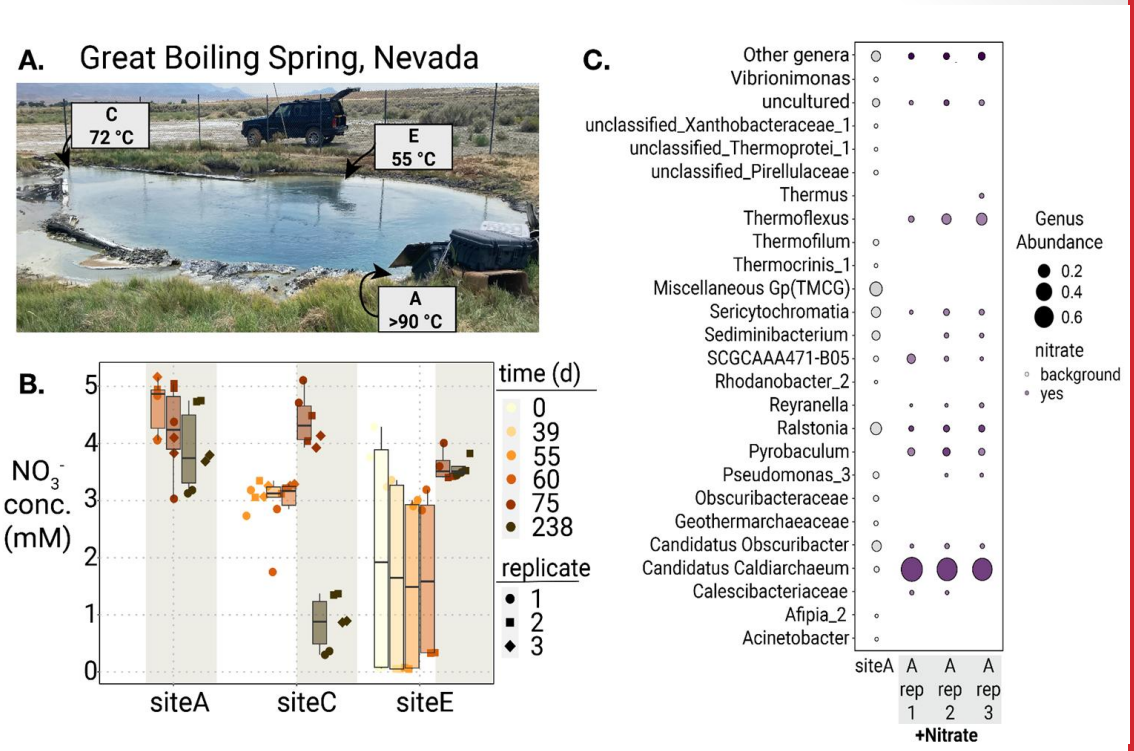
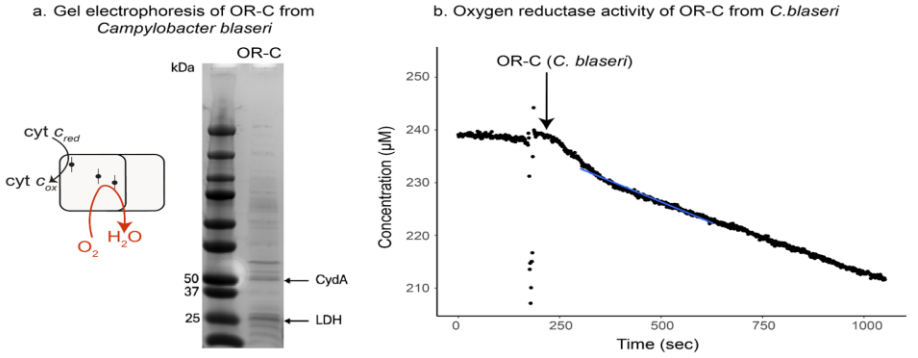
Investigating denitrification pathways in hot springs

NO_3^- is consumed by microbial communities in enrichment cultures from the hot spring sites A, C and E at the Great Boiling Spring (GBS) in northern Nevada (A,B). C) Enrichment of putative nitrate reducing genera is observed with 16S rRNA-based community analysis.



Characterization of a novel oxygen reductase found in a member of the human microbiome, *Campylobacter blaseri*

We confirmed the oxygen reductase activity of a recently discovered membrane-bound enzyme playing an important role in little known respiratory pathways.



Big Data Research

Statistical genetics and biostatistics

Dr. Amei Amei

Professor,

Department of Mathematical Sciences

Email: amei.amei@unlv.edu

Expertise

- Statistical methods to detect risk genes and gene-environment interactions underlying complex diseases
- Large-scale sequence-based genetic association studies
- Statistical inference of stochastic modeling
- Bayesian variable selection

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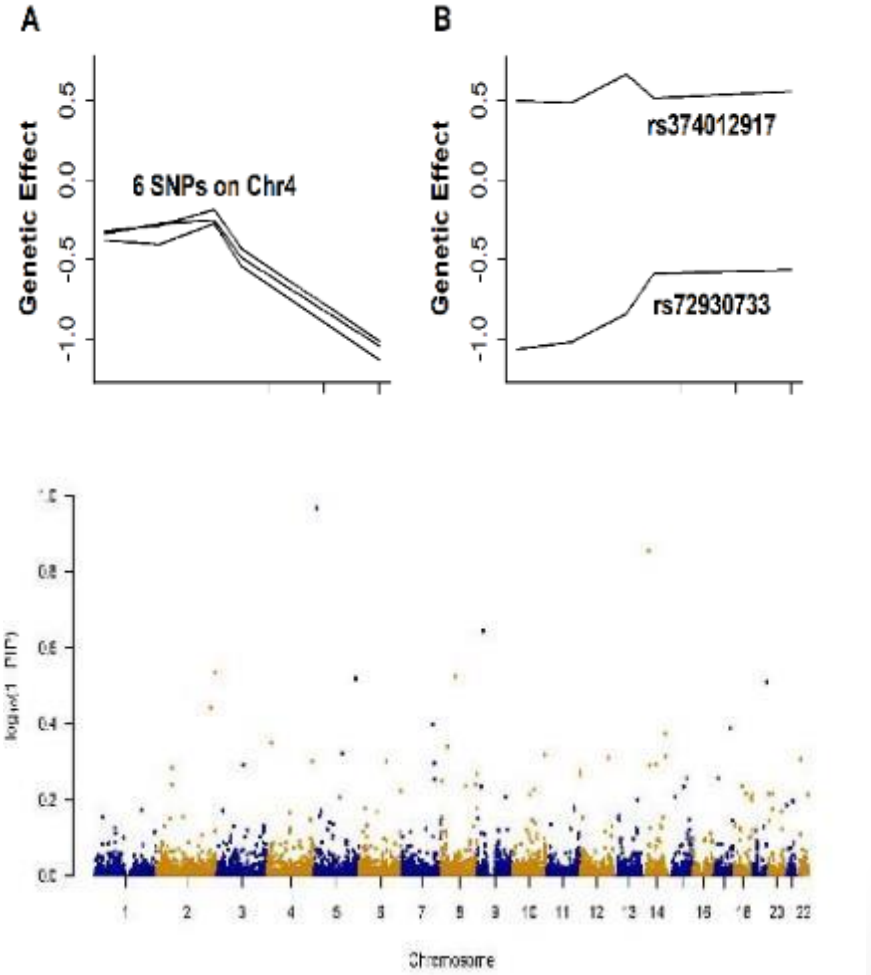
Genome-wide association studies in hypertension and schizophrenia

