

# Luke G. Bouma

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## RESEARCH INTERESTS

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- Exoplanets: their formation, evolution, and long-term fates.
- Evolution of young stars and dissolution of their host clusters (stellar and galactic astrophysics).
- Computational methods in astrophysical data analysis.

## PROFESSIONAL APPOINTMENTS

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

## EDUCATION

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

*M.A, Astrophysics. Advisor: J. Winn* *09/2016–08/2018*

Massachusetts Institute of Technology Cambridge, MA  
*Physics Ph.D. program (transferred after completing first year). Advisor: 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

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*Refereed publications:* 55 (9 first author; 2 second author; 25 many author; 19 TESS collaboration).

*Non-refereed publications:* 1 (white paper).

*Total citations to publications:* 5832 (324 first & second author; 1022 many author; 4486 code). *h-index:* 23.

My first & second author publications are [listed here](#); a full publication list is [available here](#).

## DISTINCTIONS

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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)

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01/2023 Collaborator: NASA Astrophysics Data Analysis Program (PI: K. Pardo).  
*Detecting Gravitational Waves from Supermassive Black Holes with Kepler.*

† 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.*

## SERVICE & PUBLIC ENGAGEMENT

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- *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

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Lead Instructor, Introduction to Astronomy and Planetary Science <i>7-week overview of astronomy and planetary science, through LA Prison Education Project</i>	Halawa Correctional (Remote) <i>02/2023 – 04/2023</i>
Lead Instructor, Introduction to Astronomy and Planetary Science <i>As above.</i>	Kulani Correctional (Remote) <i>09/2022 – 11/2022</i>
Lead Instructor, Introduction to Astronomy <i>Introduction to undergraduate-level astronomy, through LA Prison Education Project</i>	HMP Addiewell (Remote) <i>05/2022 – 07/2022</i>
Lead Instructor, Introduction to STEM <i>Overview of STEM fields for 12<sup>th</sup> grade students, through LA Prison Education Project</i>	Indio Juvenile Hall (Remote) <i>02/2022 – 04/2022</i>
Teaching Assistant, Planets in the Universe (AST205) <i>Introductory undergraduate astronomy course for non-science majors</i>	Princeton University <i>09/2015 – 01/2016</i>

## PROFESSIONAL ACTIVITIES

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- Reviewer for Caltech Optical Observatories Time Allocation Committee (2022).
- 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, NSF, and NOIRLab panels (2021-present).
- Member, TESS Follow-up Observing Program (TFOP; 2018-present).
- Organizer, TESS Extended Mission Working Group (2015-2018).

### First & second author

The † symbol denotes projects led by students that I supervised.

12. †Boyle, A. and Bouma, L. *When Does Gyrochronology Start to Work? – Stellar Rotation and Structure of the  $\alpha$  Persei Complex*. AAS journals, submitted. arXiv:2211.09822.
11. Bouma, L., Kerr, R., et al. *Kepler and the Behemoth: Three Mini-Neptunes in a 40 Million Year Old Association*. AJ, 164, 215 (2022).
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

For each of these papers, I contributed key methods, data, code, and/or co-authored significant portions of the text.

25. Wood, M. et al., incl. Bouma, L. *TESS Hunt for Young and Maturing Exoplanets (THYME) VII: a 27 Myr extended population of Lower-Centarus Crux with a transiting two-planet system*. AAS journals, submitted. arXiv:2212.03266.
24. Yee, S. et al., incl. Bouma, L. *The TESS Grand Unified Hot Jupiter Survey. II. Twenty Hot Jupiters*. AAS journals, submitted. arXiv:2210.15473
23. 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
22. Dai, F. et al., incl. Bouma, L. *TOI-1136 is a Young, Coplanar, Aligned Planetary System in a Pristine Resonant Chain*. AJ, 165, 33 (2023).
21. Stassun, K. et al., incl. Bouma, L. *A Low-Mass Pre-Main-Sequence Eclipsing Binary in Lower Centaurus Crux Discovered with TESS*. AJ, 941, 125 (2022).
20. 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, 164, 137 (2022).
19. Palumbo, E. et al., incl. Bouma, L. *Evidence for Centrifugal Breakout around the Young M Dwarf TIC 234284556*. ApJ, 925, 75 (2022).

