

2019 Spring Semester Research Newsletter

Major Events:

- The College of Sciences is celebrating its [50th anniversary](#). In 1958, UNLV's College of Science and Mathematics was formed. The following year, Robert Smith began serving as founding Dean, with nearly 500 undergraduate and 41 graduate students enrolled. Fifty years later, the college has approximately 2,500 undergraduate students and 250 graduate students in five core academic areas: **life sciences; chemistry and biochemistry; geoscience; mathematical sciences; and physics and astronomy**. During the semester, the college hosted five public lectures, one in each of the core academic areas. Those lectures included:



1. Jan. 31: Dr. **Jason Steffen**, Department of Physics and Astronomy, ["The Search of Distant Worlds"](#);



2. Feb. 28: Dr. **Clemens Heske**, Department of Chemistry and Biochemistry, ["How a Particle Accelerator Can Help to Make Solar Cells Better"](#);



3. Mar. 28: Dr. **Nora Caberoy**, School of Life Sciences, ["Eyes Wide Open: The Race to Find a Cure for Alzheimer's Disease"](#);



4. Apr. 25: Dr. **Arthur Baragar**, Department of Mathematical Sciences, ["Circle Packings and the Markoff Equation"](#);



5. May 16: Dr. **Steve Rowland**, Department of Geoscience, ["Ice Age Mammoths of Southern Nevada"](#).


- 14th Annual GeoSymposium was held at Stan Fulton Building on the UNLV Campus on April 26-27, 2019. The symposium is a student-run event, designed to provide graduate and undergraduate students with an opportunity to present their original research and receive feedback from members of industry, government professionals, academic experts and members of the community.
- "Athena ++ Workshop 2019", an international astrophysics workshop, was held at UNLV Hospitality Hall on Mar. 18th-22nd. Department of Physics and Astronomy Assistant Professor, **Zhaohuan Zhu**, and Professor **Daniel Proga** are among organizers of this first ever developer and user meeting for the popular and publicly available general relativistic magnetohydrodynamics (GR-MHD) code Athena++. Over 60 scientists from many institutions around the world (Princeton, Osaka, Harvard, Cambridge, UC Berkeley, to name a few) attended the meeting. It is hoped that this is the first of many successful meetings to come.



- Department of Physics and Astronomy sponsored the **Russell Frank Astronomy Lecture Series** on April 18, 2019, which features Caltech professor George Djorgovski. The title of his talk was “Exploring Space in Cyberspace: How Big Data Are Revolutionizing Astronomy.”

The Russell Frank Astronomy Lecture Series
UNLV Physics and Astronomy Department

7:30pm Thursday April 18
Bigelow Physics Building Rm 102 UNLV
Free Admission



Exploring Space in Cyberspace:
How Big Data Are Revolutionizing Astronomy

Professor George Djorgovski
California Institute of Technology

We will show how astronomy is changing in the era of big data. Digital sky surveys are now generating Petabytes of data, measuring hundreds or thousands of attributes for billions of celestial sources – stars, galaxies, quasars, etc. We are seeing the rise of new methods for data-rich, computationally enabled science in the twenty-first century.

This talk is intended for a general audience, including enthusiasts of all backgrounds and ages.

New Faculty Appointments:



1. **Dr. Cory Rusinek:** hired as an Assistant Professor, Department of Chemistry and Biochemistry, expert in analytical chemistry, starting date: Jul. 1, 2019;



2. **Dr. Jeremy Koonce:** hired as an Assistant Professor in Residence, Department of Geoscience, starting date: Jul. 1, 2019;



3. **Dr. Farhad Shokoohi:** hired as an Assistant Professor, Department of Mathematical Sciences, expert in statistics, starting date: Jul. 1, 2019;



4. **Dr. Joshua Island:** hired as an Assistant Professor, Department of Physics and Astronomy, expert in condensed matter physics, starting date Jul. 1, 2019;



5. **Dr. Yan Zhou:** hired as an Assistant Professor, Department of Physics and Astrnomy, expert in experimental AMO physics, starting date Jan. 2, 2020

There are two more ongoing searches for a tenure track assistant professor in the Department of Geoscience and for a non-tenure-track lecturer in the Department of Mathematical Sciences.

