

David R. Rice

Planet Interiors and Dynamics; Computational Techniques; Interdisciplinary Collaborations

CONTACT INFORMATION

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EDUCATION

Ph.D. Astronomy, University of Nevada, Las Vegas **May 2023**
M.S. Astronomy, University of Nevada, Las Vegas **Dec. 2019**
Dissertation Advisor: Prof. Jason H. Steffen
Dissertation Title: *Inferences of a planet's interior structure*
M.S. Thesis Title: *The timing of dynamical interactions between planets*
B.A. Integrated Science with Honors, Physics & Astronomy, and Earth & Planetary Sciences, Northwestern University, Evanston, IL **Jun. 2016**
Senior Thesis Advisor: Prof. Fred Rasio

RESEARCH EXPERIENCE

Star & Planet Formation Group

Nevada Center for Astrophysics, Las Vegas, NV

Characterizing Planet Interiors

Aug. 2017–Present

Developed MAGRATHEA, an open-source interior structure model featuring enhanced flexibility and extensibility. Collaborated with high-pressure physicists and geologists to implement the newest equation of state measurements. Characterized the interiors of the planets in the K2-138 and Trappist-1 systems..

Timescales of Instabilities in Planetary Systems

Aug. 2017–Present

Simulated tens of thousands of planetary systems on Cherry-Creek, UNLV's computer cluster. Determined an inclination criteria for the long-term survival of tightly-packed systems.

Center for Interdisciplinary Exploration & Research in Astrophysics

Northwestern University, Evanston, IL

Survival of Closely Packed Planetary Systems

Jan. 2013–Aug. 2016

Laboratory for Atmospheric and Space Physics NSF REU

Southwest Research Institute, Boulder, CO, advised by Dr. Craig DeForest

Turbulence in the Solar Wind

Jun. 2014–Aug. 2014

AWARDS & CERTIFICATIONS

President's Foundation Graduate Research Fellowship, UNLV **2022**
Graduate Mentorship Certificate, UNLV **2022**
1st Place, GPSA Research Forum Podium Session, UNLV **2021, 2022**
Community Engagement Student Service Honorable Mention, UNLV **2021**
Donna Weistrop & David B. Shaffer Scholarship, UNLV **2018, 2019**

AWARDS & CERTIFICATIONS (CONTINUED)

Nevada Space Grant Graduate Fellowship, NASA	2018
Dean's List, Northwestern University	Fall 2013, Fall 2014, Spring 2016
Illinois Undergraduate Space Grant, NASA	2015

TEACHING EXPERIENCE

Lab Instructor, University of Nevada, Las Vegas	
Phys. 180L, Mechanics Lab	9 Sections, 5 Terms
Phys. 181L, Electromagnetism Lab	2 Sections, 1 Term
Phys. 151L, General Physics I Lab	6 Sections, 3 Terms
Phys. 152L, General Physics II Lab	5 Sections, 4 Terms
SAGA Education Math Teacher, Chicago, IL	Aug. 2016–Jun. 2017
Delivered a daily, individualized, small-group class in algebra and geometry at Phillips Academy High School with 96% low-income students.	

MENTORING

Undergraduate students	
Tristan Benally	Fall 2021–Present
Rosalie Chaleunsouck	Fall 2021–Fall 2022

PROFESSIONAL ACTIVITIES, OUTREACH, AND SERVICE

Workshop/Seminar organizer	
Let's Build a Planet: Improving Interior Models,	Jul. 2022
Rocky Worlds II Conference , 50 break-out session participants	
Journal Club and Astro Coffee, UNLV	Fall 2018–Spring 2019

Journal referee

The Astrophysical Journal, Monthly Notices of the Royal Astronomical Society, and Publications of the Astronomical Society of Japan.

Outreach

Astronomy on Tap, Las Vegas	Jun. 2018–Present
Founder, Lead Organizer, and Emcee	
Led quarterly events with over 50 attendees per event	
Skype a Scientist	
Invited video Q&A, 5th grade project	Feb. 2022
Invited video lecture, 5th grade class: "Are Exoplanets Habitable?"	Feb. 2021
Invited video lecture, high school astronomy club	Feb. 2021
Invited video lecture, 11th grade physics class	Apr. 2020
STEM Nova Award Scouts Day Camp	Jan. 2022
Science Advisor and Station Organizer	
Dallas Center-Grimes High School	Jan. 2022
Invited lecture, AP Physics class	
Camp Hippocampus Employee Astronomy Night	Sep. 2021
Invited lecture: "Our Cosmic Address"	

Outreach (Continued)

- Las Vegas Astronomical Society monthly meeting **Jun. 2020**
 Invited lecture: “Exoplanets”
- The CSN Planetarium Astronomy Q&A livestream **Apr. 2020**
 Invited lecture: “The Pluto Controversy”, [<https://youtu.be/EnzSoXZJtIs>]

Volunteer Service

- Judge for AAS Chambliss Student Achievement Awards **Jan. 2023**
- Judge for Southern NV Regional Science & Engineering Fair **Mar. 2022**
- Volunteer Observer with Project RECON **Oct. 2021**

