Konstantin **Gerbig**

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Research Interests

Planet formation theory; physics of protoplanetary disks; ML & AI applications in astrophysics; exoplanetary demographics and architectures; computational astrophysics; orbital dynamics; accretion disks; magneto-hydrodynamics: instabilities and turbulence; meteorology and atmospheric physics

Research Positions

University of Chicago, Department of Astronomy & Astrophysics — *Chicago, IL, USA*
Eric and Wendy Schmidt AI in Sciences Postdoctoral Fellow — *2025 - present*

Yale University, Department of Astronomy — *New Haven, CT, USA*
Graduate Research Assistant — *Sept 2020 - 2025*

Max Planck Institute for Astronomy — *Heidelberg, BW, Germany*
Research Assistant — *2019 - 2020*

University of California, Santa Cruz, Department for Astronomy & Astrophysics — *Santa Cruz, CA, USA*
Junior Scientist — *2018 - 2019*

Max Planck Institute for Astronomy — *Heidelberg, BW, Germany*
Student Researcher — *2016 - 2018*

Education

Yale University, Department of Astronomy — *New Haven, CT, USA*
PhD in Astronomy, Adviser: Gregory P. Laughlin (Yale) — *2020 - 2025*

Master of Science in Astronomy, Master of Philosophy in Astronomy — *2023*

Ruprecht-Karls Universität Heidelberg — *Heidelberg, BW, Germany*
Master of Science, Physics, Advisers: Hubert Klahr (MPIA) & Ruth Murray-Clay (UCSC) — *2017 - 2019*

Ruprecht-Karls Universität Heidelberg — *Heidelberg, BW, Germany*
Bachelor of Science, Physics, Adviser: Hubert Klahr (MPIA) — *2013 - 2017*

Publications

154 citations on ADS (109 lead-author) as of type-setting this CV; h-index = 5

Lead-Author

6. **Gerbig, K.**, Rice, M., Zanazzi, J.J., Christian, S., & Vanderburg, A. 2024, *Aligning Planet-Hosting Binaries via Dissipative Precession in Circumstellar Disks*, The Astrophysical Journal, 972, 161
5. **Gerbig, K.**, Lin, M., & Lehmann, M., 2024, *Filament Formation due to Diffusive Instabilities in Dusty Protoplanetary disks*, The Astrophysical Journal ,961, 183
4. **Gerbig, K.**, & Li, R., 2023, *Planetesimal Initial Mass Functions following Diffusion regulated Gravitational Collapse*, The Astrophysical Journal, 949, 81
3. **Gerbig, K.**, & Laughlin, G., 2022, *The Prospects for Hurricane-like Vortices in Protoplanetary Disks*, The Astrophysical Journal, 930, 68
2. **Gerbig, K.**, Murray-Clay, R. A., Klahr, H. & Baehr, H., 2020, *Requirements for Gravitational Collapse in Planetesimal Formation — The Impact of Scales set by Kelvin-Helmholtz and Nonlinear Streaming Instability*, The Astrophysical Journal, 895, 91
1. **Gerbig, K.**, Lenz, C. T., & Klahr, H., 2019, *Linking Planetesimal and Dust Content in Protoplanetary Disks via a Local Toy Model*, Astronomy & Astrophysics, 629, A116

Contributed

5. Cui, C., **Gerbig, K.**, Li, Y., Xu, Z., Li, R. Yu, C., Lin, M., & Yuan, F., 2025 *Dust Growth in ALMA Rings. II. Dusty Rossby Wave Instability*, The Astrophysical Journal, 986,86

4. Hand, J., **Gerbig, K.**, & Rice, M., 2025 *The Case for Edge-On Binaries: An Avenue Toward Comparative Exoplanet Demographics*, The Astrophysical Journal Letters, 985, 1

