

Luke G. Bouma

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RESEARCH INTERESTS

- The formation, evolution, and long-term fates of planetary systems.
- Evolution of young stars and their host clusters.
- Discovery and characterization of exoplanets using ground and space-based observatories.

PROFESSIONAL APPOINTMENTS

California Institute of Technology Pasadena, CA
51 Pegasi b Fellow in Planetary Astronomy. Supervisor: L. Hillenbrand *09/2021–present*

EDUCATION

Princeton University Princeton, NJ
Ph.D, Astrophysics. Thesis: “Origins and Fates of Close-In Giant Planets” *09/2018–08/2021*
M.A, Astrophysics. Supervisor: J. Winn *09/2016–08/2018*

Massachusetts Institute of Technology Cambridge, MA
Physics Ph.D. program (transferred after completing first year). Supervisor: J. Winn *09/2015–08/2016*

University of Southern California Los Angeles, CA
B.Sc, Physics; B.A, Mathematics; Minor, Astronomy *09/2011–05/2015*

PUBLICATION SUMMARY

Refereed & submitted publications: 54 (9 first author; 1 second author; 19 through the TESS collaboration).

Non-refereed publications: 1 (white paper).

Total citations to publications: 5,098 (285 first & second author; 873 many author; 3940 code).

A full listing of my publications is available below, and [online](#).

DISTINCTIONS

2021–24 Heising-Simons 51 Pegasi b Fellowship *Prize postdoctoral fellowship in planetary astronomy.*

2020–21 Charlotte Elizabeth Procter Fellowship *Honorary fellowship for final-year Ph.D. students.*

05/2015 USC Discovery Scholar *University fellowship based on research portfolio towards graduate study.*

05/2014 Caltech Summer Undergraduate Research Fellowship (Pasadena, CA)

04/2014 Goldwater Scholarship *National fellowship for undergraduates pursuing careers in STEM.*

05/2013 NIST Summer Undergraduate Research Fellowship (Boulder, CO)

2011–15 USC Trustee and University Scholarships *Full tuition award and merit stipend.*

AWARDS (The † symbol denotes active awards)

† 12/2021 PI: NASA TESS Cycle 4 GI Program G04032.
Difference Imaging of Stars in Clusters.

† 08/2021 PI: Heising-Simons 51 Pegasi b Fellowship in Planetary Astronomy.
Discovery, Description, and Demographics of Young Transiting Exoplanets.

06/2020 Co-I: NASA TESS Cycle 3 GI Program G03064 (PI: J. Hartman).
Cluster Difference Imaging Photometric Survey.

07/2019 Co-I: NASA TESS Cycle 2 GI Program G022117 (PI: J. Hartman).
Cluster Difference Imaging Photometric Survey.

07/2018 Co-I: NASA TESS Cycle 1 GI Program G011103 (PI: J. Hartman).
Difference Imaging of Star Clusters at Low Galactic Latitude.

ADVISING

Post-baccalaureate Students

Andrew Boyle (Caltech): May 2022-present, primarily advised by LB, co-advised by Lynne Hillenbrand. Andy's project is on the open cluster α Per (≈ 90 Myr): what is its shape, and can we use it as a benchmark for stellar spin-down? Using TESS and Gaia, Andy has found that the α Per cluster may be one portion of a much larger complex of associated stars that are all the same age, and that it may indeed be useful for gyrochronology.

Undergraduate Students

Elsa Palumbo (Caltech): January 2022-present, primarily advised by LB, co-advised by Lynne Hillenbrand. Elsa's focus is on measuring ages for the youngest Kepler planets using stellar rotation rates and lithium. Elsa has devised an approach that has yielded 84 Kepler objects of interest in 66 unique systems that are younger than 700 Myr – a three-fold expansion of the current cumulative sample from Kepler, K2, and TESS.

High School Students

Thaddaeus Kiker and **Veronica Diaz** (Sunny Hills High School, Fullerton, CA): January 2022-present, advised by LB. Veronica and Thaddaeus have focused on finding transiting planets around the nearest pre-main-sequence stars using TESS. So far, they have found a dozen eclipsing binaries, with secondary components that are Jovian-sized. They have also found a rare B-star with a unique, and poorly understood, light curve.