18. 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).
17. Günther, M. et al., incl. Bouma, L. *Complex Modulation of Rapidly Rotating Young M Dwarfs: Adding Pieces to the Puzzle*. AJ, 163, 144 (2022).
16. 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).
15. Fausnaugh, M. et al., incl. Bouma, L. *The TESS Mission Target Selection Procedure*. PASP. 133, 1027 (2021).
14. 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)
13. Wirth, C. et al., incl. Bouma, L. *TOI-942b: A Prograde Neptune in a ~60 Myr old Multi-transiting System*. ApJL, 917, 34 (2021).
12. Stassun, K. et al., incl. Bouma, L. *Discovery and Characterization of a Rare Magnetic Hybrid  $\beta$  Cephei Slowly Pulsating B-type Star in an Eclipsing Binary in the Young Open Cluster NGC 6193* AJ, 910, 133 (2021).
11. 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).
10. 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).
9. Patra, K. et al., incl. Bouma, L. *The Continuing Search For Evidence of Tidal Orbital Decay For Hot Jupiters*. AJ, 159, 150 (2020).
8. 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).
7. 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).
6. 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).
5. Zhan, Z. et al., incl. Bouma, L. *Complex Rotational Modulation of Rapidly Rotating M Stars Observed with TESS*. ApJ, 876, 127 (2019).
4. Rappaport, S. et al., incl. Bouma, L. *Deep long asymmetric occultation in EPIC 204376071*. MNRAS, 485, 2681 (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).

### **TESS Collaboration**

These are papers for which my authorship results from my contributions to mission planning and internal data analysis in the TESS collaboration. In all such instances, I provided substantive feedback on the manuscripts.

19. Sha, L. et al., incl. Bouma, L. *TESS Spots a Mini-Neptune Interior to a Hot Saturn in the TOI-2000 System*. MNRAS, submitted. arXiv:2209.14396
18. El Mufti, M. et al., incl. Bouma, L. *TOI-560: Two Transiting Planets Orbiting a K Dwarf Validated with *iSHELL*, *PFS* and *HIRES* RVs*. AJ, 165, 10 (2023).

17. Cadieux, 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).
16. Hord, B. et al., incl. Bouma, L. *The Discovery of a Planetary Companion Interior to Hot Jupiter WASP-132b*. AJ, 164, 13 (2022).
15. Wittenmyer, R. et al., incl. Bouma, L. *TOI-1842b: A Transiting Warm Saturn Undergoing Reinflation around an Evolving Subgiant*, AJ, 163, 82 (2022).
14. Cabot, S. H. C. et al., incl. Bouma, L. *TOI-1518b: A Misaligned Ultra-hot Jupiter with Iron in Its Atmosphere*. AJ, 162, 218 (2021).
13. Addison, 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).
12. Hedges, 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).
11. Guerrero, N. et al., incl. Bouma, L. *The TESS Objects of Interest Catalog from the TESS Prime Mission*. ApJS, 254, 39 (2021).
10. Dawson, 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).
9. Daylan, 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).
8. Fridlund, M. et al., incl. Bouma, L. *The TOI-763 system: sub-Neptunes orbiting a Sun-like star*. MNRAS, 498, 3 (2020).
7. Rowden, P., et al., incl. Bouma, L. *TIC 278956474: Two Close Binaries in One Young Quadruple System Identified by TESS*. AJ, 160, 2 (2020).
6. Jordán, 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).
5. Quinn, S. et al., incl. Bouma, L. *Near-resonance in a system of sub-Neptunes from TESS*. AJ, 158, 177 (2019).
4. Günther, 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).
3. Dawson, 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).
2. Shporer, A. et al., incl. Bouma, L. *TESS Full Orbital Phase Curve of the WASP-18b System*. AJ, 157, 178 (2019).
1. Rodriguez, 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).