3. Rice, M., **Gerbig, K.**, & Vanderburg, A., 2024, *The Orbital Geometries and Stellar Obliquities of Exoplanet-hosting Multistar Systems*, The Astronomical Journal ,167, 126

2. Rice, M., Wang, S., **Gerbig, K.**, Wang, X., Dai, F., Tyler, D., Isaacson H., & Howard A., 2023, *The Orbital Architecture of Qatar-6: A Fully Aligned 3-Body System?*, The Astronomical Journal, 165, 65

1. Klahr, H., Delbo, M., & **Gerbig, K.**, 2022, *Constraining the Formation of MBAs: Timing of Formation and Initial Size-Frequency Distribution*, Simone Marchi. Vesta and Ceres: Insights into the Dawn of the Solar System, Chapter 13, p. 199

In Advanced Preparation

2. **Gerbig, K.**, & Murray-Clay, R., *Non-Axisymmetric Gravitational Instabilities in Plantesimal Formation*, in prep.

1. **Gerbig, K.**, & Lin, M., *The Role of Dust-Gas Feedback for Diffusive Instabilities in Protoplanetary Disks*, in prep.

Non-Refereed

2. Levine, W.G., **Gerbig, K.**, Louden, E., Lu, T., Hsieh, C., O'Connor, C., Li, R., & Dong, J., 2024, *Emerging Researchers in Exoplanetary Science (ERES): Lessons Learned in Conference Organization for Early-Career Researchers*, Bulletin of the AAS 56(1)

1. Asali, Y, **Gerbig, K.**, Ghosh, A., Lindsay, C., Shen, Z., & Geha, M., 2022, *A Standardized Framework for Collecting Graduate Student Input in Faculty Searches*, Bulletin of the AAS 54(1), (equal first-authorship)

Oral Presentations and Talks

*Virtual (via Zoom), † Upcoming as of type-setting this CV

Invited Talks

Other Worlds Laboratories 2024 — *Santa Cruz, CA, USA*
Talk: *Dust Concentration through Diffusive Instabilities in Protoplanetary Disks* — *Jul 2024*

Academia Sinica, Institute for Astronomy and Astrophysics — Colloquium — *Taipei, Taiwan*
Talk: *Formation of dusty filaments & orbital alignment in binary systems* — *Feb 2024*

MIT — Monday Afternoon Talk — *Cambridge, MA, USA*
Talk: *Modern planetesimal formation: From Diffusive Instabilities to Gravitational Collapse* — *Dec 2023*

AMNH — Astro Seminar — *New York City, NY, USA*
Talk: *Planetesimal Formation Instigated by Novel Diffusive Instabilities* — *Dec 2023*

*** Princeton — Exoplanet Seminar** — *Princeton, NJ, USA*
Talk: *Novel Insights into Planetesimal Formation through Diffusive Instabilities* — *Dec 2023*

Institute for Advanced Study — Coffee Talk — *Princeton, NJ, USA*
Talk: *Diffusive Instabilities as Analogies to Underwater Sand Ripples in Dusty Protoplanetary Disks* — *Dec 2023*

University of California, Santa Cruz — Planetary Lunch Seminar — *Santa Cruz, CA, USA*
Talk: *New Insights into Planetesimal Formation through Diffusive Instabilities* — *Nov 2023*

CalTech Seminar — *Pasadena, CA, USA*
Talk: *Diffusive Instabilities and Filament Formation* — *Nov 2023*

UCLA — Astronomy Lunch Seminar — *Los Angeles, CA, USA*
Talk: *New Insights into Planetesimal Formation through Diffusive Instabilities* — *Nov 2023*

University of California, Berkeley — TAC Seminar — *Berkeley, CA, USA*
Talk: *New Perspectives on Planetesimal Formation: Diffusive Instabilities in Protoplanetary Disks* — *Oct 2023*

Harvard CfA — ITC Luncheon Talk — *Cambridge, MA, USA*
Talk: *Underwater Sand Ripples but in Dusty Protoplanetary Disks* — *Oct 2023*

