

2020 Fall Semester Research Newsletter

Foreword: The 2020 fall semester was still affected by the COVID-19 pandemic. Our faculty, postdocs and students have tried to continue research within their capacity. This newsletter highlights these achievements during this difficult time.

Major Events:

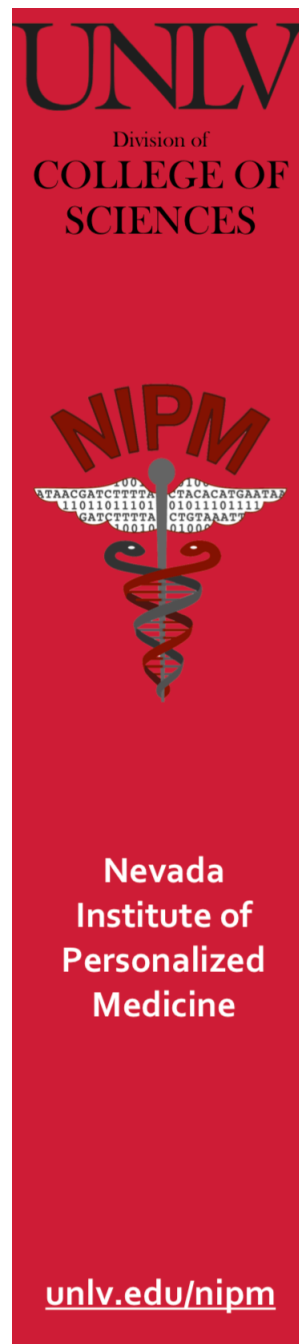
- **Nevada Institute of Personalized Medicine (NIPM)** formally joined as a division of College of Sciences in July 2020.



Directed by School of Life Sciences professor **Martin Schiller**, **NIPM** is working to improve individual and community health in Nevada through research, education, workforce training, technology commercialization, and job creation.

Following COS members are NIPM affiliated faculty:

- **Ernesto Abel-Santos** (Chemistry and BioChemistry)
- **Amei Amei** (Mathematical Sciences)
- **Nora Caberoy** (Life sciences)
- **Mira Han** (Life Sciences)
- **Brian Hedlund** (Life Sciences)
- **Laurel Raftery** (Life sciences)
- **Hui Zhang** (Chemistry and Biochemistry)



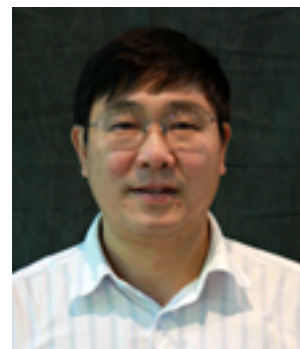
Newly Awarded Major Research Grants (>\$100,000):



1. **Helen Wing** (Life Sciences) received a grant (\$444,540) from **National Institutes of Health**. The title of the project is “Understanding transcriptional silencing & anti-silencing mechanisms in *Shigella*”. The goal of this study is to elucidate the mechanism of transcriptional silencing and anti-silencing at the *Shigella icsP* promoter. This is the 4th consecutive award on this topic.



2. **Hui Zhang** and **Hong Sun**, (both Chemistry and Biochemistry) recently received an RO1 from **National Institutes of Health (NIH)** entitled “Regulation of SOX Proteins by Methylation-dependent Proteolysis in Stem Cells and Development” from the National Institutes of Health with total **\$1,238,360**. The SOX (SRY-related HMG box) family proteins act as key regulators for embryonic, fetal, and adult stem cells for the formation of major tissues such as brain, lung, skin, and blood during development or for adult tissue renewal or repair. The aim of the grant is to investigate how the pluripotency and self-renewal of embryonic stem cells and neurogenesis during the development of the central nervous system are controlled by novel lysine methylation-dependent proteolytic and cell signaling mechanisms that regulate the homeostasis of the master stem cell protein SOX2 and related SOX family members.



