

YIHAN WANG (王艺涵)

Department of Astronomy
University of Wisconsin–Madison
500 Lincoln Dr, Madison, WI 53706

Email: wang3697@wisc.edu
[Personal Homepage](#)
[Google Scholar Profile](#)

PROFESSIONAL APPOINTMENTS

Postdoctoral Research Associate University of Wisconsin–Madison	2025–Present
Fellow, Nevada Center for Astrophysics University of Nevada, Las Vegas	2022–2025

EDUCATION

Ph.D. in Physics Stony Brook University, NY <i>Advisor: Rosalba Perna</i>	2017–2022
M.A. in Physics Stony Brook University, NY	2016–2017
B.S. in Physics (Theoretical Physics) University of Science and Technology of China (USTC)	2011–2015

RESEARCH PROFILE

Theoretical Astrophysics | Cluster Dynamics | Multi-messenger Astrophysics | Computational Astrophysics

My research develops a unified theoretical framework for the coupled evolution of accretion disks and stellar populations in galactic nuclei. I study how dissipative disk processes regulate few-body interactions, compact-object population evolution, and transient production, connecting small-scale gravitational dynamics to observable electromagnetic and gravitational-wave phenomena.

- **AGN disk–cluster coupling:** capture, migration, gas-assisted scattering, and binary formation of stars and compact objects in galactic nuclei.
- **Nuclear transients:** disk-assisted tidal disruption events, changing-look AGN, and quasi-periodic eruptions driven by disk–star interactions.
- **Gravitational-wave sources:** formation and evolution of extreme mass-ratio inspirals and binary black holes in dense nuclear environments.
- **Computational infrastructure:** development of open, high-performance tools for few-body dynamics and relativistic transient modeling.

GRANTS & COMPUTING ALLOCATIONS

ACCESS-SDSC 1.25M CPU hours Project: <i>Propagation of Fast Radio Bursts</i> (PI)	2023–2025
ACCESS-SDSC 0.5M CPU hours Project: <i>Hot Jupiter Formation in Dense Star Clusters</i> (PI)	2022–2024

HONORS & AWARDS

Gerald Brown Prize	2022
Di Tian Prize for Excellent Research	2020
National Endeavor Scholarship	2014
Outstanding Student Scholarship (USTC)	2012, 2013
Exceptional Prize, Physics Experiment Contest (USTC)	2013

PUBLICATIONS

A complete and updated publication list is available on [NASA ADS](#) and [Google Scholar](#).

