

# NICHOLAS Z. RUI

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## EDUCATION

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- Ph.D. Physics** (in progress) ..... 2020 —  
California Institute of Technology  
*NSF Graduate Research Fellow*
- B.A. Physics, Astrophysics** ..... 2016 – 2020  
University of California, Berkeley  
*Highest Distinction*

## RESEARCH

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- Red giant asteroseismology** ([site](#)) ..... 2020 —  
Advisor: Jim Fuller ◇ *Caltech Department of Physics (TAPIR)*
- Globular cluster dynamics** ([site](#)) ..... 2019  
Advisor: Fred Rasio ◇ Mentor: Kyle Kremer ◇ *NU Department of Physics and Astronomy (CIERA)*
- Nanoscale sensing with solid-state defects** ([site](#)) ..... 2018 – 2020  
Advisor: Norman Yao ◇ Mentor: Satcher Hsieh ◇ *UCB Department of Physics*
- Young massive clusters in the Galactic Center** ([site](#)) ..... 2016 – 2019  
Advisor: Jessica Lu ◇ Mentor: Matthew Hosek Jr. ◇ *UCB Department of Astronomy*

## MENTORSHIP

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- Stephon Qian (undergraduate) ◇ *Rotational signatures of stellar mergers* ..... Summer 2023

## REFEREED PUBLICATIONS

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[Google Scholar](#) ◇ [Astrophysics Data System](#) ◇ [arXiv](#) ◇  0000-0002-1884-3992

[o] *A close-in giant planet escapes engulfment by its star*

Hon, M.; Huber, D.; [Rui, N. Z.](#); Fuller, J.; Veras, D.; Kusclewicz, J. S.; Kochukhov, O.; Stokholm, A.; Rørsted, J. L.; Yıldız, M.; Orhan, Z. Ç.; Örtel, S.; Jiang, C.; Hey, D. R.; Isaacson, H.; Zhang, J.; Vrad, M.; Stassun, K. G.; Shappee, B. J.; Tayar, J.; Clayton, Z. R.; Beard, C.; Bedding, T. R.; Brinkman, C.; Campante, T. L.; Chaplin, W. J.; Chontos, A.; Giacalone, S.; Holcomb, R.; Howard, A. W.; Lubin, J.; MacDougall, M.; Montet, B. T.; Murphy, J. M. A.; Ong, J.; Pidhorodetska, D.; Polanski, A. S.; Rice, M.; Stello, D.; Tyler, D.; Van Zandt, J.; Weiss, L.  
submitted to Nature

[10] *Gravity waves in strong magnetic fields*

[Rui, N. Z.](#); Fuller, J.  
submitted to MNRAS, [arXiv:2303.08147](#)

[9] *Compact Object Modeling in the Globular Cluster 47 Tucanae*

Ye, C. S.; Kremer, K.; Rodriguez, C. L.; [Rui, N. Z.](#); Weatherford, N. C.; Chatterjee, S.; Fragione, G.; Rasio, F. A.  
*ApJ* 931, 84 (2022). [arXiv:2106.02643](#)

[8] *Modeling Dense Star Clusters in the Milky Way and Beyond with the Cluster Monte Carlo Code*

Rodriguez, C. L.; Weatherford, N. C.; Coughlin, S. C.; Amaro-Seoane, P.; Breivik, K.; Chatterjee, S.; Kiroğlu, F.; Kremer, K.; [Rui, N. Z.](#); Ye, C. S.; Zevin, M.; Rasio, F. A.  
*ApJS* 258, 22 (2022). [arXiv:2106.02643](#)

[7] *Asteroseismic fingerprints of stellar mergers*

[Rui, N. Z.](#); Fuller, J.  
*MNRAS* 508, 2 (2021). [arXiv:2108.10322](#)

[6] *White Dwarf Subsystems in Core-Collapsed Globular Clusters*

Kremer, K.; [Rui, N. Z.](#); Weatherford, N. C.; Chatterjee, S.; Fragione, G.; Rasio, F. A.; Rodriguez, Carl L.; Ye, Claire S. *ApJ* 917, 28 (2021). [arXiv:2104.11751](#)

[5] *Matching Globular Cluster Models to Observations*

[Rui, N. Z.](#); Kremer, K.; Weatherford, N. C.; Chatterjee, S.; Rasio, F. A.; Rodriguez, Carl L.; Ye, Claire S. *ApJ* 912, 102 (2021). [arXiv:2103.05033](#)