## 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

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- 01/2023 PI: Keck/HIRES (2.0 nights).  
*Age-Dating the Cep-Her Complex and Reconstructing its Formation History.*
- 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).  
*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

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- University of Geneva Exoplanets Seminar, March 2023
- Yale Exoplanets/Stars Seminar (Invited), February 2023
- Earth 2.0 Mission Science Seminar Series (Invited), October 2022
- University of Michigan Star and Planet Formation Seminar, September 2022
- 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

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- ESA ESTEC Planet-ESLAB-2023 (Talk), *Using Gaia to Find The Youngest Planets from the Prime Kepler Mission*, March 2023, Noordwijk, Netherlands
- 51 Pegasi Summit ( $\mu$ Talk), *Weird Photometric Modulation of Pre-Main-Sequence M-Dwarfs*, August 2022, San Francisco, CA
- 51 Pegasi Summit (Talk), *The Youngest Planets from the Prime Kepler Mission*, August 2022, San Francisco, CA
- ERES-VII (Poster), *Kepler and the Behemoth*, July 2022, State College, PA
- AAS Meeting #240 (Talk), *The Youngest Planets from the Prime Kepler Mission*, June 2022, Pasadena, CA
- Exoplanets IV (Talk), *The Youngest Planets from the Prime Kepler Mission*, May 2022, Las Vegas, NV
- JHU-APL Exoplanet Early Career Highlight Seminar (Talk), *A 38 Million Year Old Neptune-Sized Planet in the Kepler Field*, January 2022, Online
- TESS Science Conference II (Talk), *Young Planets in the Halos of Nearby Open Clusters*, August 2021, Online
- AAS Meeting #238 (Talk & Press Conference), *An Open Cluster Spread Across 500 Parsecs*, July 2021, Online
- THYME 2020 Conference (Invited Talk), *Snapshots of Planet Evolution taken by the Cluster Difference Imaging Photometric Survey*, December 2020, Online
- ExSoCal 2020 (Poster), *PTFO 8-8695: Two Stars, Two Signals, No Planet*, September 2020, Online
- TESS Science Team Meeting #19 (Talk), *PTFO 8-8695: Two Stars, Two Signals, No Planet*, June 2020, Online
- Princeton Club of Chicago - Research on the Road Alumni Meeting (Invited Talk), *Planets Around Other Stars*, March 2020, Chicago, IL
- TESS Science Team Meeting #18 (Talk), *TESS Planet Candidates in Open Clusters*, December 2019, Cambridge, MA
- Extreme Solar Systems IV (Poster), *TESS Planet Candidates in Open Clusters*, August 2019, Reykjavik, Iceland
- STScI TESS Data Workshop (Invited Talk), *Homogeneous Light Curves for Stars in Clusters from TESS*, February 2019, Baltimore, MD
- TESS Science Conference I (Talk & Invited Panel), *The Early Arrival of WASP-4b*, July 2019, Cambridge, MA
- TESS Science Team Meeting #16 (Talk), *Extending the Planet Search with TESS*, Oct 2018, Cambridge, MA
- Exoplanets II (Poster), *How do Unresolved Binaries Bias Transit Survey Occurrence Rates?*, June 2018, Cambridge, England
- TESS Science Team Meeting #10 (Talk), *Planet-Detection Simulations for Several Possible TESS Extended Missions*, December 2016, Cambridge, MA
- TESS Science Team Meeting #8 (Talk), *The TESS Extended Mission*, May 2016, Cambridge, MA
- NExSci Sagan Summer Workshop (Poster), *Planet-Detection Simulations for Several Possible TESS Extended Missions* May 2016, Cambridge, MA
- TESS Science Team Meeting #7 (Talk), *TESS from 2019 to 2021*, February 2016, Cambridge, MA