- In genome-wide association analysis of longitudinal traits, modeling time-varying genetic effect can increase power for the detection of genes underlying the development and progression of complex diseases.
- BVS methods can be used to reanalyze published datasets to discover new risk genetic variants for many diseases without new sample collection, ascertainment, and genotyping.



Critical Zone Hydrology

- **Dr. Hannes Bauser**
- Assistant Professor
- Department of Geoscience
- Email: hannes.bauser@unlv.edu
- Website: https://geoscience.unlv.edu/people/department-faculty/hannes-bauser/

Expertise

- Vadose Zone Hydrology and Soil Physics
- Hydrologic Modeling
- Data Assimilation
- Machine Learning

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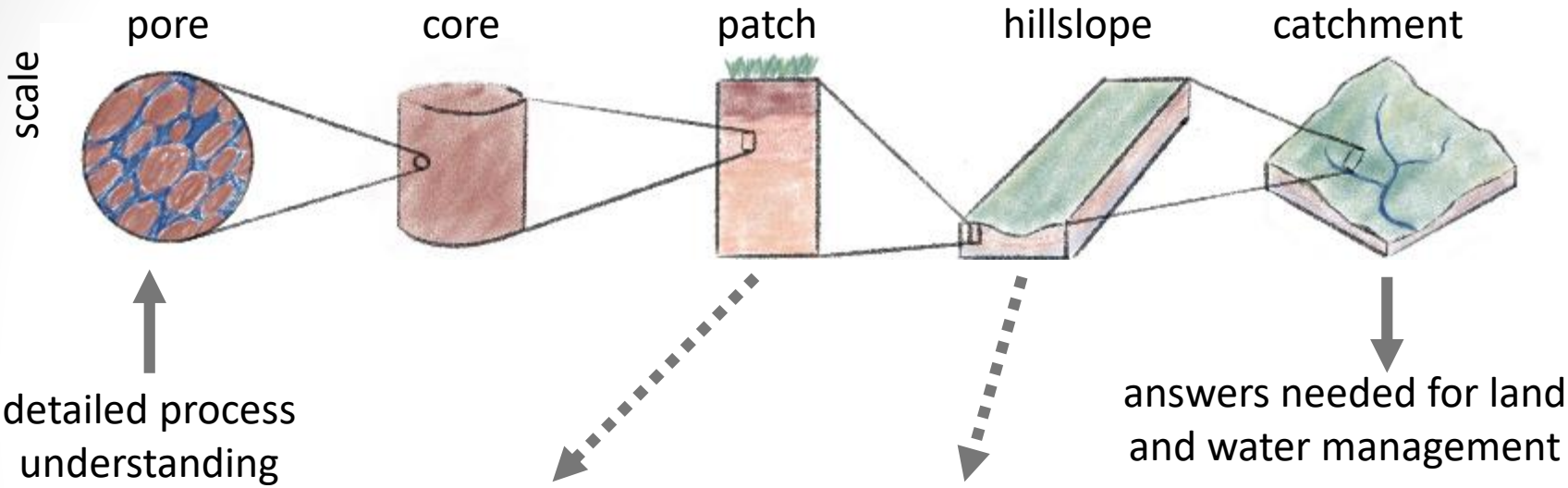
Hydrologic Scaling Challenge



Collaboration with the Desert Research Institute for access to the SEPHAS Lysimeters in Boulder City.

Collaboration with the University of Arizona for access to the Landscape Evolution Observatory at Biosphere 2.

How can we use data science (e.g., data assimilation, machine learning) to combine process understanding and data to solve the hydrologic scaling challenge?

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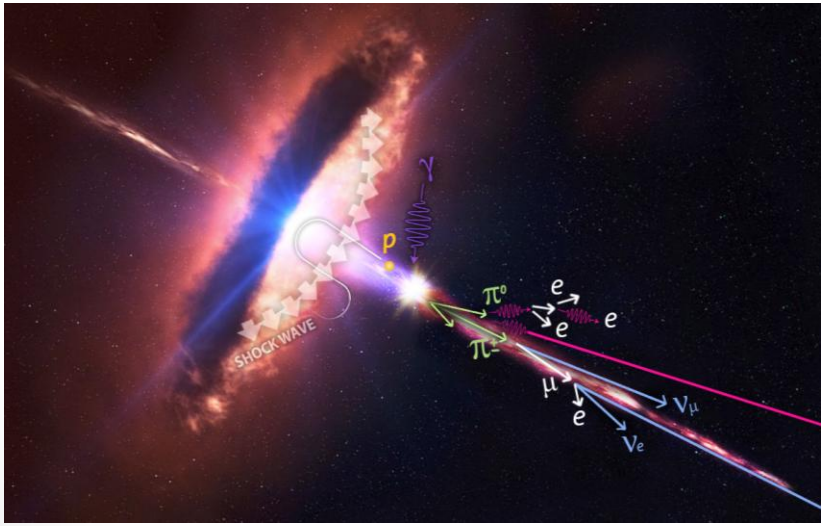
Particle Astrophysics with Neutrinos

- **Dr. Ali Kheirandish**
- Assistant Professor
- Department of Physics and Astronomy
- BPB 208, ali.kheirandish@unlv.edu
- Website: https://www.physics.unlv.edu/~kheirand



Expertise

- Neutrino Astrophysics
- Multi-messenger Astrophysics
- High-Energy Astrophysical Phenomena
- Physics beyond the Standard Model
- Dark Matter