3. **Arya Udry** (GeoScience) received two grants. The first (\$93,000) is from **NASA** Mars 2020 participating scientist program titled “Using Jezero crater igneous compositions to constrain martian interior and surface processes from the Noachian to Amazonian”. Using several instruments on the Mars

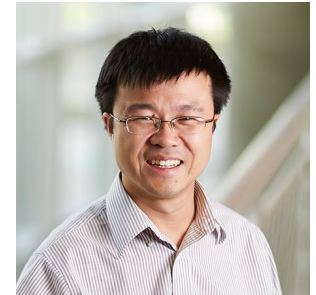


2020 Perseverance rover, she will better constrain the formation of the magmatic rocks in the Jezero crater (the landing site of the rover) and overall better understand the magmatic martian evolution. The second (\$455,000) is from **NASA** Solar System Working Program titled “Constraining parental melt compositions and mineral formation in martian nakhlite and chassignite meteorites”, which will study an important group of martian meteorites called nakhlites and chassignites to better constrain their geologic links and how they formed.



4. **Daniel Proga** (Physics and Astronomy) is the Principal Investigator of a **NASA** Theoretical and Computational Astrophysics Networks (TCAN) award, which involves five institutions and a total budget of \$1,547,537. UNLV is the lead institution with a total budget of **\$547,598**.

Zhaohuan Zhu (also Physics and Astronomy) is a Co-Investigator of the grant. This grant, titled “Global models of accretion and outflows in astrophysical disks: A new DAWN (Disk Accretion & Winds Network)” aims to combine efforts to conduct comprehensive numerical modeling of accretion disks and winds in many astrophysical systems.



5. **Rebecca Martin** (Physics and Astronomy) received a grant (\$541,460) from **NASA** Exoplanets Research program. The title of the project is “Formation and evolution of misaligned disks and planets in binary star systems”.

6. **Chao-Chin Yang** (Physics and Astronomy) received a grant (\$184,911) to UNLV from the **NASA** Theoretical and Computational Astrophysics Networks (TCAN) program. The title of the project is “Dynamical instabilities in the air of planet formation in circumstellar disks”.





7. **Allyson Hindle** (Life Sciences) received a grant (\$884,080) from **National Science Foundation**. The title of the project is “Epigenetic pathways to regulate homeostatic resilience: Model-based discovery of rules across diverse mammals”.



8. **Jichun Li** (Mathematical Sciences) received a (\$252,172) from **National Science Foundation**. This project will develop novel mathematical modeling and robust computational methods for simulating wave propagation in complex media such as metamaterials and graphene.

9. **Pengtao Sun** (Mathematical Sciences) received a five-year grant “Collaboration Grants for Mathematicians” from Simons Foundation, — a prestigious private foundation, also one of the largest charitable organizations in the US which has been dedicated to advancing the frontiers of research in mathematics and the basic sciences since 1994.



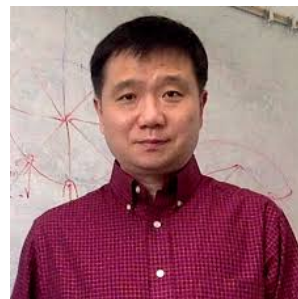
10. **Ashkan Salamat** (Physics and Astronomy) received a grant (\$452,184) from the **Air Force office of scientific research**. The grant is titled "The synthesis of supernitride compounds via extreme (pressure, temperature) conditions: a new generation of high-energy density materials". Modern calculations reveal a novel group of binary metals materials with high nitrogen content — “supernitrides” that are metastable under extreme conditions. This proposal aims to realize these new, high-energy density materials using a combination of laser heating and high pressure conditions and to identify pathways for material recoverability.

High-impact publications:

1. **Ashkan Salamat** (Physics and Astronomy) published one paper in **Nature** (2019 impact factor = 42.8) titled “Room-temperature superconductivity in a carbonaceous sulfur hydride”.



2. **Bing Zhang** (Physics and Astronomy) published three papers in *Nature*. He is a corresponding author of the first two papers: "[Diverse polarization angle swings from a repeating fast radio burst source](#)" and "[No pulsed radio emission during a bursting phase of a Galactic magnetar](#)"; and the sole author of the third review paper: "[The physical mechanisms of fast radio bursts](#)". He is also a corresponding author of this paper "[A possible bright ultraviolet flash from a galaxy at redshift \$z \approx 11\$](#) " published in *Nature Astronomy* (2019 impact factor 11.5).



