Stanford

Michelle Hill

Postdoctoral Scholar, Earth and Planetary Sciences

Bio

BIO

Michelle's work addresses a fundamental question in exoplanet habitability: determining the minimum planetary size required to maintain an atmosphere, a critical prerequisite for life as we know it. She found that stagnant lid (no plate tectonics) planets Earth sized and below orbiting in the habitable zone (HZ) of a Sun-like star need to be ≥ 0.8 Earth radii to maintain their atmosphere past 1 billion years. As a Stanford Science Fellow, Michelle will advance her research and expand her planetary habitability models to look at how tectonic regime, initial volatile content, stellar type, tidal locking and tidal heating effect the results of whether a planet smaller than Earth can hold onto it's atmosphere. Her faculty host is Laura Schaefer, Assistant Professor in the department of Earth and Planetary Sciences.

Michelle also detects and refines the masses and orbits of exoplanets using a combination of radial velocity (RV), transit and astrometry. She is currently observing 10 known planet systems that have shown indications of additional planets in orbit in order to detect the long period outer companions. These observations have lead to the discovery of 3 planets so far.

Michelle recently completed her PhD in Earth and planetary sciences at the University of California, Riverside, where she developed research on exoplanet habitability while supported by the NASA FINESST award. She lead a catalog paper on the demographics of all the known planets in HZ of their star where she found evidence of the sub-Saturn valley in the HZ. During this time she was also a member of the TESS-Keck Survey (TKS) team that conducted RV followup of TESS Objects of Interest (TOIs) and she lead the discovery paper of TOI-1386 b and c.

Michelle completed her post bachelor honours in astrophysics at University of Southern Queensland, Australia. Here Michelle worked on the occurrence rates of giant exoplanets in the habitable zone of their star and found that while giant planets are less likely to be found in the habitable zone than terrestrial planets, if each giant planet is host to more than one moon then exomoons could be more numerous than terrestrial planets in the habitable zone of their star. This work has direct implications for the fraction of stars in the galaxy that may host habitable terrestrial worlds.

Prior to this Michelle completed her bachelors in physics at University of New England, Australia where she attended San Francisco State University during her year abroad. Here she contributed to a study of the Kepler habitable zone planets where she found that the distribution of planets within the habitable zone closely mirrored the distribution of all known planets. This discovery had major implications for the opportunities of statistical analysis of this relatively small group of habitable zone planets.

Michelle loves flying! She was a commercial pilot before returning to school to study physics. She currently holds an Australian ATPL with plans to (one day!) convert this to an FAA APT.

HONORS AND AWARDS

- Stanford Science Fellow, Stanford University (2025 - 2028)
- FINESST Fellow, NASA (2021 - 2025)
- First Class Honours, University of Southern Queensland (2018)
- Vice Chancellor Honour Roll, University of New England (2015 - 2016)
- Dean's List, San Francisco State University (2015)

PROFESSIONAL EDUCATION

- PhD, University of California, Riverside , Earth & Planetary Science (2025)
- Bachelor of Science. Honors, University of Southern Queensland , Physics (2018)
- Bachelor of Science, University of New England , Physics (2017)

STANFORD ADVISORS

- Laura Schaefer, Postdoctoral Faculty Sponsor

LINKS

- My Website: www.planethuntress.com

Research & Scholarship

LAB AFFILIATIONS

- Laura Schaefer, Schaefer Planet Lab (8/25/2025)