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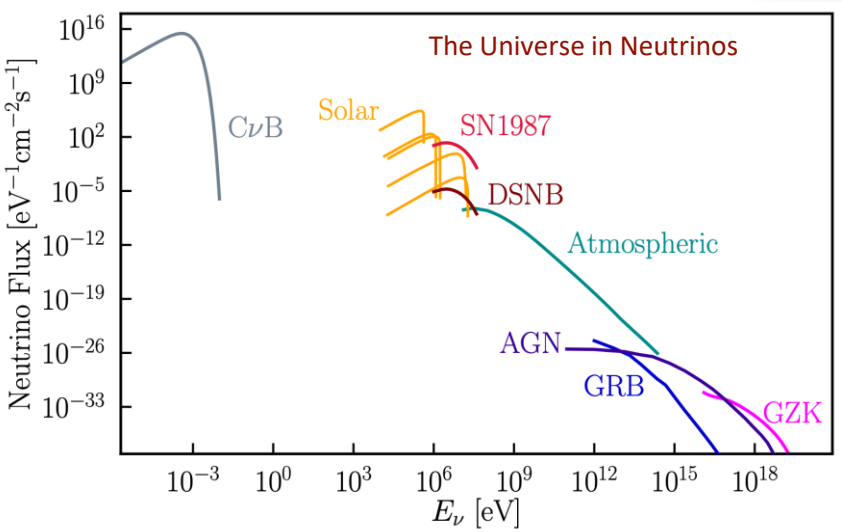
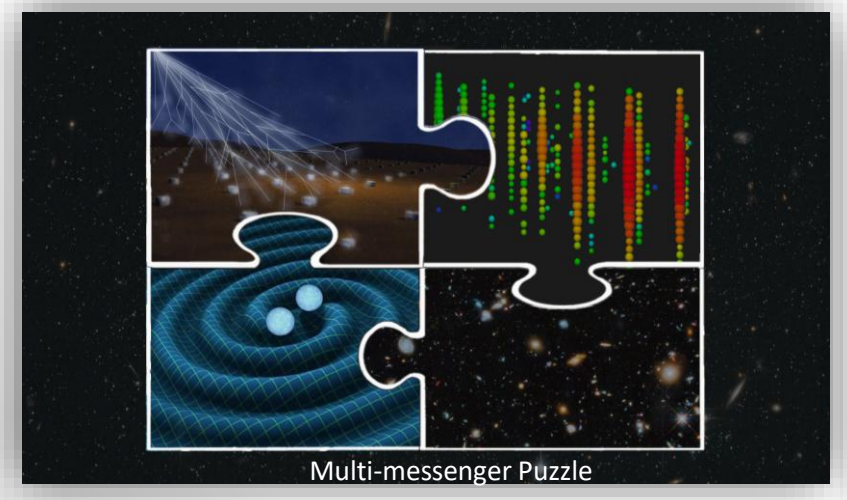
Research Summary

Dr. Kheirandish's research is centered on particle astrophysics with high-energy neutrinos from IceCube Neutrino Observatory. It covers theory as well as analysis of high-energy neutrino data to the search for the sources of cosmic neutrinos and physics beyond the Standard Model.



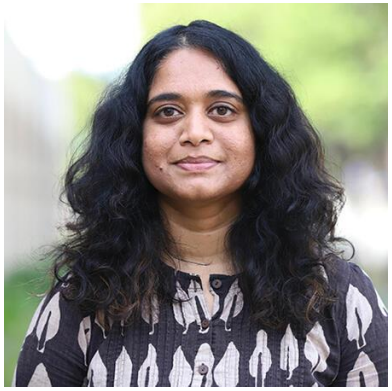
Neutrinos are the tiniest and the most enigmatic particles in the Standard Model. Current pressing puzzles in cosmology and astrophysics, such as dark matter, dark energy, and the origin of the cosmic rays, are tied to the nature of neutrinos. Thus, neutrinos offer a unique opportunity to look for answers to the problems at the intersection of particle physics, astrophysics, and cosmology.


Multi-messenger Puzzle


IceCube Lab at the South Pole

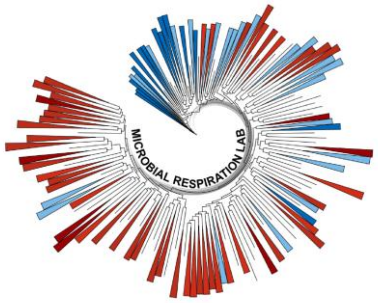
Microbial Respiration and molecular evolution

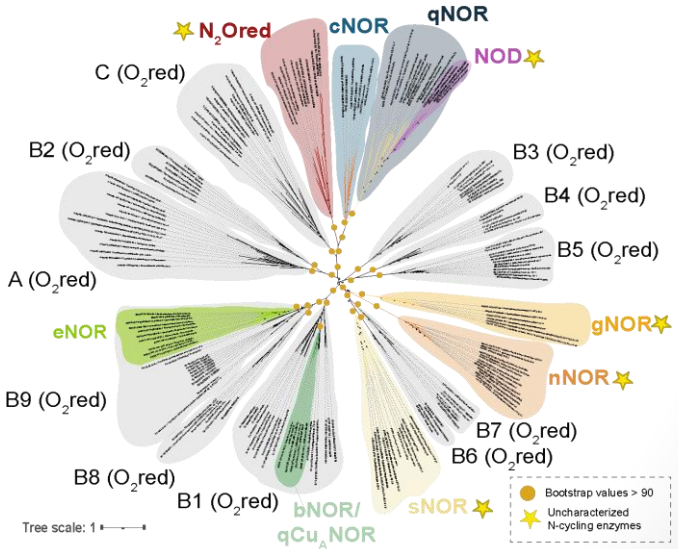
- **Dr. Ranjani Murali**
- Assistant Professor
- Department of Life Sciences
- Email: ranjani.murali@unlv.edu



Expertise

- Microbial Respiration
- Geomicrobiology
- Bioenergetics





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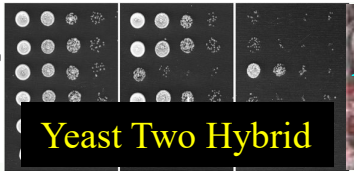
Dr. Jeffery Shen
Professor,
School of Life Sciences
Phone: 702-895-4704
Email: jeffery.shen@unlv.edu

Expertise

- Big Data Analysis to Study Biology, Agriculture and Medicine
- Molecular Mechanisms Controlling Plant Responses to Drought Heat, and Salinity
- Seed Germination, Tissue Culture and Plant Transformation
- Molecular Basis of Leukemia (in collaboration with Dr. J. Cheng at the University of Chicago Medical School)
- Nutrition of Cereal Crops (in collaboration with Dr. Christine Bergman, Ph.D. and R.D. at UNLV)

Molecular Basis of Drought Stress Responses and Seed Germination



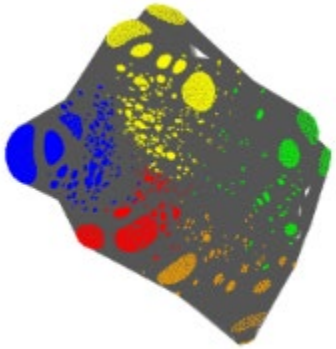
BMC Genomics, 2016, 17:102
Plant Science, 2015, 236:214-222
Front. Plant Science,2015; 6: 1145
Trends in Plant Sci, 2010, 15: 247