Newly Awarded Major Research Grants (>\$100,000):

1. **Balakrishnan Naduvalath** (Chemistry & Biochemistry) is part a research team that received the coveted Multidisciplinary University Research Initiative (MURI) award from the **Department of Defense (DoD)**, Army Research Office. The interdisciplinary team from multiple institutions (Harvard, Stanford, University of Colorado Boulder, University of New Mexico, and UNLV) comprised of Physicists and Chemists will receive \$6.25 M over a 5-year period starting June 1, 2019. Prof. Naduvalath will receive **\$750,000** during this period to carry out theoretical and computational



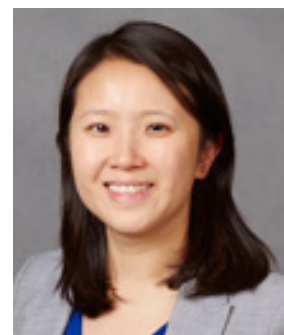
studies of quantum state controlled molecular collisions and chemical reactions. Potential applications of this research include emerging areas of quantum technologies such as quantum computing, sensing, and quantum control of chemical reactions.

2. **Pamela C. Burnley** (PI, Geoscience) and **Ashkan Salamat** (CoI, Physics and Astronomy) received a grant from **Department of Energy (DoE)**

Stewardship Science Academic Alliances (SSAA) program. The five-year grant, entitled “Deformation of Polycrystalline Materials under Extreme Conditions: Stress Percolation, Shear Localization and Grain Boundary Rheology”, is worth **\$525,000** and started in Jan. 15, 2019. The goal of the proposed research is to improve the ability to predict mechanical constitutive properties at extreme conditions. The project will test a novel theory of polycrystalline behavior that posits that the mechanical constituents (grains and grain boundaries) in a polycrystal interact so as to generate percolation patterns in the stress state that in turn lead to varying degrees of shear localization. To test this theory the team will integrate deformation experiments, microstructural observations and numerical simulations.



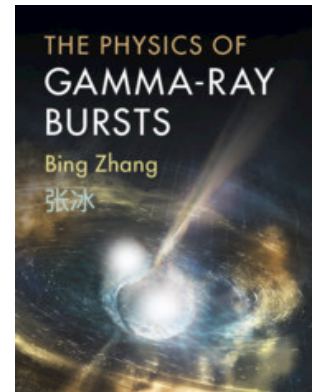
3. **Boo Shan Tseng** (Life Sciences) was awarded a **Cystic Fibrosis Foundation** pilot grant, entitled "Suppressors of mucA essentiality in *Pseudomonas aeruginosa*." This two-year, **\$107,290** award will be to study why the gene mucA is required for bacteria to survive. This bacterial gene is important in infection, as mutations of this gene is strongly correlated with death of cystic fibrosis patients chronically infected with this pathogen. Understanding the role of this gene in bacterial survival may ultimately lead to the development of novel antibacterial agents to treat *P. aeruginosa* infections.
4. **Clemens Heske** (Chemistry and Biochemistry) and his group are part of a research team that was selected for an Award by the Department of Energy (DOE), Office of Energy Efficiency and Renewable Energy (EERE), Solar Energy Technologies Office (SETO). The project "Novel and Effective Surface Passivation for High Efficiency n- and p-type Silicon Solar Cell" is



led by the University of Delaware and also includes the Georgia Institute of Technology as a project partner.

High-impact publications:

1. **Bing Zhang** (Physics and Astronomy) has published a book entitled "[The Physics of Gamma-Ray Bursts](#)". The textbook, published by **Cambridge University Press**, is "the most complete, comprehensive, and up-to-date monograph on the physics of gamma-ray bursts, by one of the leading experts in the field, which will be an invaluable resource both for the advanced researchers and for those wishing to gain an overview of one of the most exciting topics in contemporary astrophysics." (from Foreword of the book).



2. **Ernesto Abel-Santos** (Chemistry and Biochemistry) authored the review chapter ("Modulators of Bacterial Spore Germination") in the book "[Germination: Types, Process and Effects](#)" published by **Nova Science Publishers**.