- [33] Chen, Liang-Jun, ..., **Wang, Y.-H.**, ..., *Signature of a Magnetar Central Engine from the Multiband Afterglow of GRB 151027A Associated with a Supernova*, 2026, [ApJ](#)
- [32] Dai, C.-Y., Quirola-Vásquez, J., **Wang, Y.-H.**, ... *An energetic dirty fireball detected in soft X-rays*, 2025, accepted in Science, [arXiv:2603.26213](#)
- [31] Li, Ye, ..., **Wang, Y.-H.**, ..., *Multiwavelength Observations of the Apparently Nonrepeating FRB 20250316A*, 2025, [ApJ](#)
- [30] **Wang, Y.**, Chen, C., Zhang, B., *VegasAfterglow: A High-Performance Framework for Gamma-Ray Burst Afterglows*, 2025, [JHEAp](#)
- [29] Chen, C., **Wang, Y.**, Zhang, B., *X-ray Emission Signatures of Neutron Star Mergers*, 2025, [ApJ](#)
- [28] Li, W.-X., ..., **Wang, Y.-H.**, ..., *An Extremely Soft and Weak Fast X-ray Transient Associated with a Luminous Supernova*, 2025, submitted, [arXiv:2504.17034](#)
- [27] **Wang, Y.**, Perna, R., Zhu, Z., Lin, D. N. C., *Evolution of Extremely Soft Binaries in Dense Star Clusters: On the Jupiter-Mass Binary Objects*, 2024, submitted to [ApJ](#)
- [26] **Wang, Y.**, Graham, M., Ford, S., McKernan, B., Ryu, T., Stern, D., *Conditions for Changing-Look AGNs from Accretion Disk-Induced Tidal Disruption Events*, 2024, submitted to [ApJL](#), [arXiv:2406.12096](#)
- [25] **Wang, Y.**, Zhang, B., *Evidence of a Past Merger of the Galactic Center Black Hole*, 2024, [Nature Astronomy](#)
- [24] **Wang, Y.**, Perna, R., Zhu, Z., *Floating Binary Planets from Ejections during Close Stellar Encounters*, 2024, [Nature Astronomy](#)
- [23] **Wang, Y.**, Lin, D. N. C., Zhang, B., Zhu, Z., *Changing-Look AGN Behaviour Induced by Disk-Captured Tidal Disruption Events*, 2023, [ApJL](#), [962](#), L7
- [22] Prasad, C., **Wang, Y.**, Perna, R., Ford, S., McKernan, B., *Tidal Disruption Events from Three-Body Scatterings in the Disks of Active Galactic Nuclei*, 2023, submitted to MNRAS, [arXiv:2310.00020](#)
- [21] **Wang, Y.**, Zhang, B., Zhu, Z., *Anisotropic Energy Injection from Magnetar Central Engines in Short GRBs*, 2023, [MNRAS](#), [528](#), 3705
- [20] **Wang, Y.**, Zhu, Z., Lin, D. N. C., *Stellar/BH Populations in AGN Disks: Direct Binary Formation from Captured Objects in Nuclear Clusters*, 2023, [MNRAS](#), [528](#), 4958
- [19] **Wang, Y.**, Ford, S., Perna, R., McKernan, B., Zhu, Z., Zhang, B., *Effective Two-Body Scatterings around a Massive Object*, 2023, [MNRAS](#), [523](#), 2014
- [18] Xin, C., Haiman, Z., Perna, R., **Wang, Y.**, Ryu, T., *Tidal Peeling Events: Low-Eccentricity Tidal Disruption of a Star by a Stellar-Mass Black Hole*, 2023, [ApJ](#), [961](#), 149
- [17] **Wang, Y.-H.**, Lazzati, D., Perna, R., *The Emergence of Diffused Gamma-Ray Burst Afterglows from the Disks of Active Galactic Nuclei*, 2022, [MNRAS](#), [516](#), 5935
- [16] Ryu, T., Perna, R., **Wang, Y.-H.**, *Close Encounters of Stars with Stellar-Mass Black Hole Binaries*, 2022, [MNRAS](#), [516](#), 2204

- [15] Perna, R., Artale, M. C., **Wang, Y.-H.**, et al., *Host Galaxies and Electromagnetic Counterparts to Binary Neutron Star Mergers across Cosmic Time*, 2021, [MNRAS](#), 512, 2654
- [14] **Wang, Y.-H.**, Perna, R., Leigh, N. W. C., Shara, M. M., *Hot Jupiter Formation in Star Clusters: Secular Chaos*, 2021, [MNRAS](#), 509, 5253
- [13] **Wang, Y.-H.**, McKernan, B., Ford, S., Perna, R., Leigh, N. W. C., Mac Low, M.-M., *Symmetry Breaking in Dynamical Encounters in the Disks of Active Galactic Nuclei*, 2021, [ApJL](#), 923, L23
- [12] **Wang, Y.-H.**, Leigh, N. W. C., Liu, B., Perna, R., *SpaceHub: A High-Performance Gravity Integration Toolkit for Few-Body Problems in Astrophysics*, 2021, [MNRAS](#), 505, 1053
- [11] **Wang, Y.-H.**, Perna, R., Armitage, P. J., *Partial Tidal Disruption Events by Stellar-Mass Black Holes: Gravitational Instability of the Stream and Impact from the Remnant Core*, 2021, [MNRAS](#), 503, 6005
- [10] **Wang, Y.-H.**, Leigh, N. W. C., Perna, R., Shara, M. M., *Hot Jupiter and Ultra-Cold Saturn Formation in Dense Star Clusters*, 2020, [ApJ](#), 905, 136
- [9] **Wang, Y.-H.**, Perna, R., Leigh, N. W. C., *Planetary Architectures in Interacting Stellar Environments*, 2020, [MNRAS](#), 496, 1453
- [8] **Wang, Y.-H.**, Perna, R., Leigh, N. W. C., *Giant Planet Swaps during Close Stellar Encounters*, 2020, [ApJL](#), 891, L14
- [7] **Wang, Y.-H.**, Leigh, N. W. C., Sesana, A., Perna, R., *The Cosmological Distribution of Compact Object Mergers from Dynamical Interactions with SMBH Binaries*, 2019, [MNRAS](#), 490, 2627
- [6] Liu, B., Lai, D., **Wang, Y.-H.**, *Binary Mergers near a Supermassive Black Hole: Relativistic Effects in Triples*, 2019, [ApJL](#), 883, L7
- [5] Liu, B., Lai, D., **Wang, Y.-H.**, *Black Hole and Neutron Star Binary Mergers in Triple Systems. II. Merger Eccentricity and Spin-Orbit Misalignment*, 2019, [ApJ](#), 881, 41
- [4] Perna, R., **Wang, Y.-H.**, Farr, W. M., Leigh, N., Cantiello, M., *Constraining the Black Hole Initial Mass Function with LIGO/Virgo Observations*, 2019, [ApJL](#), 878, L1
- [3] **Wang, Y.-H.**, Leigh, N., Sesana, A., Perna, R., *Hypervelocity Binaries from Close Encounters with a SMBH–IMBH Binary: Orbital Properties and Diagnostics*, 2019, [MNRAS](#), 482, 3206
- [2] **Wang, Y.-H.**, Leigh, N., Yuan, Y.-F., Perna, R., *The Fate of Close Encounters between Binary Stars and Binary Supermassive Black Holes*, 2018, [MNRAS](#), 475, 4595
- [1] Liu, B., **Wang, Y.-H.**, Yuan, Y.-F., *Modified Evolution of Stellar Binaries from Supermassive Black Hole Binaries*, 2017, [MNRAS](#), 466, 3376