Short Read Assembly Algorithm

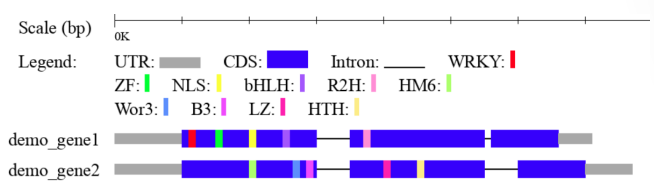
for Genome and Transcriptome Analysis

http://shenlab.sols.unlv.edu/shenlab/software/Tiling_Assembly/tiling_assembly.html

DNA Research, 2015, 22: 319-329
Genomics, 2014, 103:122-134



Signaling network Analysis



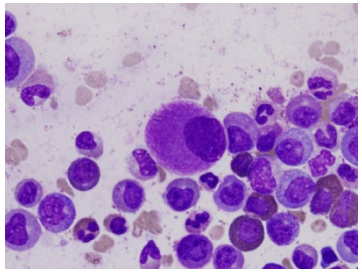
Promoter and Coding Region Structures

http://shenlab.sols.unlv.edu/shenlab/software/TSD/transcript_display.html

Bioinformatics, 2016, 32:2024-2025
Plant Cell Environ. 2017, 40:2004-2016

Molecular Basis of Leukemia

(in collaboration with Medical School, University of Chicago)



Cytogenetically normal refractory cytopenia with multilineage dysplasia (CN-RCMD)

Nature Communications, 2018, 9:1163
Leukemia, 2013, 27: 1291-1300

High-dimensional Data Analysis

- **Dr. Farhad Shokoohi**
- Assistant Professor of Statistics
- Department of Mathematical Sciences
- Email: farhad.shokoohi@unlv.edu
- Website: https://farhad.faculty.unlv.edu

Expertise

- Bayesian and Frequentist Analysis
- Mixture Modelling
- Survival Analysis
- High-Dimensional Genomics and Epigenetic
- Sparse Estimation in Finite Mixture of Regressions
- Machine Learning in Medical and Financial Data
- Differential DNA Methylation Analysis in Cancer Epigenetics
- Hidden Markov Models
- Nonparametric and Semiparametric Regression
- Software Development

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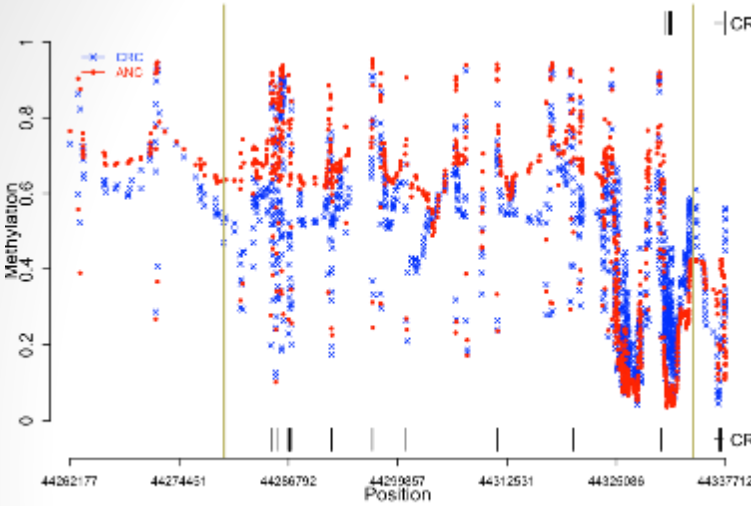
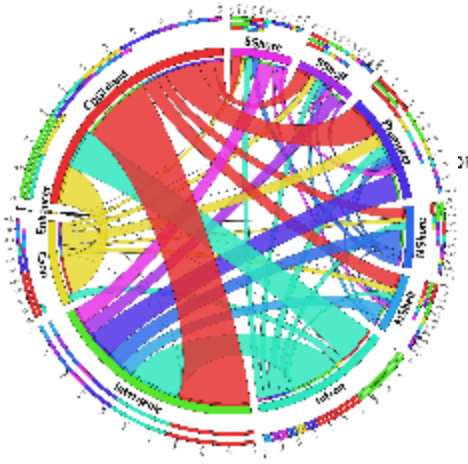
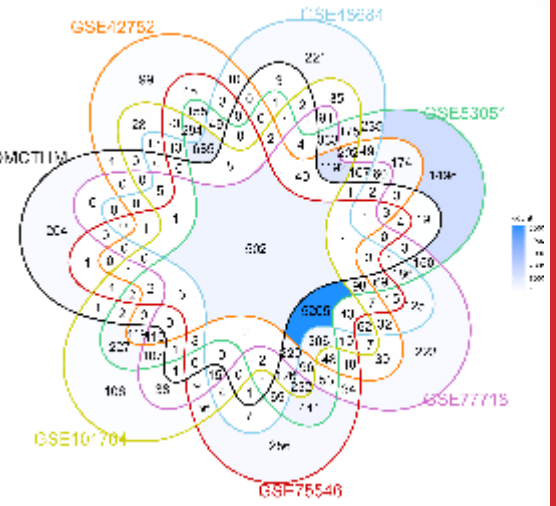
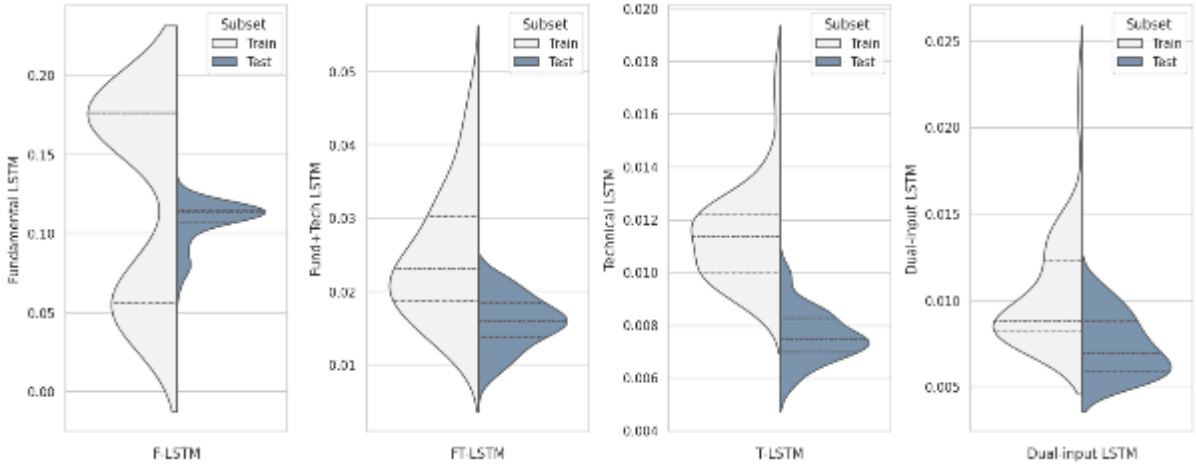
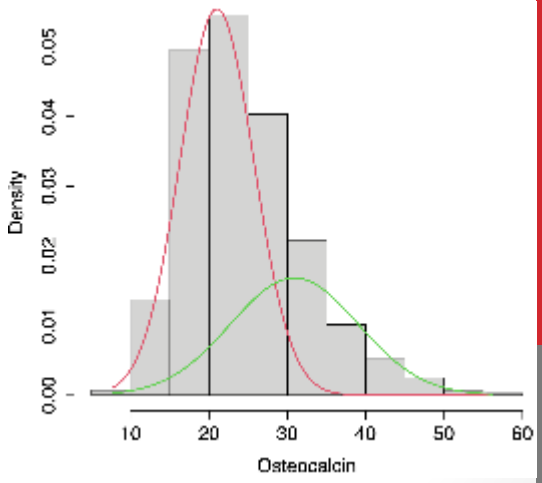
High-dimensional data analysis across a variety of sectors, including finance, healthcare, genomics, market, among others.