SERVICE & PUBLIC ENGAGEMENT

- *Los Angeles Prison Education Project*: Jan 2022 – present. Designed and taught classes focused on STEM careers (Spring 2022), astronomy (Summer 2022), and a combination of astronomy and planetary science (Fall 2022). Courses attended by 10-20 students per term; evaluations have been highly favorable.
- *Skype a Scientist*: Oct 2020 – Spring 2022. Gave 15 remote public talks in K-12 classrooms.
- *Resident Graduate Student*: Sept 2018 – May 2021. Resident advisor to 30 undergraduate students per year. Encouraged a civilized and supportive residential environment; hosted star-gazing nights, office hours, and social events; post-COVID, focused on academic support and 1-on-1 advising.
- *Observing Outreach Organizer*: Sept 2016 – Sept 2019. Organized over 20 public observing events at Princeton's department telescope. Led outreach team to host groups ranging from 10 to 100 people; also hosted private groups (e.g., middle and high-school classes; student clubs; university staff).
- *Princeton LGBT Center Discussion Group Co-Organizer*: Sept 2018 – May 2019. Hosted a discussion group for students to speak about identity, orientation, relationships, and community.

CLASSROOM EXPERIENCE

Lead Instructor, Introduction to Astronomy and Planetary Science <i>8-week overview of astronomy and planetary science, through LA Prison Education Project</i>	Kulani Correctional (Remote) 09/2022 – 11/2022
Lead Instructor, Introduction to Astronomy <i>Introduction to undergraduate-level astronomy, through LA Prison Education Project</i>	HMP Addiewell (Remote) 05/2022 – 07/2022
Lead Instructor, Introduction to STEM <i>Overview of STEM fields for 12th grade students, through LA Prison Education Project</i>	Indio Juvenile Hall (Remote) 02/2022 – 04/2022

PROFESSIONAL ACTIVITIES

Chair, [Emerging Researchers in Exoplanet Science \(ERES\) 2021](#).

Member, American Astronomical Society (AAS). (2018-present)

Member, Division for Planetary Sciences of the AAS. (2020-present)

Active referee for AJ, ApJL, Nature Astronomy, A&A, MNRAS, PASP.

Reviewer for NASA and NOIRLab panels (2020-present).

Member, TESS Follow-up Observing Program (TFOP; 2018-present).

Organizer, TESS Extended Mission Working Group (2015-2018).

PUBLICATION LIST [[LINK TO ADS LIBRARY](#)]

First & second author

11. Bouma, L., Kerr, R., et al. *Kepler and the Behemoth: Three Mini-Neptunes in a 40 Million Year Old Association*. AJ, accepted. arXiv:2205.01112.
10. Bouma, L., Curtis, J., et al. *A 38 Million Year Old Neptune-Sized Planet in the Kepler Field*. AJ, 163, 121 (2022).
9. Bouma, L., Curtis, J., et al. *Rotation and Lithium Confirmation of a 500 Parsec Halo for the Open Cluster NGC 2516*. AJ, 162, 197 (2021).
8. Bouma, L., Hartman, J., et al. *Cluster Difference Imaging Photometric Survey. II. TOI 837: A Young Validated Planet in IC 2602*. AJ, 160, 239 (2020).
7. Bouma, L., Winn, J., et al. *PTFO 8-8695: Two Stars, Two Signals, No Planet*. AJ, 160, 86 (2020).
6. Bouma, L., Winn, J., et al. *WASP-4 is Accelerating Toward the Earth*. ApJL, 893, 2 (2020).
5. Bouma, L., Hartman, J., et al. *Cluster Difference Imaging Photometric Survey. I. Light Curves of Stars in Open Clusters from TESS Sectors 6 & 7*. ApJS, 245, 13 (2019).
4. Bouma, L., Winn, J., et al. *WASP-4b Arrived Early for the TESS Mission*. AJ, 157, 217 (2019).
3. Bouma, L., Masuda, K., Winn, J. *Biases in Planet Occurrence Caused by Unresolved Binaries in Transit Surveys*. AJ, 155, 244 (2018).
2. Penev, K., Bouma, L., et al. *Empirical Tidal Dissipation in Exoplanet Hosts From Tidal Spin-Up*. AJ, 155, 165 (2018).
1. Bouma, L., Winn, J., et al. *Planet-Detection Simulations for Several Possible TESS Extended Missions*. arXiv:1705.08891 (2017). Non-refereed white paper.

Many author

The ^c symbol denotes papers in which my authorship results from my contributions to mission planning and internal data analysis in the TESS collaboration. In all instances, I provided substantive feedback on the manuscripts. For the other papers, I contributed key methods, data, code, and/or co-authored significant portions of the text.

