature – having two

molar crests – which to this day allows them to process a wide range of food types found in the varying environments of Africa and Asia.

Others involved in the research were scientists from nine U.S. universities and a foreign national museum.

"Primitive Old World monkey from the earliest Miocene of Kenya and the evolution of cercopithecoid bilophodonty" was published in *Proceedings of the National Academy of Sciences*.



May 2019 Outstanding Graduates

More than 3,000 students joined the ranks of UNLV alumni May 18, each with a unique path of perseverance that led them to receive their hard-earned degrees.

An enduring UNLV commencement tradition is for the president to honor a select group of outstanding graduates who exemplify the academic, research, and community impact of the graduating class.

Two of this spring's honorees were from the College of Sciences.

NICHOLAS FORESTER **B.S. in Mathematics;** **Aerospace Studies minor**

The recognition of Outstanding Graduates requires success in the classroom and beyond – and Air Force ROTC Distinguished Graduate Nicholas Forester proves just that.



Nicholas, a first-generation college student, has exhibited academic and personal achievement that has inspired his professors, his fellow cadets, and most importantly, his family. Graduating with a B.S. in Mathematics and a minor in Aerospace Studies, Nicholas has persevered and will soon achieve his dream of becoming an officer and pilot in the United States Air Force.

Amidst handling college courses and ROTC, Nicholas had to overcome challenges on a personal scale. On his first day at UNLV, his infant daughter was diagnosed with the most serious form of spina bifida.

Over the past four years, Nicholas – whose wife also serves in the Air Force – has been a diligent student and father – he balanced 18+ credits per semester, worked part time, and was a primary caregiver for his daughter, who has required multiple operations since birth. Nicholas has also exhibited top performance within UNLV's ROTC program – he has been presented 28 ROTC awards, is recognized as top 10 percent of all AFROTC graduates nationwide, and most importantly, has been selected to attend USAF Pilot Training once becoming an officer this spring.

As he continues to help support his family and serve his country, Nicholas Forester is prepared to overcome any obstacle to achieve his dreams

TIFFANY PEREIRA **M.S. in Biological Sciences**

Tiffany Pereira approaches science with the eye of an artist. Graduating with a master's in biology and an impressive 3.97 GPA, Tiffany came to UNLV two years ago to begin her master's research on the Las Vegas bearpoppy plant, a Nevada state critically endangered flowering plant.



Her work – which beautifully represents the concept of science as art – includes the first reported long-term research of the Las Vegas bearpoppy and an original collection of botanical illustration and photography. It will soon be used as an identification tool for state, regional, and federal agencies working together to ensure the plant's conservation.

A mentor for undergraduate students – many of whom nominated her – Tiffany is committed to both making science accessible to the public and spurring budding scientists into careers in the field. According to one faculty nominator, they'd rarely seen a master's thesis defense that was standing room only due the number of undergraduates and community members in attendance.

"I struggled to find meaning in my college career before I started working with her," said one undergraduate nominator. "Tiffany is the most incredible mentor and researcher; I know she is the one graduating, but I feel like all of us are graduating with her."

Tiffany has earned multiple honors from the UNLV Graduate College for her research, mentorship, and communications. She won the top prize for science in the 2019 Graduate and Professional Student Association Research Forum and was selected to present at the UNLV Graduate Showcase.

Original story published at unlv.edu/news

UNLV Honors College and College of Sciences Student Wins Coveted Goldwater Scholarship

For the first time in nearly two decades, two UNLV students in a single cycle are recipients of the Barry Goldwater Scholarship, the nation's premier undergraduate award in mathematics, natural sciences, and engineering.

One of those is UNLV Honors College student Michael Schwob. He is among just 496 scholarship recipients handpicked from a national field of competitors nominated by colleges and universities. The scholarships provide up to \$7,500 per year for sophomores and juniors to cover the costs of tuition, fees, books, and other expenses.

Schwob — a sophomore with a triple major in economics, math, and computer science — has a 3.942 GPA and is one of 62 scholars selected in his field of study. He has authored two submitted papers and worked on two additional research projects. Outside of class, Schwob tutors other students, participates in various campus organizations groups, works for UNLV's Admissions Office, serves as an Ambassador for the Office of Undergraduate Research, and plays recreational soccer.

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send and receive messages with each other—to create more accurate models and help researchers better understand our bodies' biological processes.

Schwob attributes his success to encouragement from his family, research advisor Justin Zhan, professors Bradley Wimmer and Rebecca Martin and Ian McDonough, Honors College dean

As an undergraduate, Schwob has been involved in research on cells' signaling pathways—the communication mechanisms that allow our body's cells to



Andrew Hanson, UNLV College of Hospitality dean Stowe Shoemaker, and UNLV vice president of research Mary Croughan.

"Given my aspiration to pursue a Ph.D. in statistics or biostatistics, this scholarship will aid my admission into some of the top graduate programs in the world," said Schwob, who expects to graduate in May 2021. "This recognition provides motivation to continue my research career to improve the state of the nation's public health."

Andrew Hanson, acting dean of the Honors College, calls the Goldwater Scholarship the "gold standard for STEM students." To qualify, students must have at least a 3.9 or higher GPA, have completed research work prior to applying, and have a commitment to earning a Ph.D. and going on to a research career.