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Research Group of Dr. Steffen

- **Dr. Jason H. Steffen**
- Associate Professor
- Department of Physics and Astronomy
- Email: jason.steffen@unlv.edu
- Website: jasonhsteffen.com

Expertise

- Understanding the properties of extrasolar planets and planetary systems
- Planetary dynamics
- Planet interior modeling
- Composition of planet-forming materials

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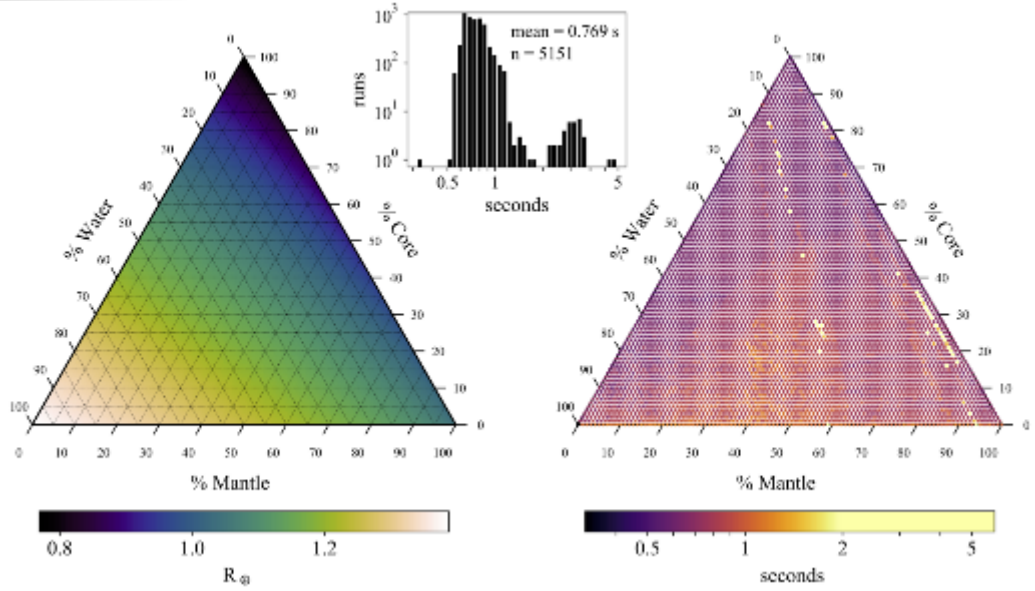
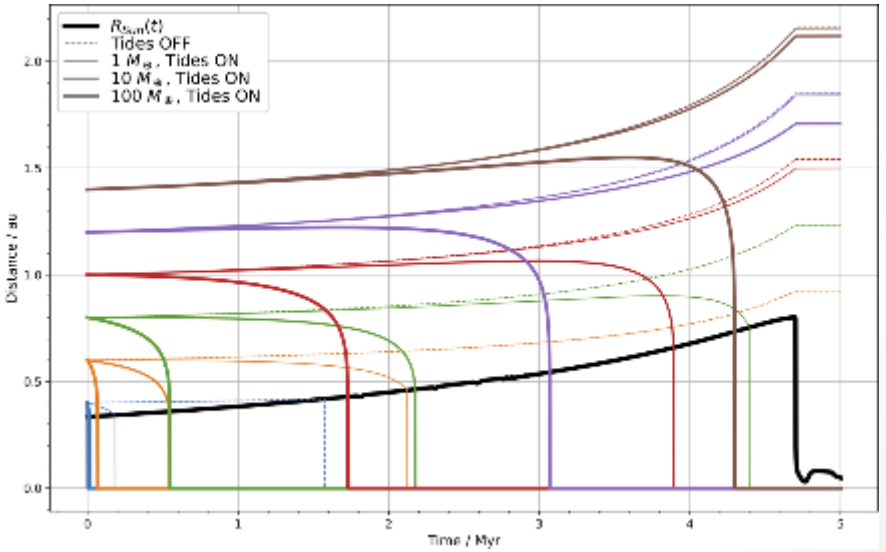


Timing results for planet models using the MAGRATHEA code, developed by our group at UNLV.

Future of planets in a system during the late stages of stellar evolution, including the effects of tides and stellar mass loss.



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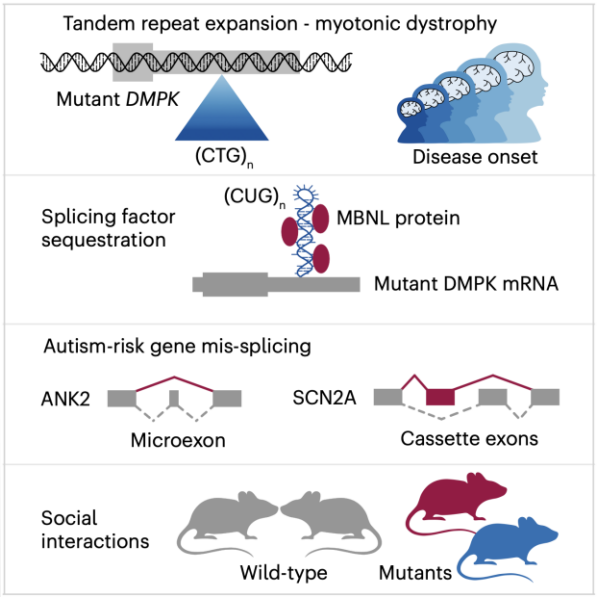
Neurogenetics

- **Dr. Łukasz J Sznajder**
- Assistant Professor
- Department of Chemistry and Biochemistry
- Email: lukasz.sznajder@unlv.edu