University of Chicago — Astrophysics Seminar — *Chicago, IL, USA*
Talk: *Planetesimal Formation via New Diffusive Instabilities* — *Sep 2023*

Indiana University — Astrophysics Tea Talk *Bloomington, IN, USA*
Talk: *New Perspectives on Planetesimal Formation through Diffusive Instabilities* *Sep 2023*

Cornell — Astrophysics Lunch *Ithaca, NY, USA*
Talk: *Planetesimal Formation Instigated by Diffusive Instabilities* *Sep 2023*

Academia Sinica, Institute for Astronomy and Astrophysics — Seminar *Taipei, Taiwan*
Talk: *Planetesimal IMF following Diffusion Regulated Gravitational Collapse* *Apr 2023*

***University of Michigan — Stars, Planets, and Formation Journal Club** *Ann Arbor, MI, USA*
Talk: *The Planetesimal Initial Mass Function* *Mar 2023*

***University of Arizona — Star & Planet Formation Group Meeting** *Tucson, AZ, USA*
Talk: *Planetesimal IMF following Diffusion Regulated Gravitational Collapse* *Feb 2023*

***CalTech — Yuk Lunch Seminar** *Pasadena, CA, USA*
Talk: *Can Hurricane-like Vortices Exist in Protoplanetary Disks?* *Nov 2022*

Universitäts-Sternwarte München — Planet Formation Group Meeting *Munich, Germany*
Talk: *Hurricane-like Vortices in Protoplanetary Disks* *Aug 2022*

Other Worlds Laboratories 2022 *Santa Cruz, CA, USA*
Talk: *Hurricane-like Vortices in Protoplanetary Disks* *July 2022*

***Planetesimal Formation Workshop** *virtual*
Talk: *The Importance of Streaming Instability driven Particle Diffusion for Planetesimal Formation* *Nov 2020*

***Building Blocks of Planets Workshop** *virtual*
Talk: *How Streaming and Kelvin-Helmholtz Instabilities can Regulate Planetesimal Formation* *Apr 2020*

Pebbles, Planetesimals and Protoplanets Workshop *Ringberg, Germany*
Talk: *Requirements for Gravitational Collapse in Planetesimal Formation* *Mar 2020*

University of California, Santa Cruz — Friday Lunch Time Astrophysics Seminar *Santa Cruz, CA, USA*
Talk: *Requirements for Gravitational Collapse in Planetesimal Formation* *Jan 2020*

Contributed Talks and Posters

Boston Area Planetary Science Meeting May 2025 *Cambridge, MA, USA*
Talk: *Diffusive Instabilities and their Role Planetesimal Formation* *May 2025*

2nd New York Area Exoplanet Meeting *New York City, NY, USA*
Talk: *Diffusive Instabilities: Nonlinear Saturation and its Connection to Streaming Instability and Planetesimal Formation* *May 2025*

***Pebbles in Planet Formation 2025** *Tokyo, Japan*
Talk: *Planetesimal Formation Instigated by Diffusive Instabilities* *Jan 2025*

245th American Astronomical Society Meeting *National Harbor, MD, USA*
Dissertation Talk: *Planetesimal Formation Instigated by Diffusive Instabilities* *Jan 2025*

46th Bay Area Exoplanet Meeting *Santa Cruz, CA, USA*
Talk: *Diffusive Instabilities as Underwater Sand Ripple Analogies* *Jul 2024*

2024 Northeast Star and Planet Formation Meeting, MIT Haystack Observatory *Westford, MA, USA*
Talk: *Diffusive Instabilities in Protoplanetary Disks* *Jul 2024*

1st New York Area Exoplanet Meeting *New York City, NY, USA*
Talk: *Aligning Planet-hosting binaries via Dissipative Precession in Circumstellar Disks* *Jun 2024*