40. Stassun, K. et al., incl. Bouma, L. *A Low-Mass Pre-Main-Sequence Eclipsing Binary in Lower Centaurus Crux Discovered with TESS*. AAS journals, submitted.
39. Heitzmann, A. et al., incl. Bouma, L. *TOI-4562 b: A highly eccentric temperate Jupiter analog orbiting a young field star*. AAS journals, submitted. arXiv:2208.10854

38. ^cEl Mufti, M. et al., incl. Bouma, L. *TOI-560: Two Transiting Planets Orbiting a K Dwarf Validated with iSHELL, PFS and HIRES RVs*. AAS journals, submitted. arXiv: 2112.13448.
37. Kounkel, M. et al., incl. Bouma, L. *Untangling the Galaxy. IV. Empirical Constraints on Angular Momentum Evolution and Gyrochronology for Young Stars in the Field*. AJ, accepted. arXiv: 2206.13545
36. ^cCadieux, C. et al., incl. Bouma, L. *TOI-1452 b: SPIRou and TESS reveal a temperate super-Earth around a nearby M4 dwarf*. AJ, 164, 96 (2022).
35. ^cHord, B. et al., incl. Bouma, L. *The Discovery of a Planetary Companion Interior to Hot Jupiter WASP-132b*. AJ, 164, 13 (2022).
34. Palumbo, E. et al., incl. Bouma, L. *Evidence for Centrifugal Breakout around the Young M Dwarf TIC 234284556*. ApJ, 925, 75 (2022).
33. Zhou, G. et al., incl. Bouma, L. *A Mini-Neptune from TESS and CHEOPS Around the 120 Myr Old AB Dor member HIP 94235*. AJ, 163, 289 (2022).
32. Günther, M. et al., incl. Bouma, L. *Complex Modulation of Rapidly Rotating Young M Dwarfs: Adding Pieces to the Puzzle*. AJ, 163, 144 (2022).
31. ^cWittenmyer, R. et al., incl. Bouma, L. *TOI-1842b: A Transiting Warm Saturn Undergoing Reinflation around an Evolving Subgiant*, AJ, 163, 82 (2022).
30. Heitzmann, A. et al., incl. Bouma, L. *The obliquity of HIP 67522 b: a 17 Myr old transiting hot Jupiter-sized planet*. ApJL, 922, 1 (2021).
29. ^cCabot, S. H. C. et al., incl. Bouma, L. *TOI-1518b: A Misaligned Ultra-hot Jupiter with Iron in Its Atmosphere*. AJ, 162, 218 (2021).
28. Fausnaugh, M. et al., incl. Bouma, L. *The TESS Mission Target Selection Procedure*. PASP. 133, 1027 (2021).
27. Grieves, N. et al., incl. Bouma, L. *Populating the brown dwarf and stellar boundary: Five stars with transiting companions near the hydrogen-burning mass limit*. A&A, 652, 127 (2021)
26. Wirth, C. et al., incl. Bouma, L. *TOI-942b: A Prograde Neptune in a ~60 Myr old Multi-transiting System* . ApJL, 917, 34 (2021).
25. ^cAddison, B. C. et al., incl. Bouma, L. *TOI-1431b/MASCARA-5b: A Highly Irradiated Ultra-Hot Jupiter Orbiting One of the Hottest & Brightest Known Exoplanet Host Stars*. AJ, 162, 292 (2021).
24. ^cHedges, C. et al., incl. Bouma, L. *TOI-2076 and TOI-1807: Two Young, Comoving Planetary Systems within 50 pc Identified by TESS that are Ideal Candidates for Further Follow Up* . AJ, 162, 54 (2021).
23. ^cGuerrero, N. et al., incl. Bouma, L. *The TESS Objects of Interest Catalog from the TESS Prime Mission*. ApJS, 254, 39 (2021).
22. Stassun, K. et al., incl. Bouma, L. *Discovery and Characterization of a Rare Magnetic Hybrid β Cephei Slowly Pulsating B-type Star in an Eclipsing Binary in the Young Open Cluster NGC 6193* AJ, 910, 133 (2021).
21. Tofflemire, B. et al., incl. Bouma, L. *TESS Hunt for Young and Maturing Exoplanets (THYME) V: A Sub-Neptune Transiting a Young Field Star*. AJ, 161, 171 (2021).
20. Zhou, G. et al., incl. Bouma, L. *Two young planetary systems around field stars with ages between 10–170 Myr from TESS*. AJ, 161, 2 (2021).
19. ^cDawson, B. et al., incl. Bouma, L. *Precise transit and radial-velocity characterization of a resonant pair: a warm Jupiter TOI-216c and eccentric warm Neptune TOI-216b*. AJ, 161, 161 (2021).
18. ^cDaylan, T. et al., incl. Bouma, L. *TESS discovery of a super-Earth and three sub-Neptunes hosted by the bright, Sun-like star HD 108236*. AJ, 161, 85 (2021).