Publications

PUBLICATIONS

- **No Giant Planets in the Eta Cassiopeiae System: Dynamical Implications of a Wide Binary Companion** *ASTRONOMICAL JOURNAL*
  Kane, S. R., Li, Z., Hill, M. L., D'Angiolillo, S., Fulton, B. J., Howard, A. W.
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- **Planet Masses, Radii, and Orbits from NASA's K2 Mission** *ASTROPHYSICAL JOURNAL SUPPLEMENT SERIES*
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- **The TESS-Keck Survey. XXIV. Outer Giants May Be More Prevalent in the Presence of Inner Small Planets** *ASTRONOMICAL JOURNAL*
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- **The California Legacy Survey. V. Chromospheric Activity Cycles in Main-sequence Stars** *ASTROPHYSICAL JOURNAL SUPPLEMENT SERIES*
  Isaacson, H., Howard, A. W., Fulton, B., Petigura, E. A., Weiss, L. M., Kane, S. R., Carter, B., Beard, C., Giacalone, S., Van Zandt, J., Murphy, J., Dai, F., Chontos, et al
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- **The TESS-Keck Survey. XXII. A Sub-Neptune Orbiting TOI-1437** *ASTRONOMICAL JOURNAL*

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- **The TESS-Keck Survey. XX. 15 New TESS Planets and a Uniform RV Analysis of All Survey Targets** *ASTROPHYSICAL JOURNAL SUPPLEMENT SERIES*

  Polanski, A. S., Lubin, J., Beard, C., Akana Murphy, J. M., Rubenzahl, R., Hill, M. L., Crossfield, I. J. M., Chontos, A., Robertson, P., Isaacson, H., Kane, S. R., Ciardi, D. R., Batalha, et al

  2024; 272 (2)

- **The TESS-Keck Survey. VII. A Superdense Sub-Neptune Orbiting TOI-1824** *ASTRONOMICAL JOURNAL*

  Lange, S., Murphy, J., Batalha, N. M., Crossfield, I. J. M., Dressing, C. D., Fulton, B., Howard, A. W., Huber, D., Isaacson, H., Kane, S. R., Petigura, E. A., Robertson, P., Weiss, et al

  2024; 167 (6)

- **The TESS-Keck Survey. XVIII. A Sub-Neptune and Spurious Long-period Signal in the TOI-1751 System** *ASTRONOMICAL JOURNAL*

  Desai, A., Turtelboom, E. V., Harada, C. K., Dressing, C. D., Rice, D. R., Murphy, J., Brinkman, C. L., Chontos, A., Crossfield, I. J. M., Dai, F., Hill, M. L., Fetherolf, T., Giacalone, et al

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- **The TESS-Keck Survey. XIX. A Warm Transiting Sub-Saturn-mass Planet and a Nontransiting Saturn-mass Planet Orbiting a Solar Analog** *ASTRONOMICAL JOURNAL*

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- **The TESS-Keck Survey. XII. A Dense 1.8 R _# Ultra-short-period Planet Possibly Clinging to a High-mean-molecular-weight Atmosphere after the First Gigayear** *ASTRONOMICAL JOURNAL*

  Rubenzahl, R. A., Dai, F., Howard, A. W., Lissauer, J. J., Van Zandt, J., Beard, C., Giacalone, S., Murphy, J., Chontos, A., Lubin, J., Brinkman, C. L., Tyler, D., Macdougall, et al

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- **The TESS-Keck Survey. XVII. Precise Mass Measurements in a Young, High-multiplicity Transiting Planet System Using Radial Velocities and Transit Timing Variations** *ASTRONOMICAL JOURNAL*

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- **The Kepler Giant Planet Search. I. A Decade of Kepler Planet-host Radial Velocities from W. M. Keck Observatory** *ASTROPHYSICAL JOURNAL SUPPLEMENT SERIES*

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- **The TESS-Keck Survey. XVI. Mass Measurements for 12 Planets in Eight Systems** *ASTRONOMICAL JOURNAL*

  Akana Murphy, J. M., Batalha, N. M., Scarsdale, N., Isaacson, H., Ciardi, D. R., Gonzales, E. J., Giacalone, S., Twicken, J. D., Dattilo, A., Fetherolf, T., Rubenzahl, R. A., Crossfield, I. J. M., Dressing, et al

  2023; 166 (4)

- **The TESS-Keck Survey. XV. Precise Properties of 108 TESS Planets and Their Host Stars** *ASTRONOMICAL JOURNAL*