Extreme Solar Systems V *Christchurch, New Zealand*
Poster: *Rethinking Dust Concentration in Protoplanetary Disks with Underwater Sand Ripples* *Mar 2024*

2023 Northeast Star and Planet Formation Meeting, Center for Astrophysics *Cambridge, MA, USA*
Talk: *The Planetsimal Initial Mass Function from Diffusion-Limited Gravitational Collapse* *Jun 2023*

54th Meeting of the Division on Dynamical Astronomy *East Lansing, MI, USA*
Talk: *Precession-Driven Dissipation in Exoplanet-Hosting Binary Star Systems* *May 2023*

Athena++ workshop, CCA *New York City, NY, USA*
Talk: *Hurricane-like Vortices in Protoplanetary Disks* *May 2023*

Protostars and Planets VII — *Kyoto, Japan*
Poster: *Predicting Planetesimal Initial Mass Functions following Diffusion Regulated Gravitational Collapse* — *Apr 2023*

240th American Astronomical Society Meeting — *Pasadena, CA, USA*
Talk: *Hurricane-like Vortices in Protoplanetary Disks* — *June 2022*

Exoplanets IV — *Las Vegas, NV, USA*
Poster: *The Prospects for Hurricane-like Vortices in Protoplanetary Disks* — *May 2022*

***Exoplanets III** — *virtual*
Poster: *Requirements for Gravitational Collapse in Planetesimal Formation* — *Jul 2020*

235th American Astronomical Society Meeting — *Honolulu, HI, USA*
Poster: *Planetesimal Formation Regulated by Scales of Streaming and Kelvin-Helmholtz Instability* — *Jan 2020*

Extreme Solar Systems IV — *Reykjavik, Iceland*
Poster: *How Scales of Streaming and Kelvin-Helmholtz Instabilities Regulate Particle Over-Densities and Planetesimal Formation* — *Aug 2019*

29th Bay Area Exoplanet Meeting — *Santa Cruz, CA, USA*
Talk: *How Scales of Streaming and Vertical Shear Instabilities Regulate Particle Over-Densities in Protoplanetary Disks* — *Jun 2019*

Teaching

Lecturer

Dynamics — *Reutlingen, BW, Germany*
Assistant Lecturer at Reutlingen University — *Spring 2020*

Material Sciences — *Reutlingen, BW, Germany*
Assistant Lecturer at Reutlingen University — *Spring 2020*

Strength of Materials — *Reutlingen, BW, Germany*
Assistant Lecturer at Reutlingen University — *Spring 2020*

Teaching Assistant

ASTR 375/575: Exoplanets — *New Haven, CT, USA*
Teaching Fellow at Yale University — *Spring 2025*

ASTR 160: Frontiers & Controversies in Astrophysics — *New Haven, CT, USA*
Teaching Fellow at Yale University — *Fall 2022*

ASTR 105: The Earth in its Cosmic Context — *New Haven, CT, USA*
Teaching Fellow at Yale University — *Spring 2021*

ASTR 110: Planets & Stars — *New Haven, CT, USA*
Teaching Fellow at Yale University — *Fall 2021*

ASTR 160: Frontiers & Controversies in Astrophysics — *New Haven, CT, USA*
Teaching Fellow at Yale University — *Spring 2021*

AY9: Introduction to Research in Astronomy & Astrophysics — *Santa Cruz, CA, USA*
Teaching Assistant at University of California, Santa Cruz — *Spring 2019*

Physics for Non-Physicists — *Heidelberg, BW, Germany*
Teaching Assistant at Heidelberg University — *Spring 2018*

Physics Lab — *Heidelberg, BW, Germany*
Lab Tutor at Heidelberg University — *Fall 2017*

Introductory Mathematics — *Heidelberg, BW, Germany*
Teaching Assistant at Heidelberg University — *Spring 2016*