17. ^cFridlund, M., et al., incl. Bouma, L. *The TOI-763 system: sub-Neptunes orbiting a Sun-like star*. MNRAS, 498, 3 (2020).
16. ^cRowden, P., et al., incl. Bouma, L. *TIC 278956474: Two Close Binaries in One Young Quadruple System Identified by TESS*. AJ, 160, 2 (2020).
15. Patra, K. et al., incl. Bouma, L. *The Continuing Search For Evidence of Tidal Orbital Decay For Hot Jupiters*. AJ, 159, 150 (2020).
14. ^cJordán, A. et al., incl. Bouma, L. *TOI-677 b: A Warm Jupiter (P=11.2d) on an eccentric orbit transiting a late F-type star*. AJ, 159, 145 (2020).
13. Soares-Furtado, M. et al., incl. Bouma, L. *A Catalog of Periodic Variables in Open Clusters M 35 and NGC 2158*. ApJS, 246, 15 (2020).
12. Rodríguez Martínez, R. et al., incl. Bouma, L. *KELT-25b and KELT-26b: A Hot Jupiter and a Substellar Companion Transiting Young A-Stars Observed by TESS*. ApJS, 246, 15 (2020).
11. Newton, E. et al., incl. Bouma, L. *TESS Hunt for Young and Maturing Exoplanets (THYME): A Planet in the 45 Myr Tucana-Horologium Association*. ApJL, 880, 1, L17 (2019).
10. ^cQuinn, S. et al., incl. Bouma, L. *Near-resonance in a system of sub-Neptunes from TESS*. AJ, 158, 177 (2019).
9. ^cGünther, M. et al., incl. Bouma, L. *A Super-Earth and two sub-Neptunes transiting the bright, nearby, and quiet M-dwarf TOI-270*. Nature Astronomy (2019).
8. ^cDawson, B. et al., incl. Bouma, L. *TOI-216b and TOI-216c: Two warm, large exoplanets in or slightly wide of the 2:1 orbital resonance*. AJ, 158, 65 (2019).
7. ^cShporer, A. et al., incl. Bouma, L. *TESS Full Orbital Phase Curve of the WASP-18b System*. AJ, 157, 178 (2019).
6. Zhan, Z. et al., incl. Bouma, L. *Complex Rotational Modulation of Rapidly Rotating M Stars Observed with TESS*. ApJ, 876, 127 (2019).
5. Rappaport, S. et al., incl. Bouma, L. *Deep long asymmetric occultation in EPIC 204376071*. MNRAS, 485, 2681 (2019).
4. ^cRodríguez, J. et al., incl. Bouma, L. *An Eccentric Massive Jupiter Orbiting a Sub-Giant on a 9.5 Day Period Discovered in the TESS Full Frame Images*. AJ, 157, 191 (2019).
3. Burt, J. et al., incl. Bouma, L. *Simulating the M-R Relation From APF Followup of TESS Targets: Survey Design and Strategies for Overcoming Mass Biases*. AJ, 156, 255 (2018).
2. Louie, D. et al., incl. Bouma, L. *Simulated JWST/NIRISS Transit Spectroscopy of Anticipated TESS Planets Compared to Select Discoveries from Space-Based and Ground-Based Surveys*. PASP 130d 4401 (2018).
1. Campante, T. et al., incl. Bouma, L. *The asteroseismic potential of TESS: Exoplanet-Host Stars*. ApJ, 830, 2 (2016).

Software

4. Foreman-Mackey, D., et al., incl. Bouma, L. *exoplanet: Gradient-based probabilistic inference for exoplanet data & other astronomical time series*. JOSS, 6, 62, 3285 (2021).
3. Bhatti, W. Bouma, L., and Yee S. *cdips-pipeline: difference-imaging photometry pipeline*. [Link](#).
2. Bhatti, W. Bouma, L., and Wallace J. *astrobases: package for variable star astronomy*. [Link](#).
1. Astropy Collaboration et al., incl. Bouma, L. *The Astropy Project*. AJ, 156, 123 (2018).