3. **Gary Kleiger** (Chemistry and Biochemistry) is a co-corresponding author on a paper titled "[Linkage-Specific Ubiquitin Chain Formation Depends on a Lysine Hydrocarbon Ruler](#)" that was in the journal *Nature Chemical Biology* (2019 impact factor = 12.6). Three UNLV students also contributed to the paper as co-authors.



4. **Brian Hedlund** (School of Life Sciences) was part of a large international team led by the U.S. Department of Energy's [Joint Genome Institute](#) (JGI) that published a paper, "[A Genomic Catalog of Earth's Microbiomes](#)," "A Genomic Catalog of Earth's Microbiomes," in *Nature Biotechnology* (2019 impact factor = 36.6). The paper describes 52,515 new draft microbial genomes that were generated from metagenomic data contained within the JGI's Integrated Microbial Genomes & Microbiomes platform. The study revealed 18,000 new microbial species and expanded the known diversity of bacteria and archaea by 44 percent.



5. **Zhaohuan Zhu** (Physics and Astronomy) published one paper in *Science* (2019 impact factor = 41.8) titled "[A triple-star system with a misaligned and warped circumstellar disk shaped by disk tearing](#)".
6. **Arya Udry** (GeoScience) published an review article titled "[What martian meteorites reveal about the interior and surface of Mars](#)" in *Journal of Geophysical Research: Planets*.

7. **Simon Jowitt** (GeoScience) published an entry titled "[Non-Renewable Resource Depletion and Use](#)" in ***Oxford Bibliographies in Environmental Science***. He also published an article titled "[Future availability of non-renewable metal resources and the influence of environmental, social, and governance conflicts on metal production](#)" in ***Communications Earth & Environment*** and an article titled "[Mining in Papua New Guinea: A complex story of trends, impacts and governance](#)" in ***Science of the Total Environment*** (2019 impact factor 6.6).



8. **Steve Rowland** (GeoScience) along with former grad student Zach Jensen and colleague Mario Caputo, published a paper in ***PLOS ONE*** on a 313-million-year-old vertebrate trackway in the Grand Canyon. The title is "[Early adaptation to eolian sand dunes by basal amniotes is documented in two Pennsylvanian Grand Canyon trackways](#)".



9. **Scott Abella** (Life Sciences) published a large monograph titled "[Resilience and alternative stable states after desert wildfires](#)" in ***Ecological Monographs***.



10. **Ernesto Abel-Santos** (Chemistry and BioChemistry) published one paper titled "[Pharmacokinetics of CamSA, a potential prophylactic compound against Clostridioides difficile infections](#)" published in ***Biochem***

Pharma.



11. **Pengtao Sun** (Mathematical Sciences) published two papers with his student in two top journals in mathematics: "[A Novel Arbitrary Lagrangian–Eulerian Finite Element Method for a Mixed Parabolic Problem in a Moving Domain](#)" published in ***Journal of Scientific Computing*** and "[A novel arbitrary Lagrangian–Eulerian finite element method for a parabolic/mixed parabolic moving interface problem](#)" published in ***Journal of Computational and Applied Mathematics***.

12. **Jichun Li** (Mathematical Sciences) published two papers in two top journals in mathematics: “[Time-domain finite element method and analysis for modeling of surface plasmon polaritons](#)” published in [Computer Methods in Applied Mechanics and Engineering](#) and “[Optimal control for electromagnetic cloaking metamaterial parameters design](#)” published in [Computers & Mathematics with Applications](#).