Expertise

- Neurodevelopmental and neuromuscular disorders
- Genetics, RNA biology, and bioinformatics
- Disease mechanisms and gene therapy

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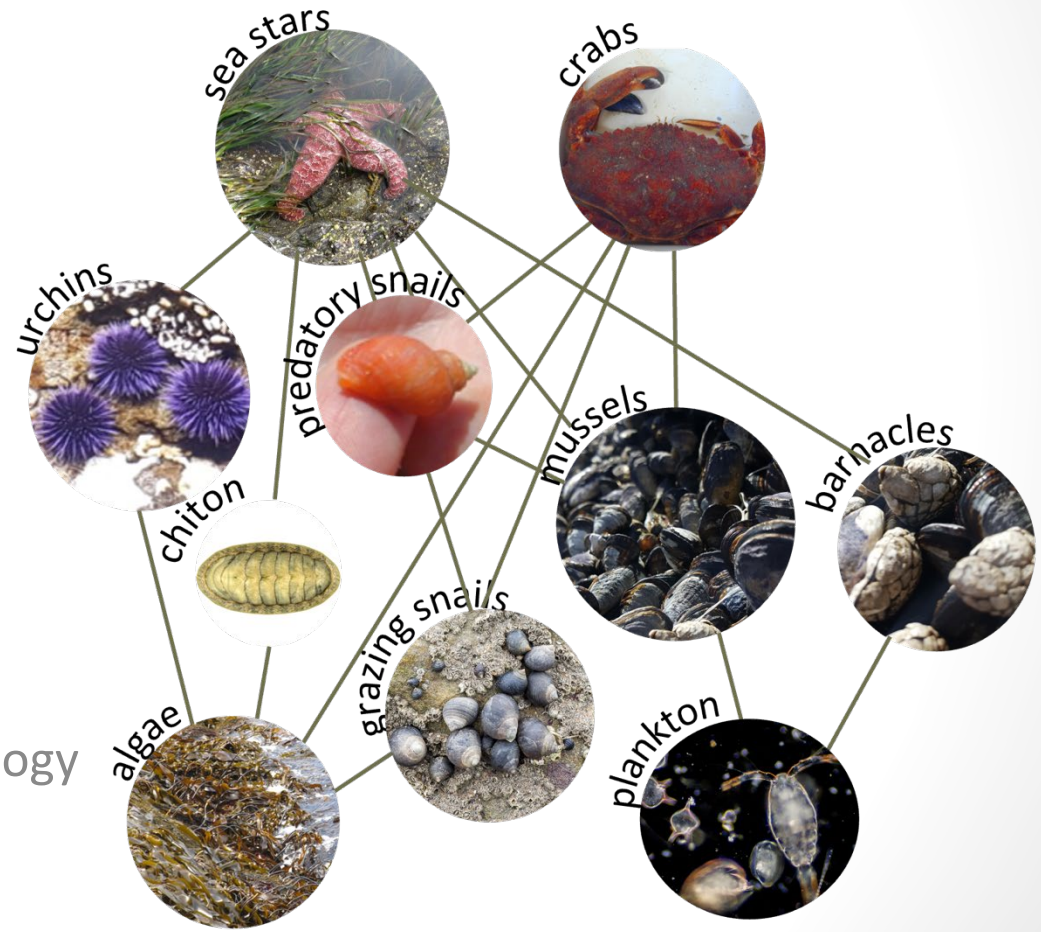
Paleoecology

- **Dr. Carrie L. Tyler, Ph.D.**
- Assistant Professor
- Department of Geoscience
- Email: carrie.tyler@unlv.edu
- Website: www.carrietyler.com

Expertise

- Marine invertebrates
- Taphonomy
- Food webs
- Conservation Paleobiology
- Predation



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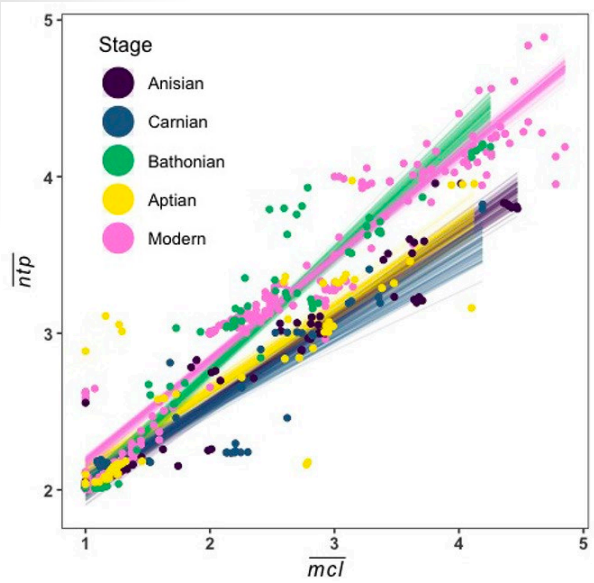


Marine food web structure from the Bathonian Stage (168 mya) resembles a modern Jamaican reef, but not the ecosystem before or after it.

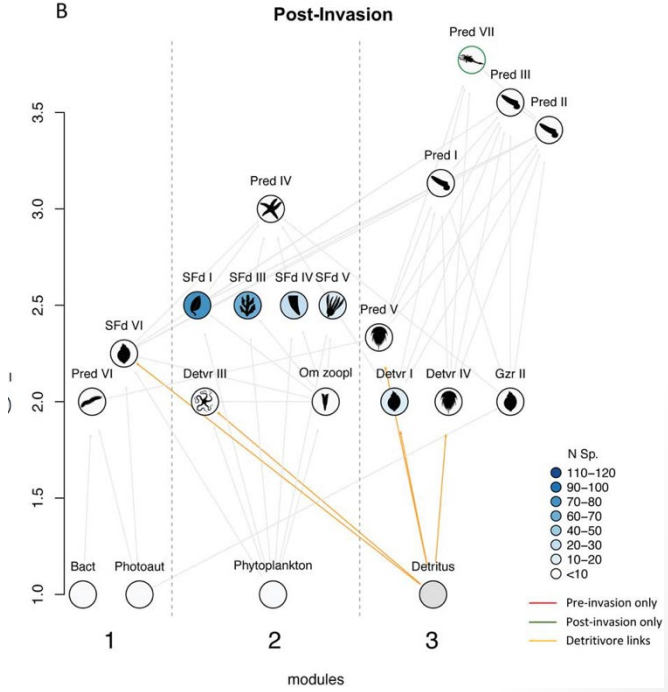
A better understanding of trophic position is needed for restoration planning, as communities may be so severely altered that restoring species or interactions may no longer be possible.

Banker *et al.* 2022 https://doi.org/10.3389/fevo.2022.983374

Fossil food webs before and after an invasion show changes in ecosystem dynamics, and invaders destabilized the ecosystem.