RECENT OBSERVING PROGRAMS

- 06/2022 PI: Keck/HIRES (1.75 nights).
Confirming Transiting Planets Around Young Stars From TESS & Kepler.
- 12/2021 Co-I: NOAO LCOGT 1 m, 2 m, & MuSCAT3 (20, 1.2, & 1.1 nights) (PI: J. Hartman, 2022A-934009).
Confirming and Characterizing Transiting Planets From HAT & TESS with LCO.
Note: Long-term status awarded for 2022A, 2022B, 2023A.
- 06/2021 Co-I: Keck/HIRES (1 night) (PI: L. Hillenbrand).
Confirming a 30 Million Year Old Mini-Neptune and Measuring its Stellar Obliquity.
- 06/2021 Co-I: NOAO LCOGT 1 m & 2 m (20 & 2.5 nights) (PI: J. Hartman, 2021B-0004).
Confirming and Characterizing Transiting Planets From HAT & TESS with LCO.
- 06/2021 Co-I: TESS GI Program G04168 (PI: R. Jayaraman).
Complex Photometric Modulations of Rapidly-Rotating M Dwarfs in the Northern Sky and the Ecliptic
- 12/2020 PI: NOIRLab Minerva-Australis (2 nights).
Confirming and Characterizing Transiting Planets Around Young Stars.
- 12/2020 Co-I: NOAO LCOGT 1 m & 2 m (20 & 2 nights) (PI: J. Hartman, 2021A-0045).
Confirming and Characterizing Transiting Planets From HAT+TESS with LCO.
- 11/2020 PI: Magellan/PFS (2 nights; Princeton TAC).
Confirming and Characterizing Transiting Planets Around Young Stars
- 10/2020 PI: TESS Director's Discretionary Time
Complex Modulation of Rapidly Rotating Young M Dwarfs

SEMINARS & COLLOQUIA

- MIT TESS Science Talks Seminar (Invited), March 2022
- Penn State Center for Exoplanets and Habitable Worlds (Invited), April 2021
- Harvard Exoplanet Pizza Lunch, April 2021
- JPL Astrophysics Colloquium (Invited), October 2020
- Caltech Dix Planetary Science Seminar, October 2020
- UCLA Physics and Astronomy Lunch Talk Series, September 2020
- University of Chicago Exoplanet Seminar, March 2020
- Princeton Thunch Seminar, January 2019

CONFERENCE TALKS & POSTERS

- 51 Pegasi b Summit (μ Talk), *Weird Photometric Modulation of Pre-Main-Sequence M-Dwarfs*, August 2022
- 51 Pegasi b Summit (Talk), *The Youngest Planets from the Prime Kepler Mission*, August 2022
- ERES-VII (Poster), *Kepler and the Behemoth*, July 2022
- AAS Meeting #240 (Talk), *The Youngest Planets from the Prime Kepler Mission*, June 2022
- Exoplanets IV (Talk), *The Youngest Planets from the Prime Kepler Mission*, May 2022
- JHU-APL Exoplanet Early Career Highlight Seminar (Talk), *A 38 Million Year Old Neptune-Sized Planet in the Kepler Field*, January 2022

- TESS Science Conference II (Talk), *Young Planets in the Halos of Nearby Open Clusters*, August 2021
- AAS Meeting #238 (Talk & Press Conference), *An Open Cluster Spread Across 500 Parsecs*, July 2021
- THYME 2020 Conference (Invited Talk), *Snapshots of Planet Evolution taken by the Cluster Difference Imaging Photometric Survey*, December 2020
- ExSoCal 2020 (Poster), *PTFO 8-8695: Two Stars, Two Signals, No Planet*, September 2020
- TESS Science Team Meeting #19 (Talk), *PTFO 8-8695: Two Stars, Two Signals, No Planet*, June 2020
- Princeton Club of Chicago - Research on the Road Alumni Meeting (Invited Talk), *Planets Around Other Stars*, March 2020
- TESS Science Team Meeting #18 (Talk), *TESS Planet Candidates in Open Clusters*, December 2019
- Extreme Solar Systems IV (Poster), *TESS Planet Candidates in Open Clusters*, August 2019
- STScI TESS Data Workshop (Invited Talk), *Homogeneous Light Curves for Stars in Clusters from TESS*, February 2019
- TESS Science Conference I (Talk & Invited Panel), *The Early Arrival of WASP-4b*, July 2019
- TESS Science Team Meeting #16 (Talk), *Extending the Planet Search with TESS*, October 2018
- Exoplanets II (Poster), *How do Unresolved Binaries Bias Transit Survey Occurrence Rates?*, June 2018
- TESS Science Team Meeting #10 (Talk), *Planet-Detection Simulations for Several Possible TESS Extended Missions*, December 2016
- TESS Science Team Meeting #8 (Talk), *The TESS Extended Mission*, May 2016
- NExScI Sagan Summer Workshop (Poster), *Planet-Detection Simulations for Several Possible TESS Extended Missions* May 2016
- TESS Science Team Meeting #7 (Talk), *TESS from 2019 to 2021*, February 2016