Featured research:

1. **Elisabeth (Libby) Hausrath** (GeoScience) was selected as one of the Returned Sample Participating Scientists on the NASA’s Mars2020 mission. The Mars2020 mission will be a historic mission to Mars to find evidence of life on the red planet. It will be the first time a sample of rocks and soil from Mars will be brought back to earth. The mission was launched on July 30, 2020 and will land on Mars in February 2021. Her involvements in the mission are widely reported in the media. See: [Fox 5](#), [KTNV](#), [Las Vegas Review Journal](#), [Aerospace America](#), [US News](#), [News\(Wise\)](#) and [News3](#).
2. **Arya Udry** (GeoScience) was also selected as one of the Returned Sample Participating Scientists on the NASA’s Mars2020 mission. Her involvements in the mission are widely reported in the media. See: [Fox 5](#), [KTNV](#), [Las Vegas Review Journal](#), [Aerospace America](#), [US News](#), [News\(Wise\)](#), and [UNLV News Center](#).



3. **Monika Neda** (Mathematical Sciences) was featured in an interview at [UNLV News Center](#).

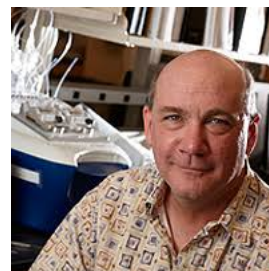


4. **Matthew Lachniet** (GeoScience) discussed how caves tell history of the climate (see [Wyoming Public Media](#), [The Salt Lake Tribute](#), [Inside Climate News](#)), how

climate change may spark serial wildfires (see [Reno News & Views](#)), the monsoon season (see [Las Vegas Sun](#)), and state climate strategy (see [The Nevada Independent](#)).

5. **Stephen Rowland** (GeoScience) discussed the Ice Age fossils recently extracted from private property in Carson City, at the Las Vegas Natural History Museum in Las Vegas. See [Las Vegas Review Journal \(1\)](#) and [Las Vegas Review Journal \(2\)](#). His discovery of fossil tracks at the Grand Canyon has been widely reported in the media. See [National Parks Traveler](#), [ABC 15: Arizona](#), [CNN](#), [Daily Mail](#), [CNET](#), [Phys.Org](#), [azcentral](#), [Mysterious Universe](#), [AP Associate Press](#), [8 NewsNow](#), [msn](#), [knpr](#), [Las Vegas Sun](#), [ABC News](#), [Arizona Republic](#), [Smithsonian Magazine](#), [Epoch Times](#), [Las Vegas Sun](#), [Las Vegas Sun](#), and [ktnv](#).

6. **Allen Gibbs** (Life Sciences) spoke to media about Asian giant hornets spreading across and establishing permanent presence in the United States. See [Newsweek](#) and [Detikinet](#).



7. **Ernesto Abel-Santos** (Chemistry and BioChemistry) spoke to multiple media about cleaning up the germs that cause COVID-19. See [NewsWise](#), [American Healthcare Journal](#), [Scientific American](#), [HealthyWomen](#), and [Kaiser Health News](#).



8. **Jason Steffen** (Physics and Astronomy) discussed a new planet discovered with the new exoplanet-hunting satellite CHEOPS, see [Popular Science](#).

9. The breakthrough discovery of room temperature superconductor by **Ashkan Salamat** (Physics and Astronomy) and colleagues have been reported by many media sources: [The New York Times](#), [BBC](#), [Der Spiegel](#), [The Hindu](#), [al Khaleej Today](#), [Las Vegas Review-Journal](#), [News 3 Las Vegas](#), [Wired](#), [Inverse](#), [National Science Foundation](#), [Scientific American](#), [Popular Mechanics](#), [Nature: News](#), [Science Magazine](#), [MIT Technology Review](#), [New Scientist](#), [Chemical & Engineering News \(ACS\)](#), [Chemistry World \(RSC\)](#), [Physics World \(IOP\)](#), [Phys.org](#), [Wikipedia](#), [Hacker News](#), [Science News](#), [Quanta Magazine](#), [Ars Technica](#), [SciTechDaily](#), [SciNews](#), [ExtremeTech](#), [Science Alert](#), [News Break](#), [New Atlas](#), [IFL Science](#), [Electronics Weekly](#), [Unfold Times](#), [Singularity Hub](#), [Chemistry Views](#), [Wonderful Engineering](#), [Fox Exclusive](#), [Knowledia](#), [Lintelligencer](#), [Up News Info](#), [UNLV Today](#), [Univ. of Rochester Newscenter](#), [Univ. of Buffalo News](#).

