

Konstantin Gerbig

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Research Interests

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

Education

Yale University, Department of Astronomy

New Haven, CT, USA

PhD in Astronomy, Adviser: Gregory P. Laughlin (Yale)

2020 - present

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

Research Positions

Yale University, Department of Astronomy

New Haven, CT, USA

Graduate Research Assistant

Sept 2020 - present

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

Publications

109 citations on ADS (85 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

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

4. **Gerbig, K.**, & Murray-Clay, R., *Non-Axisymmetric Gravitational Instabilities in Planesimal Formation*, in prep.
3. **Gerbig, K.**, & Lin, M., *The Role of Dust-Gas Feedback for Diffusive Instabilities in Protoplanetary Disks*, in prep.
2. Cui, C., **Gerbig, K.**, Li, Y. & Lin, M., *Rossby Wave Instability in Dusty Protoplanetary Disks*, in prep.
1. Hand, J., **Gerbig, K.**, & Rice, M., *The Case for Edge-On Binaries: An Avenue Toward Comparative Exoplanet Demographics*, in prep.

NON-REFEREED

2. Levine, W.G., **Gerbig, K.**, Loudén, 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 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: <i>Planetesimal IMF following Diffusion Regulated Gravitational Collapse</i>	Apr 2023
*University of Michigan — Stars, Planets, and Formation Journal Club	Ann Arbor, MI, USA
Talk: <i>The Planetesimal Initial Mass Function</i>	Mar 2023
*University of Arizona — Star & Planet Formation Group Meeting	Tucson, AZ, USA
Talk: <i>Planetesimal IMF following Diffusion Regulated Gravitational Collapse</i>	Feb 2023
*CalTech — Yuk Lunch Seminar	Pasadena, CA, USA
Talk: <i>Can Hurricane-like Vortices Exist in Protoplanetary Disks?</i>	Nov 2022
Universitäts-Sternwarte München — Planet Formation Group Meeting	Munich, Germany
Talk: <i>Hurricane-like Vortices in Protoplanetary Disks</i>	Aug 2022
Other Worlds Laboratories 2022	Santa Cruz, CA, USA
Talk: <i>Hurricane-like Vortices in Protoplanetary Disks</i>	July 2022
*Planetesimal Formation Workshop	virtual
Talk: <i>The Importance of Streaming Instability driven Particle Diffusion for Planetesimal Formation</i>	Nov 2020
*Building Blocks of Planets Workshop	virtual
Talk: <i>How Streaming and Kelvin-Helmholtz Instabilities can Regulate Planetesimal Formation</i>	Apr 2020
Pebbles, Planetesimals and Protoplanets Workshop	Ringberg, Germany
Talk: <i>Requirements for Gravitational Collapse in Planetesimal Formation</i>	Mar 2020
University of California, Santa Cruz — Friday Lunch Time Astrophysics Seminar	Santa Cruz, CA, USA
Talk: <i>Requirements for Gravitational Collapse in Planetesimal Formation</i>	Jan 2020
CONTRIBUTED TALKS AND POSTERS	
46th Bay Area Exoplanet Meeting	Santa Cruz, CA, USA
Talk: <i>Diffusive Instabilities as Underwater Sand Ripple Analogies</i>	Jul 2019
2024 Northeast Star and Planet Formation Meeting, MIT Haystack Observatory	Westford, MA, USA
Talk: <i>Diffusive Instabilities in Protoplanetary Disks</i>	Jul 2024
1st New York Area Exoplanet Meeting	New York City, NY, USA
Talk: <i>Aligning Planet-hosting binaries via Dissipative Precession in Circumstellar Disks</i>	Jun 2024
Extreme Solar Systems V	Christchurch, New Zealand
Poster: <i>Rethinking Dust Concentration in Protoplanetary Disks with Underwater Sand Ripples</i>	Mar 2024
2023 Northeast Star and Planet Formation Meeting, Center for Astrophysics	Cambridge, MA, USA
Talk: <i>The Planetesimal Initial Mass Function from Diffusion-Limited Gravitational Collapse</i>	Jun 2023
54th Meeting of the Division on Dynamical Astronomy	East Lansing, MI, USA
Talk: <i>Precession-Driven Dissipation in Exoplanet-Hosting Binary Star Systems</i>	May 2023
Athena++ workshop, CCA	New York City, NY, USA
Talk: <i>Hurricane-like Vortices in Protoplanetary Disks</i>	May 2023
Protostars and Planets VII	Kyoto, Japan
Poster: <i>Predicting Planetesimal Initial Mass Functions following Diffusion Regulated Gravitational Collapse</i>	Apr 2023
240th American Astronomical Society Meeting	Pasadena, CA, USA
Talk: <i>Hurricane-like Vortices in Protoplanetary Disks</i>	June 2022
Exoplanets IV	Las Vegas, NV, USA
Poster: <i>The Prospects for Hurricane-like Vortices in Protoplanetary Disks</i>	May 2022
*Exoplanets III	virtual
Poster: <i>Requirements for Gravitational Collapse in Planetesimal Formation</i>	Jul 2020
235th American Astronomical Society Meeting	Honolulu, HI, USA
Poster: <i>Planetesimal Formation Regulated by Scales of Streaming and Kelvin-Helmholtz Instability</i>	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 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

A new beginning: The search for more temperate Tatooines

Yale News

Jan 2024

A Grad Student Seat at the Faculty Hiring Table

Astrobits

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?

Astrobits

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 - present

Yurou (Nina) Liu, Yale University (undergraduate)

Project: *The Dynamical History of the two Hot Jupiters in the WASP-94 Binary System*

July 2023 - present

* **Jeremiah Reynoso**, Morehouse College, SURF student (undergraduate)

Project: *Dissipation due to Inelastic Planesimal 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 - present

Mentees:

- 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 Anomalous 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 Anomalous 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 - present

Reviewer

The Astrophysical Journal, The Astrophysical Journal Letters

2023 - present

Seminar Organizer

Yale Exoplanet & Stars Seminar

2022 - present

Co-Organizer and Coordinator of Yale's weekly Exoplanet and Stars seminar

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.

Co-author

Yale Astronomy Newsletter 2022

Dec 2022

- Article on Dorrit Hoffleit and the Dorrit Hoffleit fellowship at Yale
- Profile piece on 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

- Involved in efforts to make the Yale Astronomy graduate program fairer, more equitable and more accessible
- 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 - present

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

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 - present

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

Professor, Dept. of Astronomy, Yale University

Address: Department of Astronomy, Yale University, PO Box 208101, New Haven, CT 06520-8101, USA

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

Address: Academia Sinica, Institute for Astronomy and Astrophysics, No.1, Sec. 4, Roosevelt Rd, Taipei 10617, Taiwan, R.O.C.

Email: mklin@asiaa.sinica.edu.tw

Hubert Klahr

Professor, Max-Planck Insitute for Astronomy, Heidelberg University

Address: Max-Planck Insitut für Astronomie, Königstuhl 17, 69117 Heidelberg, Germany

Email: klahr@mpia.de