  MacDougall, M. G., Petigura, E. A., Gilbert, G. J., Angelo, I., Batalha, N. M., Beard, C., Behmard, A., Blunt, S., Brinkman, C., Chontos, A., Crossfield, I. J. M., Dai, F., Dalba, et al

  2023; 166 (1)

- **Revised Properties and Dynamical History for the HD 17156 System** *ASTRONOMICAL JOURNAL*

  Kane, S. R., Hill, M. L., Dalba, P. A., Fetherolf, T., Henry, G. W., Fajardo-Acosta, S. B., Gnilka, C. L., Howard, A. W., Howell, S. B., Isaacson, H.

  2023; 165 (6)

- **Revisiting the Red Giant Branch Hosts KOI-3886 and ι Draconis. Detailed Asteroseismic Modeling and Consolidated Stellar Parameters** *ASTRONOMICAL JOURNAL*

  Campante, T. L., Li, T., Ong, J., Corsaro, E., Cunha, M. S., Bedding, T. R., Bossini, D., Breton, S. N., Buzasi, D. L., Chaplin, W. J., Deal, M., Garcia, R. A., Hill, et al

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  Ostberg, C., Kane, S. R., Li, Z., Schwieterman, E. W., Hill, M. L., Bott, K., Dalba, P. A., Fetherolf, T., Head, J. W., Unterborn, C. T.
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- **TESS-Keck Survey. XIV. Two Giant Exoplanets from the Distant Giants Survey** *ASTRONOMICAL JOURNAL*
  Van Zandt, J., Petigura, E. A., MacDougall, M., Gilbert, G. J., Lubin, J., Barclay, T., Batalha, N. M., Crossfield, I. J. M., Dressing, C., Fulton, B., Howard, A. W., Huber, D., Isaacson, et al
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- **TOI-1136 is a Young, Coplanar, Aligned Planetary System in a Pristine Resonant Chain** *ASTRONOMICAL JOURNAL*
  Dai, F., Masuda, K., Beard, C., Robertson, P., Goldberg, M., Batygin, K., Bouma, L., Lissauer, J. J., Knudstrup, E., Albrecht, S., Howard, A. W., Knutson, H. A., Petigura, et al
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- **A Catalog of Habitable Zone Exoplanets** *ASTRONOMICAL JOURNAL*
  Hill, M. L. L., Bott, K., Dalba, P. A. A., Fetherolf, T., Kane, S. R. R., Kopparapu, R., Li, Z., Ostberg, C.
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- **TOI 560: Two Transiting Planets Orbiting a K Dwarf Validated with iSHELL, PFS, and HIRES RVs** *ASTRONOMICAL JOURNAL*
  El Mufti, M., Plavchan, P. P., Isaacson, H., Cale, B. L., Feliz, D. L., Reefe, M. A., Hellier, C., Stassun, K., Eastman, J., Polanski, A., Crossfield, I. J. M., Gaidos, E., Kostov, et al
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  Crossfield, I. J. M., Malik, M., Hill, M. L., Kane, S. R., Foley, B., Polanski, A. S., Coria, D., Brande, J., Zhang, Y., Wienke, K., Kreidberg, L., Cowan, N. B., Dragomir, et al
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- **The TESS-Keck Survey: * Science Goals and Target Selection** *ASTRONOMICAL JOURNAL*
  Chontos, A., Murphy, J., MacDougall, M. G., Fetherolf, T., Van Zandt, J., Rubenzahl, R. A., Beard, C., Huber, D., Batalha, N. M., Crossfield, I. J. M., Dressing, C. D., Fulton, B., Howard, et al
  2022; 163 (6)