Media Coverage

Astronomers take a second look at twin star systems
Yale News — *May 2025*

A new beginning: The search for more temperate Tatooines
Yale News — *Jan 2024*

A Grad Student Seat at the Faculty Hiring Table
Astrobites — *Jan 2023*

What Hurricanes and Space Storms have in Common
Yale News, Q&A — *Oct 2022*

Humans of Yale OISS
Humans of Yale OISS, Instagram of Yale Office of International Students and Scholars — *Sep 2022*

The Calm Before the –Planet Formation?
AAS Nova — *Jun 2022*

The Calm Before the –Planet Formation?
Astrobites — *Apr 2022*

Advising and Mentoring Experience

* Primary research adviser

Scientific

Joseph Hand, Kansas University (undergraduate)
Project: *Edge-On Binaries as an Avenue Toward Comparative Exoplanet Demographics* — *July 2024 - May 2025*

Yurou (Nina) Liu, Yale University (undergraduate)
Project: *The Dynamical History of the two Hot Jupiters in the WASP-94 Binary System* — *July 2023 - May 2025*

***Jeremiah Reynoso,** Morehouse College, SURF student (undergraduate)
Project: *Dissipation due to Inelastic Plantesimal Collisions in Differentially Precessing Debris Disks* — *June 2023 - June 2024*

***Aaron Householder,** Yale University (undergraduate)
Project: *Precessing Debris Disks with Binary Companion* — *Sep 2022 - May 2023*

Yajie Liang, Heidelberg University / MPIA (bachelor's student)
Project: *Gravitationally Unstable Disks in GIZMO* — *Jan 2020 - Aug 2020*

Marco Vetter, Heidelberg University / MPIA (bachelor's student)
Project: *Streaming Instability in Pressure Bumps* — *Aug 2019 - May 2020*

Professional

Yale Astronomy Siblings
'Big Sib' in Yale's graduate - undergraduate Astronomy mentoring program. — *2020 - 2025*
Mentees: Andy Nilipour (Yale class of 2025), Hanna Adamski (Yale class of 2024), & Audrey Cesene (Yale class of 2024)

Telescope Proposals

Keck Observatory (HIRES), 2 nights – CO-I
Probing the Exoplanet Mass Discrepancy Between the Radial Velocity and Transit Timing Methods with the Anomalously Low Density Planet Sample and Keck-HIRES (Phase 2) — *Yale 2023A*

Keck Observatory (HIRES), 2 nights – CO-I
Probing the Exoplanet Mass Discrepancy Between the Radial Velocity and Transit Timing Methods with the Anomalously Low Density Planet Sample and Keck-HIRES (Phase 1) — *Yale 2022B*

Service

Professional

Yale Astronomy Time Allocation Committee (TAC)

Ranked proposals for observing time allocated by Yale (for the Palomar and Keck 1 & 2 Observatories) *2024*

Canadian Time Allocation Committee (CanTAC)

Review of proposals for Gemini Observatory *2024*

Yale Astronomy Colloquium Committee

Coordination and speaker solicitation for the weekly colloquium at Yale Astronomy *2024 - 2025*

Reviewer

The Astrophysical Journal, The Astrophysical Journal Letters *2023 - present*

Seminar Organizer

Yale Exoplanet & Stars Seminar *2022 - 2025*

- Co-Organizer and Coordinator of Yale's weekly Exoplanet and Stars seminar
- 3-time recipient of Yale Dean's Fund for Colloquia and Symposia (2023 - 2024, $3000 total)

Lead Conference Organizer — ERES 2023

Emerging Researchers in Exoplanet Science conference hosted at Yale University in June 2023 *Nov 2022 - Nov 2023*

- Chair of Science Organizing Committee: Developed and oversaw double blind review of abstracts minimizing bias in the selection process, coordinated the distribution of abstracts to reviewers, compiled scientific program schedule, organized 100+ poster and oral presentations, lead communicator with science presenters
- Ethics Committee: Authored conference code of conduct. Contact person for reporting breaches of the code of conduct.
- Communication & PR committee: Authored conference FAQ, management of the conference Slack workspace, successful advertisement of the conference to 160 initial registrants.
- ERES 2023 was awarded a Heising-Simons Grant for $140,000, that covered participants lodging and travel expenses.