SELECTED TALKS

Invited Talks & Seminars

- Astronomy Seminar, TDLI Apr. 2026
- 4th Seminar on Accretion-modified Stars in Accretion Disks of Active Galactic Nuclei, USTC Apr. 2026
- Graduate Seminar, HKIAA, The University of Hong Kong Mar. 2026
- Graduate Seminar, University of Wisconsin–Madison Oct. 2025
- Transient Phenomena and Physical Processes Around Supermassive Black Holes Oct. 2024
- Astronomy Seminar, Institute for Advanced Study, Tsinghua University Sep. 2024
- Astronomy Seminar, Institute of High Energy Physics, Chinese Academy of Sciences Sep. 2024
- Astronomy Seminar, Fudan University Aug. 2024
- Astronomy Seminar, University of Science and Technology of China Aug. 2024

- Astronomy Seminar, Huazhong University of Science and Technology Aug. 2024
- Graduate Seminar, Zhejiang University Aug. 2024
- Graduate Seminar, Nanjing University Jun. 2023
- AGN Santa Fe Conference, Los Alamos National Laboratory Mar. 2023
- Graduate Seminar, Stony Brook University Feb. 2023
- Astro-coffee, IAS, Princeton University Feb. 2023
- Bahcall Lunch Talk, IAS, Princeton University Feb. 2023
- Graduate Seminar, Georgia Institute of Technology Sep. 2022
- Astrophysics Seminar, University of the Balearic Islands Oct. 2021
- Astronomy Seminar, Universidad de Concepción Sep. 2021
- Astronomy Group Meeting, Cornell University Jun. 2018

Contributed Talks

- 50 Years of Binaries and Disks: Lubow@75 Apr. 2024
- Anticipating the Rising Tide of Tidal Disruption Events, KITP Apr. 2024
- 53rd Annual DDA Meeting, CCA, Flatiron Institute Apr. 2022
- Planet Formation Group Meeting, CCA, Flatiron Institute Oct. 2021
- Astronomy Seminar, Stony Brook University Aug. 2021
- Compact Object Group Meeting, CCA, Flatiron Institute Mar. 2021
- Astronomy Seminar, American Museum of Natural History Aug. 2018

SOFTWARE & RESEARCH PRODUCTS

VegasAfterglow

[\[GitHub\]](#)

Primary Developer | High-speed modeling engine for gamma-ray burst (GRB) afterglows.

- Optimized C++ engine capable of generating light curves in milliseconds, enabling real-time data fitting and large-scale population studies.
- Supports diverse jet structures and emission mechanisms (synchrotron & inverse Compton) to model complex, realistic burst environments.
- Features a Python interface designed for seamless integration with standard fitting tools such as MCMC, allowing researchers to analyze observational data efficiently.
- *Publication:* Wang et al. (2025), JHEAp [Paper 30].

SpaceHub

[\[GitHub\]](#)

Primary Developer | High-precision few-body gravity integration toolkit.