[4] *Modeling Dense Star Clusters in the Milky Way and Beyond with the CMC Cluster Catalog*

Kremer, K.; Ye, C. S.; [Rui, N. Z.](#); Weatherford, N. C.; Chatterjee, S.; Fragione, G.; Rodriguez, C. L.; Spera, M.; Rasio, F. A. *ApJS* 274, 48 (2020). [arXiv:1911.00018](#)

[3] *Imaging stress and magnetism at high pressures using a nanoscale quantum sensor*

Hsieh, S.; Bhattacharyya, P.; Zu, C.; Mittiga, T.; Smart, T. J.; Machado, F.; Kobrin, B.; Höhn, T. O.; [Rui, N. Z.](#); Kamrani, M.; Chatterjee, S.; Choi, S.; Zaletel, M.; Struzhkin, V. V.; Moore, J. E.; Levitas, V. I.; Jeanloz, R.; Yao, N. Y. *Science* 366, 6471 (2019). [arXiv:1812.08796](#)

[2] *The Quintuplet Cluster: Extended Structure and Tidal Radius*

[Rui, N. Z.](#); Hosek Jr., M. W.; Lu, J. R.; Clarkson, W. I.; Anderson, J.; Morris, M. R.; Ghez, A. M. *ApJ* 877, 37 (2019). [arXiv:1904.02395](#)

[1] *Imaging the local charge environment of nitrogen-vacancy centers in diamond*

Mittiga, T.; Hsieh, S.; Zu, C.; Kobrin, B.; Machado, F.; Bhattacharyya, P.; [Rui, N. Z.](#); Jarmola, A.; Choi, S.; Budker, D.; Yao, N. Y. *PRL* 121, 24 (2018). [arXiv:1809.01668](#)

## OTHER PUBLICATIONS

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[4] *Young Massive Clusters at the Galactic Center: The Initial Mass Function*

Hosek Jr., M. W.; Lu, J. R.; [Rui, N. Z.](#); Anderson, J.; Najarro, F.; Ghez, A. M.; Morris, M. R.; Clarkson, W. I.; Albers, S. M. *ASPCS* 528 (2021).

[3] *No Black Holes in NGC 6397*

[Rui, N. Z.](#); Weatherford, N. C.; Kremer, K.; Chatterjee, S.; Fragione, G.; Rasio, F. A.; Rodriguez, Carl L.; Ye, Claire S. *RNAAS* 5, 47 (2021). [arXiv:2103.06273](#)

[2] *Prioritizing Well-Being: Berkeley Chapter Focuses on Health, Inclusion, and Community*

[Rui, N.](#); Kim, Y. *The SPS Observer*, LIII, 4 (2020).

[1] *The Stellar Initial Mass Function Across Different Environments*

Hosek Jr., M. W.; Lu, J. R.; Andersen, M.; Do, T.; Kim, D.; [Rui, N. Z.](#); Boyle, P.; Williams, B. F.; Chakrabarti, S.; Beaton, R. L. *Astro2020 White Paper* (2019). [arXiv:1903.05107](#)

## TALKS

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[6] *Asteroseismic Fingerprints of Stellar Mergers*

*University of Amsterdam Massive Stars Group Meeting*. Amsterdam, Netherlands. September 2022. (virtual)

[5] *Asteroseismic Fingerprints of Stellar Mergers*

*Asteroseismology in the Era of Surveys from Space and the Ground: Stars, Planets, and the Milky Way (TASC6/KASC13)*. Leuven, Belgium. July 2022.

[4] *Peeking inside Globular Clusters with Monte Carlo*

*Dynamical Formation of Gravitational Wave Sources*. Aspen, CO. January 2022.

[3] *Asteroseismic Signatures of Stellar Mergers in Red Giants*

*Unsolved Problems in Red Giants and Supergiants*. June 2021. (pre-recorded virtual)

[2] *Many-Body Laboratories*

*Illinois Space Grant Seminar*. Evanston, IL. August 2019.

[1] *Dynamical Structure of the Quintuplet Cluster*

*Department Lunch Talk*. Berkeley, CA. March 2019.