"Not very many students tick all the boxes, but these two students are both exceptional. I am elated when we get one Goldwater Scholar per year; to get two in one year is truly fantastic," Hanson said. "Beyond the outstanding individual accomplishments of Michael and Dylan, this national recognition affirms the growing number of undergraduates engaging in high-level research at UNLV. Really, the awards are one more significant indication of UNLV's research trajectory and status as a Top Tier R1 institution."

Awards, Recognition, and Recent Grants

COLLEGE OF SCIENCES AWARDS

Distinguished Classified Staff Award

Bianca Rideout, Chemistry and Biochemistry

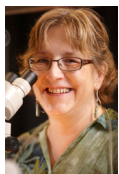
Distinguished Professional Staff Award

Keala Kiko, College of Sciences



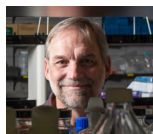
Distinguished Researcher Award

Ernesto Abel-Santos, Chemistry and Biochemistry



Distinguished Researcher Award

Laurel Raftery, Life Sciences



Distinguished Teacher Award

Jef Jaeger, Life Sciences



Distinguished Service Award

Michael Pravica, Physics and Astronomy

NEVADA SYSTEM OF HIGHER EDUCATION REGENTS AWARDS



Regents Rising Research Award

Zhaohuan Zhu, Physics and Astronomy



Regents Mid-Career Researcher Award

Brian Hedlund, Life Sciences



UNLV Foundation Distinguished Teaching Award

Alison Sloat, College of Sciences

UNLV FACULTY AWARDS



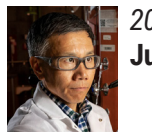
Outstanding Teaching by Part Time Faculty Award

David Choate, Life Sciences



Top-Tier Award

Allen Gibbs, Life Sciences



2018 Barrick Scholar Award

Jun Yong Kang, Chemistry and Biochemistry

UNLV STUDENT AWARDS



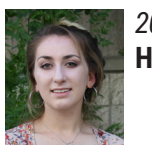
UNLV Outstanding STEM Thesis Award

**Jacqueline Phan, Chemistry and Biochemistry –
Ernesto Abel Santos**



UNLV Outstanding Graduate Student Teaching Award

Joy Immak, Life Sciences



2019 Nevada Regents' Undergraduate Scholar Award

Hannah Patenaude, Chemistry and Biochemistry

RECENT GRANTS



Daniel Proga, Physics and Astronomy

Project: "Numerical Studies of Radiation-MHD
Clouds in AGN"

Agency: NASA

Amount: \$464,618



Eduardo Robleto, Life Sciences

Project: "Mfd promotes mutagenesis and prevents
protein damage in cells experiencing oxidative stress
in *Bacillus subtilis*"

Agency: National Institutes of Health

Amount: \$428,000

Continued on page 9

Awards, Recognition, and Recent Grants Continued



Rebecca Martin and Zhaohuan Zhu, Physics and Astronomy

Project: "Origin of the giant planet dichotomy: Multi-scale modeling of planetary envelope accretion"

Agency: NASA
Amount: \$479,000



Arya Udry, Geoscience

Project: "Petrogenesis of Poikilitic Shergottites and Implications for Martian Geochemical Reservoirs"

Agency: NASA

Amount: \$330,540 and additional \$240,250 equipment grant



Aude Picard, Life Sciences

Project: "Evaluating the Impact of Oxidation on Biosignatures Preserved in Minerals"

Agency: Nevada Space Grant Consortium

Amount: \$45,000



Hui Zhang, Chemistry and Biochemistry

Project: "Regulation of Stem Cell Protein Stability by Novel Ubiquitin Ligases"

Agency: National Institutes of Health

Amount: \$437,202



Matthew Lachniet, Geoscience

Project: "Collaborative Research: P2C2—What is the Driver of Orbital-Scale Central American Monsoon Variations? Tests of the Insolation and Sea Surface Temperature Hypotheses"

Agency: National Science Foundation

Amount: \$479,099

Deep Space X-Ray Burst Continued

"The serendipitous discovery of XT2 makes another strong case that nature's fecundity repeatedly transcends human imagination," said co-author Niel Brandt of the Pennsylvania State University and principal investigator of the relevant Chandra Deep Field-South.

The international team, led by Yongquan Xue of the University of Science and Technology of China, also considered whether the collapse of a massive star could have caused XT2, rather than a neutron star merger.

The source is in the outskirts of its host galaxy, which aligns with the idea that supernova explosions that left behind the neutron stars kicked them there a few billion years earlier. The galaxy itself also has certain properties – including a low rate of star formation compared to other galaxies of a similar mass – that are much more consistent with the type of galaxy where the merger of two neutron stars is expected to occur.

"The host-galaxy properties of XT2 indeed boost our confidence

in explaining its origin," said co-author Ye Li, a postdoctoral fellow at Peking University and former UNLV Ph.D. student.

Armed with new insight, the research team is now reviewing Chandra data for similar sources. "Just as with this source, the data sitting in archives might contain some unexpected treasures," said co-author Xuechen Zheng, also of the University of Science and Technology of China.

The search for neutron star mergers also continue at the advanced Laser Interferometer Gravitational-Wave Observatory, which detected gravitational waves from a neutron star merger in 2017.

"A magnetar-powered X-ray transient as aftermath of a binary neutron star merger" appears in the April 11, 2019 issue of Nature. NASA's Marshall Space Flight Center in Huntsville, Alabama, manages the Chandra program for NASA's Science Mission Directorate in Washington. The Smithsonian Astrophysical Observatory in Cambridge, Massachusetts, controls Chandra's science and flight operations.