Co-author

Yale Astronomy Newsletter 2022 *Dec 2022*

- Article on Dorrit Hoffleit and the Dorrit Hoffleit fellowship at Yale
- Profile piece on Prof. Debra Fisher

Yale Graduate Student Assembly

Elected representative for Astronomy at Yale's Graduate Student Assembly *2022 - 2023*

- Academic and professional development committee
- Biweekly general assembly meetings

Astrobites Collaboration

Service within the Astrobites Collaboration *2022 - 2024*

- Scheduling committee co-chair
- Climate change committee

Astronomy Student Council

Elected member of Yale's Astronomy Student Council *2021 - 2023*

- Coordination of all graduate meetings
- Development of a procedure to solicit graduate feedback in faculty searches, and coordination of its implementation during two faculty hire processes at Yale Astronomy, see the corresponding publication in the Bulletin of the American Astronomical Society: *A Standardized Framework for Collecting Graduate Student Input in Faculty Searches*, Bulletin of the AAS 2022, 54(1)

Astronomy Climate and Diversity Committee

Member of Yale's Astronomy Climate and Diversity Committee *2020 - 2021*

Community Engagement

Yale Salsa Society Leadership

Co-leadership position in Yale's Salsa Society *2023 - 2025*

- Bachata and salsa dance instructor
- Organization of events, and advertisment

Outreach

Volunteer at Yale Openlabs

Local outreach organization dedicated to educating middle school children on STEM topics: *Mar 2023*

Talk: Planets in our Solar System and Beyond

Seton Elm-Ivy Award Recipient. Presentation: *Planets in our Solar System and Beyond*

Speaker for Astronomy on Tap, New Haven

Outreach program aimed at engaging local community with current astronomy research *Nov 2022*

Talk: *Mysteries of Planet Formation*

Astrobites Author and Editor

The Astrobites collaboration is a graduate student outreach organization with the goal of increasing accessibility to undergraduate students in the physical sciences *2022 - 2024*

I authored the following Astrobites articles:

- Sednoids: Echoes of a Rogue Planet in the Early Solar System?
- The First Directly Imaged Binary System with Substellar Siblings
- The Kozai-Lidov Tango: The Ups and Downs of being a Polar Circumbinary Disk
- Using tides to peek into asteroid interiors
- Diffusion and depletion of carbon monoxide in disks
- Understanding the surprising narrowness of eccentric debris belts
- Young, cool, and on edge — an unstable protoplanetary disk
- Strategies for Forming Research Talk Questions
- (Mis)alignment Between Exoplanets and Binary Stars
- Don’t (Forget To) Look Up

References

Greg Laughlin

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Email: greg.laughlin@yale.edu

Ruth Murray-Clay

Professor, Dept. of Astronomy, University of California, Santa Cruz
Address: Department of Astronomy & Astrophysics, University of California, Santa Cruz, 1156 High Street, Santa Cruz, CA 95064, USA
Email: rmc@ucsc.edu

Malena Rice

Assistant Professor, Dept. of Astronomy, Yale University
Address: Department of Astronomy, Yale University, PO Box 208101, New Haven, CT 06520-8101, USA
Email: malena.rice@yale.edu

Min-Kai Lin (林明楷)

Associate Research Fellow (Tenured), Academia Sinica, Institute for Astronomy and Astrophysics
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Hubert Klahr

Professor, Max-Planck Insititute for Astronomy, Heidelberg University
Address: Max-Planck Insitut für Astronomie, Königstuhl 17, 69117 Heidelberg, Germany
Email: klahr@mpia.de