COMPUTER SKILLS

Expert/Proficient

Programming: Python, C++, shell script, Matplotlib, and LaTeX
 Software: Mercury6 and REBOUND (n-body integrators)
 Supercomputing with Cherry Creek, UNLV and QUEST, Northwestern

Familiarity

MESA (stellar evolution), IDL, Perl, Perl Data Language, HTML, and ArcGIS

PUBLICATIONS

7. Childs, A. C., Yang, C., Shakespeare, C., **Rice, D.R.**, Steffen, J. H., (2023) *Composition constraints of the TRAPPIST-1 planets from their formation*, Submitted to MNRAS.
6. **Rice, D. R.**, Steffen, J. H., (2023) *Stable lifetime of compact, evenly-spaced planetary systems with non-equal masses*, Accepted to MNRAS, [[arXiv:2206.11374](https://arxiv.org/abs/2206.11374)].
5. Huang, C. H., **Rice, D. R.**, Steffen, J. H., (2022) *MAGRATHEA: An open-source spherical symmetric planet interior structure code*, **MNRAS**, **513**, 5256 [[arXiv:2201.03094](https://arxiv.org/abs/2201.03094)].
4. MacDonald, M. G., Feil, L., Quinn T., **Rice, D. R.**, (2022) *Confirming the 3:2 Resonant Chain of K2-138*, **AJ**, **163**, 162 [[arXiv:2201.12687](https://arxiv.org/abs/2201.12687)].
3. Huang, C., **Rice, D. R.**, Grande, Z. M., Smith, D., Smith, J. S., Boisvert, J. H., Tschauer, O., Salamat, A., Steffen, J. H., (2021) *Implications of an improved water equation of state for water-rich planets*, **MNRAS**, **503**, 2825 [[arXiv:2103.01410](https://arxiv.org/abs/2103.01410)].
2. **Rice, D. R.**, Rasio, F. A., Steffen, J. H., (2018) *Survival of non-coplanar, closely packed planetary systems after a close encounter*, **MNRAS**, **481**, 2205 [[arXiv:1807.07668](https://arxiv.org/abs/1807.07668)].
1. DeForest, C. E., Mattheaus, W. H., Howard, T. A., **Rice, D. R.**, (2015) *Turbulence in the solar wind measured with comet tail test particles*, **ApJ**, **812**, 108

INVITED TALKS

4. The Ohio State Univeristy, Exoplanet Talk Series **Oct. 2022**
3. The University of Chicago, Exoplanet Journal Club **Oct. 2022**
2. Northwestern University, Astro Theory Group **Sep. 2022**
1. PennState, The Center for Exoplanets and Habitable Worlds Seminar **Sep. 2022**

CONTRIBUTED TALKS

8. NASA's Exoplanet Modeling and Analysis Center Workshop, Virtual **Feb. 2023**
"Solving and visualizing planet interiors with MAGRATHEA"
7. 241st American Astronomical Society Meeting, Seattle, WA **Jan. 2023**
"Interior models of small planets"
6. Exoplanets IV, Las Vegas, NV **May 2022**
"Investigating systematic uncertainties in terrestrial interior models with MAGRATHEA", [<https://my.aas.org/services/AASTCS9>]
5. Graduate & Professional Student Research Forum, UNLV **Apr. 2022**
"Systematic uncertainties in terrestrial interior models with MAGRATHEA", [<https://youtu.be/6SNhho28NQ0>]
4. Graduate & Professional Student Research Forum, UNLV **Apr. 2021**
"Characterizing the composition of small exoplanets"
3. Habitable Worlds 2 Conference, Online **Feb. 2021**
"MAGRATHEA: Terrestrial planet interior solver and the degeneracy of interiors", [<https://youtu.be/1AXe-EvkPcc>]
2. Chicago Exoplanet Meeting, The University of Chicago, IL **Jun. 2015**
"Dynamical instability in exoplanetary systems"
1. LASP REU, Boulder, CO **Jul. 2014**
"Analysis of comet tails for turbulence in the solar wind",

CONTRIBUTED POSTERS

5. Rocky Worlds II, Oxford, UK **Jul. 2022**
"Investigating systematic uncertainties in terrestrial interior models with MAGRATHEA"
4. Exoplanets III, Online **Jul. 2020**
"MAGRATHEA: Terrestrial planet interior solver and the degeneracy of interiors", [<https://www.physics.unlv.edu/~drice986/Exo3Poster/riceexoposter.html9>]
3. Sagan Exoplanet Summer Workshop, Pasadena, CA **Jul. 2019**
"Differentiated collisions and their effect on terrestrial planet composition"
2. Kepler & K2 Science Convention V, Glendale, CA **Mar. 2019**
"The effect of differentiated collisions on the interiors of terrestrial planets"
1. 227th American Astronomical Society Meeting, Kissimmee, FL **Jan. 2016**
"Understanding dynamical instability in 4-planet systems with equal orbital spacing"

REFERENCES

Jason H. Steffen, Associate Professor of Physics, University of Nevada, Las Vegas

Mariah G. MacDonald, Assistant Professor of Physics, The College of New Jersey

Fred A. Rasio, Professor of Physics, Northwestern University