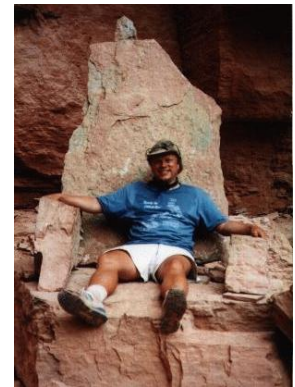
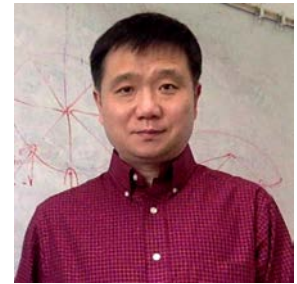
3. **Shichun Huang** (Geoscience) advised a 4th-year PhD student Chris DeFelice to publish a paper "[An isotopically depleted lower mantle component is intrinsic to the Hawaiian mantle plume](#)" in **Nature Geoscience** (2017/2018 Impact factor = 14.391). The team found that the mantle component that is isotopically depleted is intrinsic to the Hawaiian mantle plume, and is probably sourced from the lower mantle, according to radiogenic isotope analyses on shield-stage tholeiitic basalts from Mauna Kea Volcano at Hawaii.



4. Postdoc fellow **Alessia Franchini** (Physics and Astronomy) was coauthor of the paper "[A loud quasi-periodic oscillation after a star is disrupted by a massive black hole](#)" published in **Science** (2017/2018 Impact factor = 41.058). The paper reports the first discovery of a quasi-periodic oscillation X-ray signal as a star is swallowed by a supermassive black hole.



5. **Bing Zhang** (Physics and Astronomy) is one of the corresponding authors of a recently published paper in *Nature* (2017/2018 impact factor: 41.577). The paper is titled "[A magnetar-powered X-ray transient as the aftermath of a binary neutron-star merger](#)". It reports the first discovery of an X-ray transient source from archive data of the Chandra X-ray Observatory, which is best interpreted as mergers of two neutron stars leaving behind a massive, rapidly spinning neutron star termed "magnetar". The observation matches the theoretical prediction of Zhang in 2013.
6. **Stephen Lepp** (Physics and Astronomy) published an invited "News and Views" article in *Nature Astronomy* (Impact factor to be announced). The paper, entitled "[Discovery of the first molecular ion in the Universe](#)", discusses the implications of the newly discovered first molecular ion made in the universe.
7. **Elizabeth Stacy** (Life Sciences) and PhD student Tomoko Sakishima authored a paper for the *Journal of Biogeography* (Impact factor = 4.248) "Phylogeography of the Highly Dispersible Landscape-dominant Woody Species Complex, *Metrosideros*, in Hawaii." They carried out a population genetic analysis of >1,500 adults of Hawaii's dominant tree from across the archipelago for insights into how diversification occurs within long-lived, highly dispersible and continuously distributed groups.
8. **Kelly Ai-Sun Tseng** and PhD students Cindy Kha, and Dylan Guerin (all Life Sciences) published a research article, "[Using the Xenopus Developmental Eye Regrowth System to Distinguish the Role of Developmental Versus Regenerative Mechanisms](#)," in the journal *Frontiers in Physiology* (Impact factor = 4.134), the second most cited physiology journal in the world. This study addressed the role of developmental mechanisms in regenerating eye tissues after injury. The authors showed that regeneration of the retina recapitulates the developmental process. Furthermore, they identify a gene



that is used by both development and regeneration, and a gene that is used specifically for eye regeneration.

9. **Donald Price** (Life Sciences) was part of a team that recently published an article in *Current Biology* (2017 Impact factor = 9.251) titled "Reproductive Capacity Evolves in Response to Ecology through Common Changes in Cell Number in Hawaiian Drosophila." They investigated potential effects of ecology on the developmental processes underlying ovariole number evolution among Hawaiian Drosophila, a large adaptive radiation wherein the highest and lowest ovariole numbers of the family have evolved within 25 million years.

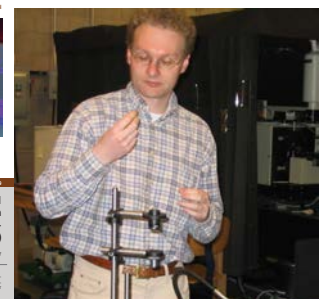


10. **Terry Spell** (Geoscience) was part of a team that recently published an article in *Proceedings of the National Academy of Sciences* (2017 Impact factor = 9.504) titled "Primitive Old World monkey from the earliest Miocene of Kenya and the evolution of cercopithecoid bilophodonty." The paper describes a new primitive monkey from Kenya that dates from ~22 million years ago and reveals a previously unknown stage of evolution.