Conservation efforts may need to focus on preserving functional diversity if more diverse ecosystems are not inherently more stable.

Kempf *et al.* 2020
https://doi.org/10.1017/pab.2020.26



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Multi-Messenger High Energy Astrophysics

Dr. Bing Zhang
Department of Physics and Astronomy
Phone: (702)895-4050
Email: zhang@physics.unlv.edu, bing.zhang@unlv.edu

Expertise:

Theoretical astrophysics

Transients (gamma-ray bursts, fast radio bursts, etc) astrophysics

Multi-messenger (EM, gravitational waves, neutrinos, etc) astrophysics

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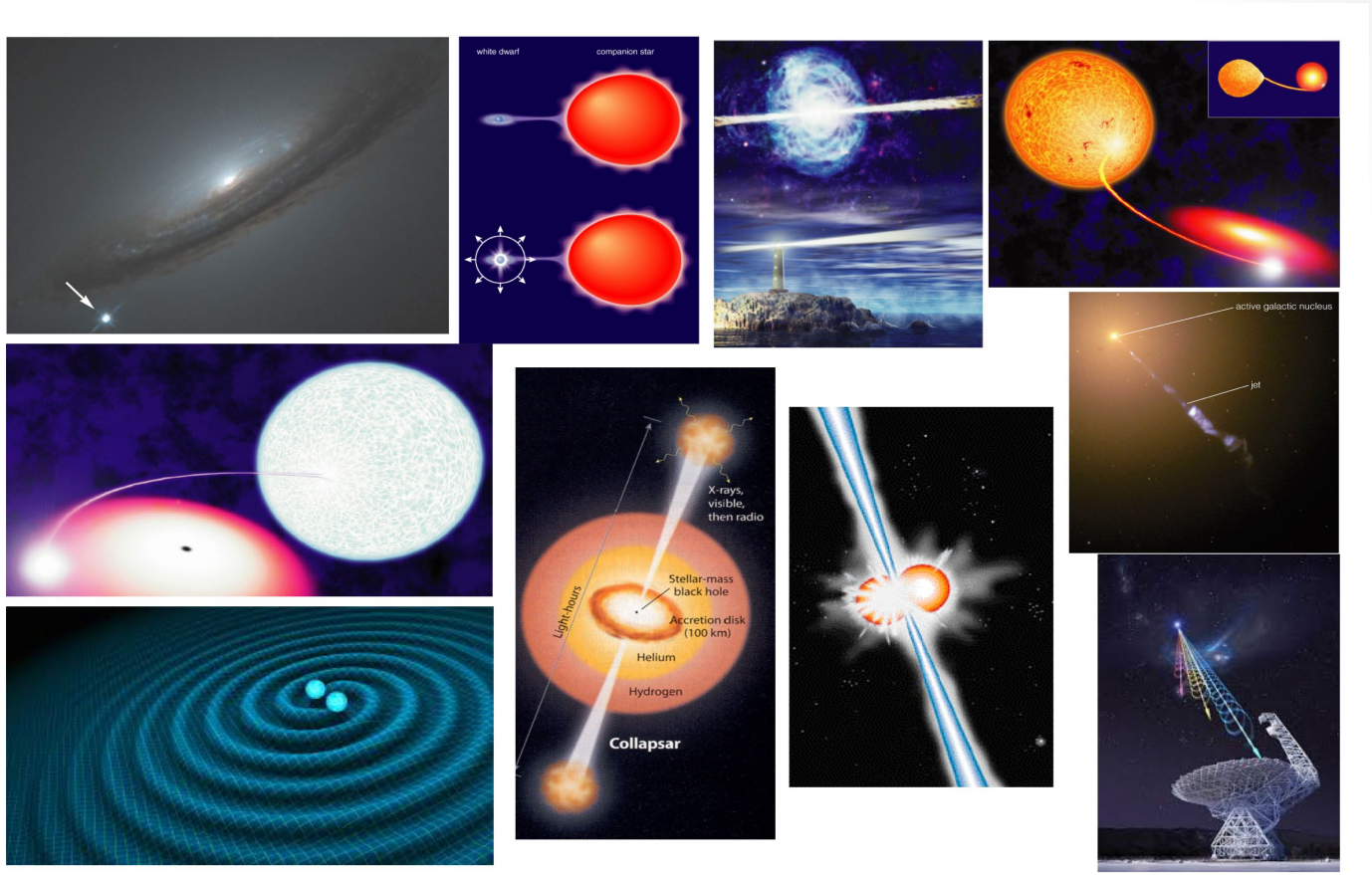
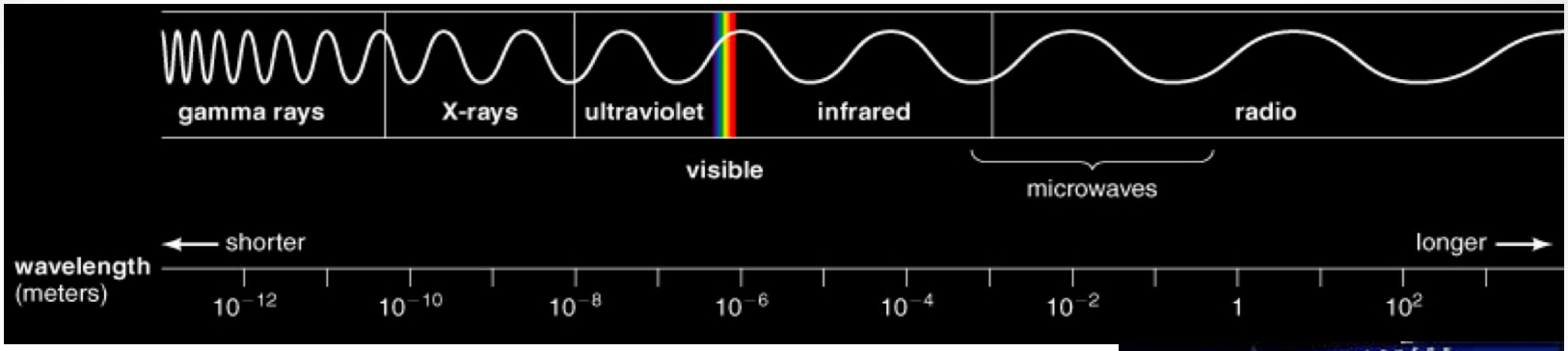
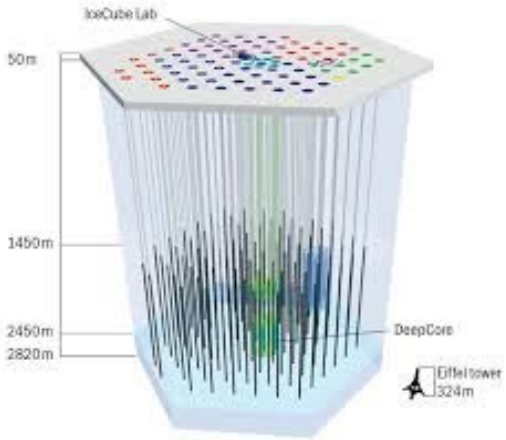