## TEACHING

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### Teaching assistantships

- Caltech Ph 101: *Order-of-Magnitude Physics*, teaching assistant ..... Spring 2023  
instructor: Sterl Phinney
- Caltech Ph 1b Practical: *Electromagnetism*, teaching assistant ..... Winter 2023  
instructor: Gil Refael
- Caltech Ph 2a: *Vibrations and Waves*, teaching assistant ..... Fall 2022  
instructor: Sergi Hildebrandt
- UCB Physics/Astron C202: *Astrophysical Fluid Dynamics*, course reader ..... Spring 2020  
instructor: *Eugene Chiang*
- UCB Physics 110A: *Electromagnetism and Optics*, course reader ..... Fall 2018  
instructor: *Kam-Biu Luk*

### Instruction

- UCB Astron 98: *Beginner's Guide to the Universe* ..... Spring 2020  
with *Shashank Dholakia, Shishir Dholakia, Yonna Kim*; faculty sponsor: *Jessica Lu*
- UCB Astron 98: *Beginner's Guide to the Universe* ..... Fall 2019  
with *Shashank Dholakia, Shishir Dholakia*; faculty sponsor: *Jessica Lu*
- UCB Astron 98/198: *Python for Astronomers* ..... Spring 2019  
with *Orion Lyau, Alexander Ye*; faculty sponsor: *Daniel Weisz*
- UCB Astron 98/198: *Python for Astronomers* ..... Spring 2018  
with *Makena Fetzer, Orion Lyau*; faculty sponsor: *Mariska Kriek*

### Volunteer tutoring

- Caltech Y Rise: in-person drop-in tutoring, John Muir High School Early College Magnet ..... 2022
- Caltech Y: online drop-in tutoring ..... 2020 – 2021

## AWARDS

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- National Science Foundation Graduate Research Fellowship ..... 2020
- Dominic Orr Graduate Fellowship ..... 2020 – 2021
- Department Citation, UCB Department of Astronomy ..... 2020
- Bernard Fries Memorial Award ..... 2019 – 2020
- Illinois Space Grant ..... 2019
- UC Berkeley Dean's List ..... 2016 – 2019
- Isidore Pomerantz Endowment Award ..... 2018 – 2019
- Berkeley Physics Undergraduate Research Scholar ..... 2018
- National Merit Scholarship Finalist ..... 2016

## SERVICE

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Referee for *Nature Astronomy*.

### Committee Appointments

- Undergraduate Student Services Committee, *UCB Department of Astronomy* ..... 2019
- Major Curriculum Committee, *UCB Department of Physics* ..... 2018 – 2020

### Society of Physics Students at Berkeley ([site](#))

- President ..... 2019 – 2020
- Co-vice president (with *Richard Pan*) ..... 2018 – 2019
- Outreach coordinator ..... 2017 – 2018

## OUTREACH

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## **Outreach presentations**

- *Five Paths through Physics*. Rainstorm, virtual, January 2022. (with D. Abramovitch, C. Cummings, E. Hathaway, H. Manetsch)
- *Apples to Orbits*. Rainstorm, virtual, August 2021. (with S. Habib, I. Legred)
- *The Art of Guessing*. Rainstorm, virtual, May 2021. (with E. Hathaway, Y. Kim)
- *Some Scientific Stories*. Physics Unlimited Summer Camp, virtual, August 2020.
- *Star Clusters: Many-Body Laboratories*. Marin Science Seminar (Terra Linda High School), Berkeley, CA, November 2019.
- *Globular Clusters: Many-Body Laboratories*. What's Up! Astronomy Talks @Claremont (Claremont Branch Library), Berkeley, CA, November 2019.
- *50th Anniversary of the Apollo 11 Moon Landing*. CIERA Astronomer Evenings (Dearborn Observatory, Northwestern University), Evanston, IL, July 2019.
- *Mostly Complex*. Splash at Berkeley (UC Berkeley), Berkeley, CA, March 2019.
- *Why Quantum?* Splash at Berkeley (UC Berkeley), Berkeley, CA, November 2018. (with A. Acharya)
- *Spacetime*. Splash at Berkeley (UC Berkeley), Berkeley, CA, November 2018. (with A. Acharya)

## **Physics competition volunteering**

- Science Olympiad Nationals 2022: Crave the Wave B (assistant event supervisor)
- Science Olympiad Southern California States 2022: Crave the Wave B (exam writer and event supervisor)
- [Physics Unlimited Premier Competition 2021](#) (exam writer)