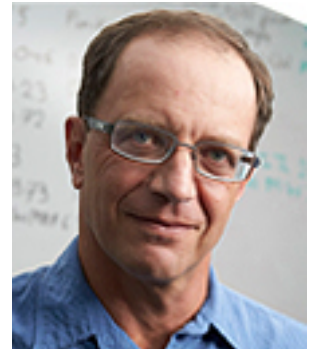
11. **Clemens Heske** (Chemistry and Biochemistry) coauthored multiple high-impact publications in 2019, including "Cadmium free Cu₂ZnSnS₄ solar cells with 9.7% efficiency" published in *Advanced Energy Materials* (2017 Impact factor = 21.875), "Surface and Interface Properties in Thin-Film Solar Cells: Using Soft X-rays and Electrons to unravel the Electronic and Chemical Structure" published in *Advanced Materials* (2017 Impact factor = 21.950), as well as two more papers published in *ACS Applied Energy Materials*.

12. **Oliver Tschauner** (Geoscience) recently published a paper titled "Pressure-induced phase transition in 1,3,5-triamino-2,4,6-trinitrobenzene (TATB)" in *Applied Physics Letters*, which was featured on the cover page of the journal.



Featured research:

1. **George Rhee** (Physics and Astronomy) had his work covered in the local press earlier this year. His online Nevada energy calculator, [*nv2050 calculator*](#), was discussed during an interview he did on [*KNPR's State of Nevada*](#) last January. His work was also discussed in an article by Heidi Kyser in [*KNPR's Desert Companion*](#). He did an interview with the Las Vegas Weekly also reproduced as with a front page headline in the [*Las Vegas Sun*](#). His work (in collaboration with UNLV undergraduates Corwin Grigg, Mechanical Engineering and Jimmy Salazar, Physics) on Colorado River flow statistics published last March in the journal of [*Climate*](#) and was quoted in the [*Las Vegas Review Journal*](#). The paper was selected to be highlighted as a paper of note by the Bulletin of the American Meteorological Society and a summary will be published by them. Rhee was also featured in [*UNLV news*](#).



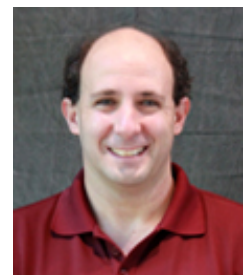
2. **Stephen Rowland** (Geoscience) and his study on the “oldest known footprints” (footprints of an early reptile-like animal) found in Grand Canyon continues to receive press coverage, e.g. in [*Earth Notes*](#). He also spoke to the media to talk about [*quicksand at Zion National Park*](#).



3. **Brenda Buck** and **Rodney Metcalf** (both Geoscience) appeared in the [*PBS Newshour interview*](#) by Miles O'Brien regarding asbestos. **Buck** was also featured in [*Gas & Electricity*](#) regarding her publication in 2013 regarding the health risk involving asbestos.



4. **Michael Pravica** (Physics and Astronomy) was featured in [*Las Vegas Sun*](#), [*LasVegasNow.com*](#), [*News 3 Las Vegas*](#), and [*Fox 5 KVVU-TV*](#) to discuss various physics-related issues in Nevada.





5. **Matthew Lachniet** (Geoscience) was featured in [Earth & Space Science News](#) regarding a hypothesis of the disappearance of the Akkadian Empire.

6. **Martin Schiller** (Life Sciences, Executive Director of the Nevada Institute of Personalized Medicine) was featured in [News 3 Las Vegas](#), [Las Vegas Review Journal](#), [WholeFoods Magazine](#), and [Global University Venturing](#) to discuss various subjects such as nutrition, healthy food, and wellness.



7. The Nature paper of **Bing Zhang** (Physics and Astronomy) was featured in various media sources, such as [NASA](#), [TechExplorist](#), [ScienceBlog](#), [Astronomy](#), [Futurity](#), [Space.com](#), and [ScienceAlert](#), and [UNLV news](#). His work on “relativistic astronomy” was recently extensively discussed in [Centauri Dreams](#) by Paul Gilster.



8. **Changfeng Chen** (Physics and Astronomy) was featured in [Physics Today](#) reporting computational modeling of helium-bearing compound deep inside Earth by his group.

9. **Wanda Taylor** (Geoscience) was featured in [KTNV Las Vegas \(abc 13\)](#) regarding her study on earthquake risks in Las Vegas.



10. **Terry Spell** (Geoscience) was featured in [Phys.org](#), [Science](#), [news.21.BY](#) and [UNLV news](#) regarding the discovery of tooth fossils that fill 6-million-year-old gap in primate evolution.

