

ISABEL JUSTICE KAIN

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EDUCATION

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|-----------------------------------------------------------------------------------|----------------|
| Ph.D. Astronomy and Astrophysics University of California, Santa Cruz | 2021 - Present |
| M.Sc. Astronomy and Astrophysics University of California, Santa Cruz | 2021 - 2024 |
| B.Sc. Physics Northeastern University Minors in Mathematics, Geology | 2017 - 2021 |

RESEARCH SKILLS AND INTERESTS

- High-contrast imaging of exoplanets with large telescopes
- Whole-instrument experience with design, fabrication, integration, and verification
- Hands-on experience with shop optics and cryogenic, high-vacuum instrumentation

FELLOWSHIPS AND AWARDS

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| NSF Graduate Research Fellowship | 2021 - 2027 |
| W. M. Keck Observatory Visiting Scholar | June - August 2023 |
| 5x Osterbrock Leadership Program Mini-Grants | 2024, 2025 |

RESEARCH

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| Instrument development of the SCALES IR spectrograph <i>Advisor: Prof. Andrew Skemer, UC Santa Cruz</i> | 2021 - Present |
| Instrument development, testing, integration, and commissioning of the Slicer Combined with an Array of Lenslets for Exoplanet Spectroscopy (SCALES) instrument, a 2-5 μ m integral field spectrograph for the W. M. Keck Observatory. Involved in all phases of instrument development from PDR through first light. Relevant skills include optical metrology, optical alignment, optomechanical design, fabrication and machining, mechanism integration and testing, and data analysis. | |
| Twilight observing program development with Keck/SCALES <i>Advisors: Dr. John O'Meara and Dr. Carlos Alvarez, W. M. Keck Observatory</i> | 2023 - Present |
| Develop twilight observing program for Keck/SCALES, including observatory integration, instrument configuration optimization, user-facing observing tool development, controls software development, and science survey design. | |
| Detector characterization for the Gemini Planet Imager (GPI) <i>Advisor: Prof. Jeffrey Chilcote, University of Notre Dame</i> | Fall 2020 |
| Characterizing photometric performance of the ASTERIA CubeSat <i>Advisor: Dr. Vanessa Bailey, NASA Jet Propulsion Laboratory (JPL)</i> | Summer 2020 |
| Firmware development for the Compact Muon Solenoid (CMS) <i>Advisor: Prof. Toyoko Oriimoto, European Organization for Nuclear Research (CERN)</i> | Fall 2019 |

Mission development: Orbiting Configurable Artificial Star (ORCAS)
Advisor: Dr. Eliad Peretz, NASA Goddard Space Flight Center

Summer 2019

Investigating exoplanet systems with transit timing variations

2017 - 2019

Advisor: Prof. Elisabeth Newton, MIT Kavli Institute for Astrophysics and Space Research

TEACHING AND PEDAGOGY

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| TA for ASTR 136: Advanced Astronomy Laboratory, UCSC | Spring 2025 |
| TA for ASTR 5: Intro Astro: Formation & Evolution of the Universe, UCSC | Spring 2022 |
| Guest lecture for ASTR 5, UCSC | May 27 2022 |
| UCSC Teaching and Learning Center pedagogy workshop | April 26 2023 |

ADVISING, MENTORSHIP, AND COMMUNITY STEWARDSHIP

Osterbrock Rising Graduate Award (2024 - Present): Provides financial support to undergraduate students at UCSC to offset the cost of graduate school applications. Secured funding from the Osterbrock Foundation to support 12 students so far, targeting women and gender minorities in astronomy and physics, and undocumented/DACAmented students in STEM.

UCSC Society of Physics Students (SPS) Mentorship (2021 - Present): Multi-year professional mentorship of UCSC undergraduates in physics and astronomy, including first-generation students from underrepresented communities.

UCSC Astronomy Graduate Student Peer Mentorship (2022 - Present)

Classroom Visits (2021 - Present): Giving astronomy outreach talks to 15+ K12 classrooms through Skype a Scientist and connections with local community.

Department and campus service:

- UAW 4811 Department Union Representative 2022 - Present
- UAW 4811 Head Steward 2024 - Present
- Organized and secured funding for annual UCSC astronomy graduate retreat 2024, 2025
- UC Observatories *Ask An Astronomer* correspondent 2021 - 2024

OBSERVING EXPERIENCE

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| Keck/NIRC2 | 9 twilight triggers |
| Keck/NIRSpec | 4 nights |
| Lick/KAST | 4 nights |
| Lick/ShARCS | 1 nights |
| Lick/Nickel | 4 nights |

INVITED AND CONTRIBUTED TALKS

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| Keck Observatory Lunchtime Talk | March 2024 |
| Keck Visiting Scholar Research Talk | August 2023 |
| UCSC Earth and Planetary Sciences Seminar | September 2023 |
| UCSC Astronomy and Astrophysics FLASH Seminar | May 2023 |
| MIT Lunchtime Science Talk | May 2019 |

FIRST-AUTHOR PUBLICATIONS

1. *Increasing science yield with a twilight observing program with the SCALES instrument at Keck.* **Isabel Kain**, Carlos Alvarez, John M O'Meara, Marc Kassis, Peter Wizinowich, Antonin Bouchez, Jim Lyke, Randall Campbell, Avinash Surendran, Imke de Pater, Katherine R. de Kleer, Ned Molter, Erin Redwing, Rosalie McGurk, Steph Sallum, Andrew Skemer. [SPIE](#) (2025).
2. *Characterization of diamond-turned optics for SCALES.* **Isabel Kain**, Phil Hinz, Marius Doetz, Benjamin Bulla, Renate Kupke, Daren Dillon, Andrew Skemer, Deno Stelter, Michael Gonzales, Nicholas MacDonald, Aditi Gangadharan, Cristian Rodriguez, Christopher Ratliff, Mackenzie R. Lach, and Steph Sallum. [SPIE](#) (2023).
3. *The Young Planetary System K2-25: Constraints on Companions and Starspots.* **Isabel J. Kain**, Elisabeth R. Newton, Jason A. Dittmann, Jonathan M. Irwin, Andrew W. Mann, Pa Chia Thao, David Charbonneau, Jennifer G. Winter. [AJ](#) (2020).