10. The breakthrough discoveries on fast radio bursts by **Bing Zhang** (Physics and Astronomy) and colleagues have been reported by many media sources: [CNN, BBC, New Scientist, Sky & Telescope, Creation&Evolution, vice.com, Sci & News, Business Insider, National Geographic, New York Post, space.com, Space Science, Popular Science, DailyGalaxy, Gizmodo, CBC News, Discover, NewsWise, Room, Cosmos, Tychyon Beam, Nano werk, KCTV, Techpost, Nature Asia, Scimex, Centauri Dreams, Science Codex, eureka!ert, ScienceDaily, Government, and UNLV News Center.](#)

Awards and Recognition:

Faculty Awards and Recognition:

1. **MaryKay Orgill** (Chemistry and BioChemistry) was selected as a **Fellow of the American Chemical Society**. She is one of 53 people named fellow for 2020. Orgill was recognized for contributions to biochemistry education research, for making theoretical frameworks accessible to the chemistry education research community. She also was recognized for leadership in the Division of Chemical Education, as chair and long-term member of its Program and Biennial Conference Committees, and for service to the society's Committee on Education and student affiliate groups.
2. The breakthrough discovery of **Ashkan Salamat** (Physics and Astronomy) on room-temperature superconductor was selected as one of [Top 10 2020 Breakthrough of the Year](#) by the **Science** magazine and [Top 10 Breakthrough of the Year for 2020](#) by Physics World.
3. The breakthrough discovery of **Bing Zhang** (Physics and Astronomy) on fast radio bursts, along with two other papers published in Nature, was selected as one of [Top 10 2020 Breakthrough of the Year](#) by the **Science** magazine and [10 remarkable discoveries from 2020](#) by the **Nature** magazine.
4. **Pengtao Sun** (Mathematical Sciences) and his student **Rihui Lan** received **The Best Paper Award for International Conference on Computational Science (ICCS)** held in Amsterdam.



5. **Kathryn Rafferty** (Life Sciences) received the **Outstanding Faculty Mentor Award** from the office of undergraduate research (OUR) at its Fall 2020 Undergraduate Research Symposium.



Student Awards and Honors:

1. The **School of Life Sciences** earned the **Champions of Undergraduate Research Award** from the office of undergraduate research (OUR) at its Fall 2020 Undergraduate Research Symposium.

2. **Cindy Kha** (Life Sciences, advisor **Kelly Tseng**) received the **Nevada Woman in STeM for December 2020** by senior **Jacky Rosen**, and **Nevada NASA Space Grant Graduate Research Opportunity Fellowship** for 2020-21.



3. **Christopher DeFelice** (GeoScience, advisor **Shichun Huang**) received the **2020-2021 President's UNLV Foundation Graduate Research Fellowship**.
4. **Rihui Lan** (Mathematical Sciences, advisor **Pengtao Sun**) received **Outstanding Dissertation Award of College of Sciences**.
5. **Laura Turello** (Chemistry and Biochemistry, advisor **Ernesto Abel-Santos**) received **Outstanding thesis Award of College of Sciences**.
6. **Rebecca Lim** (Chemistry and Biochemistry, advisor **Ron Gary**) received **Outstanding GA Teaching Award of College of Sciences**.
7. **Evan O'Neal** (GeoScience, advisor **Arya Udry**) received the **NASA Nevada Space Grant Consortium (NVSGC) fellowship**.
8. **Mary Blankenship** (Chemistry, advisor **Clemens Heske**) received the **2020 Outstanding Undergraduate Research Awardee**.
9. **Iris Nava** (Life Sciences, advisor **Kelly Tseng**) received the **Best Poster Presentation Award in Health & Natural Sciences & Engineering**.

10. **Elijah Graves** (Life Sciences, advisor **Kelly Tseng**) received **a Nevada NSF EPSCoR undergraduate research fellowship** for 2020-2021.
11. **Emaros Ahmed** (Chemistry, advisor **Jun Yong Kang**) received **The Southern Nevada Section of the American Chemical Society awards excellent undergraduate students in chemistry.**