- Implemented algorithmic regularization (AR) and symplectic integrators to handle extreme mass ratios and eccentricities (e.g., SMBHs and chaotic star clusters).
- Designed an easy-to-use API that facilitates community adoption for diverse dynamical problems.
- *Publication:* Wang et al. (2021), MNRAS [Paper 12].

Secular

[\[GitHub\]](#)

Primary Developer | Fast solver for hierarchical secular dynamics.

- Solves orbit-averaged equations of motion for hierarchical triples and quadruples.
- Highly optimized for studying long-term Lidov–Kozai oscillations and stability limits.

Code Extensions & Modifications

- **Phantom (SPH):** Implemented a custom radiative equation of state (EoS) and modified accretion-capture logic to simulate tidal disruption events (TDEs).
- **Athena++ (MHD):** Configured relativistic MHD setups for simulating short-GRB jets and their interaction with the ambient medium.

TECHNICAL SKILLS

Languages: C/C++, Fortran, Python, \LaTeX , HTML, Markdown
HPC: MPI, OpenMP, Slurm Workload Manager
Astrophysical Codes: Phantom, Athena++, Rebound, SpaceHub

MENTORING

Graduate Students

Nick Marston, University of Wisconsin–Madison	2025–Present
Connery Chen, University of Nevada, Las Vegas	2023–Present
Chaitanya Prasad, Stony Brook University	2022–2023
Michael Ray, Stony Brook University	2021–2022

Undergraduate Students

Antonio Frigo, Stony Brook University	2021
Robert Serrano, Stony Brook University	2019–2020

PROFESSIONAL SERVICE & OUTREACH

Collaboration Memberships

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| • Member, <i>Einstein Probe (EP)</i> Collaboration | 2024–Present |
| • Member, <i>SVOM</i> (Space-based multi-band astronomical Variable Objects Monitor) | 2024–Present |
| • Member, <i>LHAASO</i> (Large High Altitude Air Shower Observatory) | 2026–Present |

Referee Service: *ApJ*, *ApJL*, *MNRAS*, *A&A*, *JHEAp*.

Leadership:

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| • Coordinator, NCfA Multi-messenger Meeting | 2022–2025 |
| • Mentor, Stony Brook Graduate Mentoring Program | 2017–2019 |

Outreach:

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| • UNLV Community Engagement Expo | 2023 |
| • Astronomy on Tap (Las Vegas): “100 Years of Variable Stars” | 2023 |

TEACHING EXPERIENCE

Teaching Assistant, AST-203: <i>Astronomy</i>	Spring 2019
Teaching Assistant, AST-248: <i>Search for Life in the Universe</i>	Fall 2018
Teaching Assistant, PHY-134: <i>Classical Physics Lab II</i>	Spring 2018
Teaching Assistant, AST-205: <i>Introduction to Planetary Sciences</i>	Fall 2017
Teaching Assistant, <i>Electromagnetism</i>	Fall 2014

SELECTED PRESS COVERAGE

Evidence of a Past Merger of the Galactic Center Black Hole

- | | |
|---|-----------|
| • <i>CBC</i> : “A cosmic collision 9 billion years ago...” | Sep. 2024 |
| • <i>Phys.org</i> : “Massive merger: Study reveals evidence...” | Sep. 2024 |

Floating Binary Planets from Ejections during Close Stellar Encounters

- *Quanta Magazine*: “Rogue Worlds Throw Planetary Ideas Out of Orbit” Nov. 2023
- *Physics World*: “Pairs of rogue planets found wandering...” Oct. 2023

A Planet Could Have Been Stolen from the Solar System as It Formed

- *New Scientist* Feb. 2020

REFERENCES

Rosalba Perna

Stony Brook University

Email: rosalba.perna@stonybrook.edu

Douglas N. C. Lin

University of California, Santa Cruz

Email: lin@ucolick.org

Nicholas Stone

University of Wisconsin–Madison

Email: nstone2@wisc.edu

Ye-Fei Yuan

University of Science and Technology of China

Email: yfyuan@ustc.edu.cn

Bing Zhang

University of Nevada, Las Vegas

Email: bing.zhang@unlv.edu

Zhaohuan Zhu

University of Nevada, Las Vegas

Email: zhaohuan.zhu@unlv.edu

Dong Lai

Cornell University

Email: dong@astro.cornell.edu