CO-AUTHOR PUBLICATIONS

1. *Characterizing exoplanet atmospheres with SCALES medium-spectral-resolution angular differential imaging.* Aditi Desai, Steph Sallum, Ravinder Banyal, [...] **Isabel Kain**, [...] Sivarani Thirupathi, Kevin Wagner, Yifan Zhou. [SPIE](#) (2024).
2. *Static optic mount design and fabrication for infrared astronomy on SCALES instrument.* Cristian A. Rodriguez, Christopher Ratliff, Nicholas MacDonald, [...] **Isabel Kain**, R. Deno Stelter, Andrew J. Skemer. [SPIE](#) (2024).
3. *SCALES status report.* R. Deno Stelter, Andrew J. Skemer, Steph Sallum, [...] **Isabel Kain**, [...] Arun Surya, Hari Varshney, Eric Wang. [SPIE](#) (2024).
4. *Innovations and advances in instrumentation at the W. M. Keck Observatory, vol. III.* Marc Kassis, Carlos Alvarez, Ashley Baker, [...] **Isabel Kain**, [...] Shelley Wright, Truman World, Jake H. Zimmer. [SPIE](#) (2024).
5. *Recovering simulated planet and disk signals using SCALES aperture masking.* Mackenzie R. Lach, Steph Sallum, Ravinder Banyal, [...] **Isabel Kain**, [...] Sivarani Thirupathi, Kevin Wagner, Yifan Zhou. [SPIE](#) (2023).
6. *Simulating medium-spectral-resolution exoplanet characterization with SCALES angular/reference differential imaging.* Aditi Desai, Stephanie E. Sallum, Ravinder Banyal, [...] **Isabel Kain**, [...] Sivarani Thirupathi, Kevin Wagner, Yifan Zhou. [SPIE](#) (2023).
7. *SCALES on Keck: optical design.* Renate Kupke, R. Deno Stelter, Amirul Hasan, Arun Surya, **Isabel Kain**, Zackery Briesemeister, Jialin Li, Phil Hinz, Andrew Skemer, Benjamin Gerard, Daren Dillon, Christopher Ratliff. [SPIE](#) (2022).
8. *GPI 2.0: performance of upgrades to the Gemini Planet Imager CAL and IFS.* Dillon Peng, Maeve Curliss, Mary Anne Limbach, [...], **Isabel Kain**, [...], Clarissa Do Ó, Saavidra Perera, Eckhart Spalding. [SPIE](#) (2022).
9. *Design of SCALES: a 2-5 micron coronagraphic integral field spectrograph for Keck Observatory.* Andrew J. Skemer, R. Deno Stelter, Stephanie Sallum, [...], Isabel Kain, [...], Patrick Sheehan, Ji Man Sohn, Jordan Stone. [SPIE](#) (2022).
10. *GPI 2.0: upgrading the Gemini Planet Imager.* Jeffrey Chilcote, Quinn Konopacky, Robert J. De Rosa, [...], **Isabel Kain**, [...], Laurent Pueyo, Kaitlyn Summey, Coleman Thomas. [SPIE](#) (2020).

11. *Zodiacal Exoplanets in Time (ZEIT). IX. A Flat Transmission Spectrum and a Highly Eccentric Orbit for the Young Neptune K2-25b as Revealed by Spitzer.* Pa Chia Thao, Andrew W. Mann, Marshall C. Johnson, Elisabeth R. Newton, Xueying Guo, **Isabel J. Kain**, Aaron C. Rizzuto, Paul A. Dalba, Eric Gaidos, Jonathan M. Irwin, Adam L. Kraus. [AJ](#) (2020).
12. *Orbiting Starshade: Observing Exoplanets at visible wavelengths with GMT, TMT, and ELT.* John C. Mather, Eliad Peretz, Jonathan Arenberg, [...], **Isabel Kain**, [...], Richard Slonaker, Ignas Snellen, Phil Willems. [BAAS](#) (2019).
13. *Orbiting Configurable Artificial Star (ORCAS) for Visible Adaptive Optics from the Ground.* Eliad Peretz, John Mather, **Isabel Kain**, Richard Slonaker, John O'Meara, Sara Seager, Tiffany Hoerbelt. [BAAS](#) (2019).
14. *A TESS Dress Rehearsal: Planetary Candidates and Variables from K2 Campaign 17.* Ian J. M. Crossfield, Natalia Guerrero, [...], **Isabel Kain**, Howard Isaacson, David R. Ciardi, Erica J. Gonzales, Andrew W. Howard, and José Vinícius de Miranda Cardoso. [ApJS](#) (2018).

IN-PREP PUBLICATIONS

1. *Science program and observing tools for the SCALES twilight observing program.* **Isabel Kain** et al. (September 2026).
2. *Optical verification of SCALES on Keck.* **Isabel Kain** et al. (September 2026).