11. **Kelly Ai-Sun Tseng** (Life Sciences) and her two undergraduate mentees (Ms. Yesenia Cuenca and Mr. Alexis Saucedo-Quintero) have been highlighted as ["Trailblazers"](#) on the NV STEM Network website, which is hosted by Nevada EPSCoR. The video links are: [Cuenca](#), [Sauceda-Quintero](#), and [Tseng](#).

12. Water Chemistry Expert **David Creamer** (Geoscience) was featured in [California Water News Daily](#) regarding his critical analysis for Fenner Valley Water Authority (FVWA) regarding Cadiz Water Project.





13. **Helen Wing** (Life Sciences) was featured in UNLV [*Women's Council Spotlight*](#).

14. **Oliver Tschauner** (Geoscience) was featured in [*Phys.org*](#) and [*TechExplorist*](#) regarding the discovery of an expected phase transition in the high explosive TATB.

Awards and Recognition:

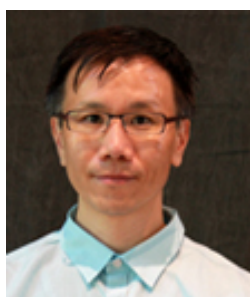
Faculty Awards and Recognition:



1. **Brian Hedlund** (Life Sciences) received 2019 Nevada System of Higher Education **Regents' Mid-Career Researcher Award**.



2. **Zhaohuan Zhu** (Physics and Astronomy) received 2019 Nevada System of Higher Education **Regents' Rising Researcher Award**.



3. **Jun Yong Kang** (Chemistry and Biochemistry) received 2018 UNLV **Barrick Scholar Award**.

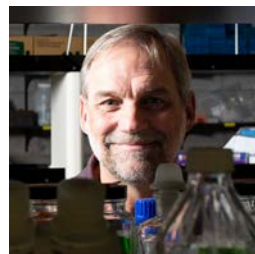
4. **Jun Yong Kang** (Chemistry and Biochemistry) received **The Thieme Chemistry Journals Award**.



5. **Ernesto Able-Santos** (Chemistry and Biochemistry) won the College of Sciences **Distinguished Researcher Award**.



6. **Laurel Raftery** (Life Sciences) won the College of Sciences **Distinguished Researcher Award**.



7. **Jef Jeager** (Life Sciences) won the College of Sciences **Distinguished Teacher Award**.

8. **Michael Pravica** (Physics and Astronomy) won the College of Sciences **Distinguished Service Award**.

9. **Bianca Rideout** (Chemistry and Biochemistry) won the College of Sciences **Distinguished Classified Staff Award**.



10. **Keala Kiko** (College of Sciences) won the College of Sciences **Distinguished Professional Staff Award**.



11. **David Choate** (Life Sciences) won the UNLV **Outstanding Teaching by Part Time Faculty Award**.

12. **Allen Gibbs** (Life Sciences) won the UNLV **Top Tier Award**.



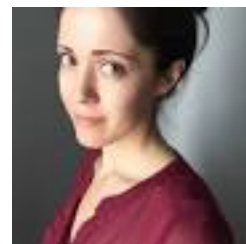
13. **Ernesto Able-Santos** (Chemistry and Biochemistry) received an i-TERP award to participate in the "Biomedical Entrepreneurship Summer Course at the University of Vermont and a Burroughs Wellcome Fund 2019 Collaborative Research Travel Grant. Both awards were highly competitive.

Student Awards and Honors:



1. **Hannah Patenaude** (Chemistry and Biochemistry) won 2019 Nevada Regents' **Undergraduate Scholar Award**.

2. **Joy Immak** (Life Sciences, Advisor **Helen Wing**) won UNLV **Outstanding Graduate Student Teaching Award**.



3. **Jacqueline Phan** (Chemistry and Biochemistry; Advisor: **Ernesto Abel Santos**) won the UNLV **Outstanding STEM Thesis Award**.

4. **Nicholas Forester** (B. S. in Mathematics; Aerospace Studies minor) was honored May 2019 **Outstanding UNLV Graduates**.



5. **Tiffany Pereira** (M. S. in Biological Sciences) was honored May 2019 **Outstanding UNLV Graduates**.



6. **Louisa Heske** (B. S. Biology and two minors in Spanish and business) was the **student commencement speaker** of Spring 2019 Commencement.