- Dr. Zhang's research covers a broad spectrum in high-energy astrophysics. He studies black holes of different scales, neutron stars of different species, and intense jets they launch. He is most actively working on the following three directions:
  - Gamma-ray bursts (the most luminous explosions in the universe)
  - Electromagnetic counterparts of gravitational waves
  - Fast radio bursts (a mysterious type of radio bursting signal)





- In terms of observational data, Dr. Zhang's theoretical work make use of multi-wavelength and multi-messenger data:
  - Multi-wavelength: across the entire electromagnetic spectrum (from MHz radio waves to TeV gamma-rays)
  - Multi-messenger: Besides the traditional electromagnetic radiation, also include gravitational waves, neutrinos, and cosmic rays.

Astrophysical Fluid Dynamics

Dr. Zhaohuan Zhu

Department of Physics and Astronomy

Phone: (702) 895- 3563

Email: zhaohuan.zhu@unlv.edu

Expertise:

Fluid dynamics for astronomical project

Star and planet formation

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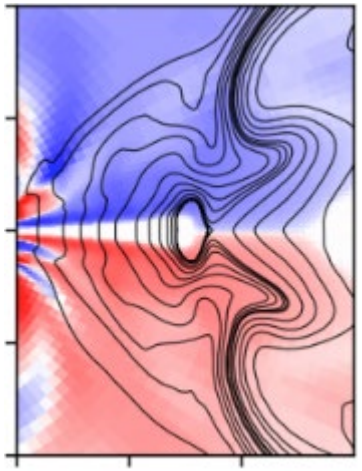
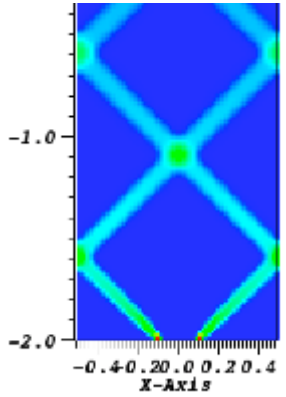
Fluid dynamics:

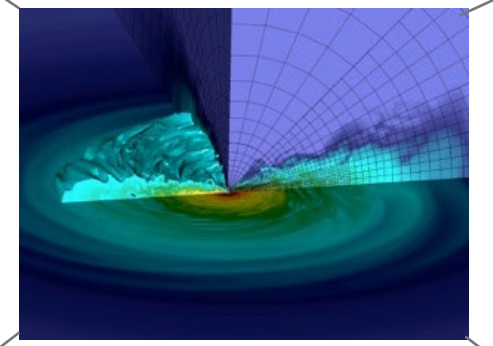
- Developing and using the state of the art numerical code to solve astrophysical fluid problem.

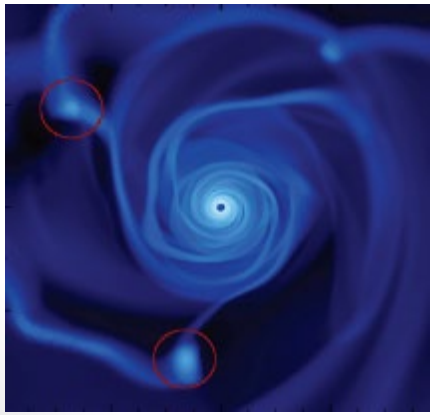


Magnetic field

Radiation

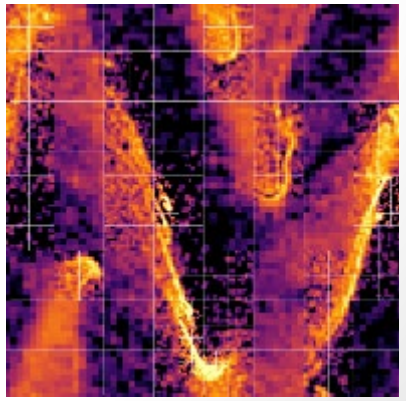






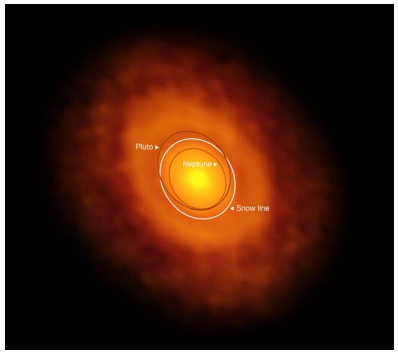
gravity

particles



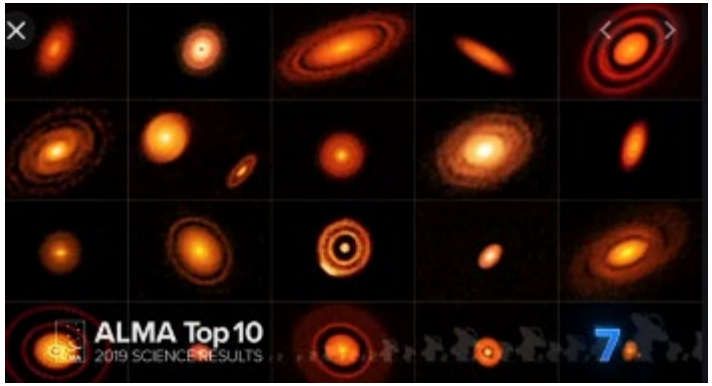
Star and planet formation:

- Protoplanetary disk dynamics:



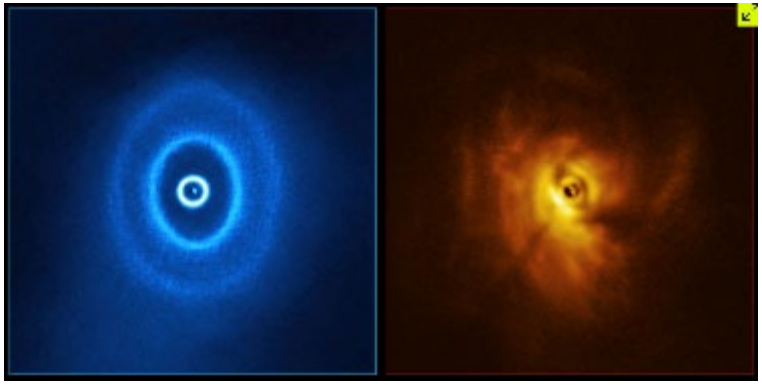
V883 Ori, *Nature*

- Planet formation



DSHARP

- Planet-disk interaction



GW Ori, *Science*