- **An Aligned Orbit for the Young Planet V1298 Tau b** *ASTRONOMICAL JOURNAL*
  Johnson, M. C., David, T. J., Petigura, E. A., Isaacson, H. T., van Zandt, J., Ilyin, I., Strassmeier, K., Mallonn, M., Zhou, G., Mann, A. W., Livingston, J. H., Luger, R., Dai, et al
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- **The TESS-Keck Survey. XI. Mass Measurements for Four Transiting Sub-Neptunes Orbiting K Dwarf TOI-1246** *ASTRONOMICAL JOURNAL*
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- **A Second Planet Transiting LTT 1445A and a Determination of the Masses of Both Worlds** *ASTRONOMICAL JOURNAL*
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- **HD 207897 b: A dense sub-Neptune transiting a nearby and bright K-type star** *ASTRONOMY & ASTROPHYSICS*
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- **The TESS-Keck Survey. VIII. Confirmation of a Transiting Giant Planet on an Eccentric 261 Day Orbit with the Automated Planet Finder Telescope*** *ASTRONOMICAL JOURNAL*
  Dalba, P. A., Kane, S. R., Dragomir, D., Villanueva, S., Collins, K. A., Jacobs, T., LaCourse, D. M., Gagliano, R., Kristiansen, M. H., Omohundro, M., Schwengeler, H. M., Terentev, I. A., Vanderburg, et al
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- **Orbital Dynamics and the Evolution of Planetary Habitability in the AU Mic System** *ASTRONOMICAL JOURNAL*
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  2021; 162 (5)

- **TESS-Keck Survey. V. Twin Sub-Neptunes Transiting the Nearby G Star HD 63935** *ASTRONOMICAL JOURNAL*
  Scarsdale, N., Murphy, J., Batalha, N. M., Crossfield, I. J. M., Dressing, C. D., Fulton, B., Howard, A. W., Huber, D., Isaacson, H., Kane, S. R., Petigura, E. A., Robertson, P., Roy, et al
  2021; 162 (5)

- **The TESS-Keck Survey. II. An Ultra-short-period Rocky Planet and Its Siblings Transiting the Galactic Thick-disk Star TOI-561** *ASTRONOMICAL JOURNAL*
  Weiss, L. M., Dai, F., Huber, D., Brewer, J. M., Collins, K. A., Ciardi, D. R., Matthews, E. C., Ziegler, C., Howell, S. B., Batalha, N. M., Crossfield, I. J. M., Dressing, C., Fulton, et al
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- **Physical Parameters of the Multiplanet Systems HD 106315 and GJ 9827*dagger** *ASTRONOMICAL JOURNAL*
  Kosiarek, M. R., Berardo, D. A., Crossfield, I. J. M., Laguna, C., Piaulet, C., Akana Murphy, J. M., Howell, S. B., Henry, G. W., Isaacson, H., Fulton, B., Weiss, L. M., Petigura, E. A., Behmard, et al
  2021; 161 (1)

- **The TESS-Keck Survey. III. A Stellar Obliquity Measurement of TOI-1726 c** *ASTRONOMICAL JOURNAL*
  Dai, F., Roy, A., Fulton, B., Robertson, P., Hirsch, L., Isaacson, H., Albrecht, S., Mann, A. W., Kristiansen, M. H., Batalha, N. M., Beard, C., Behmard, A., Chontos, et al
  2020; 160 (4)

- **A Volatile-poor Formation of LHS 3844b Based on Its Lack of Significant Atmosphere** *PLANETARY SCIENCE JOURNAL*
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- **The TESS-Keck Survey. I. A Warm Sub-Saturn-mass Planet and a Caution about Stray Light in TESS Cameras** *ASTRONOMICAL JOURNAL*
  Dalba, P. A., Gupta, A. F., Rodriguez, J. E., Dragomir, D., Huang, C. X., Kane, S. R., Quinn, S. N., Bieryla, A., Esquerdo, G. A., Fulton, B. J., Scarsdale, N., Batalha, N. M., Beard, et al
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- **Orbital Refinement and Stellar Properties for the HD 9446, HD 43691, and HD 179079 Planetary Systems** *ASTRONOMICAL JOURNAL*
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- **A CATALOG OF KEPLER HABITABLE ZONE EXOPLANET CANDIDATES** *ASTROPHYSICAL JOURNAL*
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