

Emily C. Cunningham

Flatiron Research Fellow

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Education

- UC Santa Cruz**, Ph.D. in Astronomy & Astrophysics June 2019
Designated Emphasis in Statistics
Thesis title: *HALO7D: Disentangling the Milky Way's Accretion History with Observations in 7 Dimensions*
Advisors: Alis Deason (Durham), Raja Guhathakurta (UCSC), Connie Rockosi (UCSC)
- UC Santa Cruz**, M.S. Astronomy & Astrophysics June 2015
- Haverford College**, B.S. with High Honors in Physics and Astronomy May 2012
GPA: 3.914; graduated *Magna Cum Laude*

Awards and Fellowships

- Flatiron Research Fellowship**, Flatiron Institute September 2019–Present
- ARCS Foundation Scholar Award**, UC Santa Cruz 2018-2019
- NSF Graduate Research Fellowship** September 2014-May 2017
- Whitford Prize**, UC Santa Cruz Astronomy Department 2015
Awarded to 2nd year UCSC student(s) who attains highest achievement in research, coursework, teaching, and the preliminary exam.
- Osterbrock Leadership Fellowship**, UC Santa Cruz Astronomy Department August 2013-2017
Award for students committed to learning leadership skills.
- Fulbright Fellowship**, Fulbright U.S. Student Program September 2012-May 2013
One year of funded research at the Institut d'Astrophysique de Paris, supervised by Gary A. Mamon (IAP) and Andrea Cattaneo (Marseille).
- Phi Beta Kappa** 2012

Selected Talks

Selected Recent and Upcoming Seminars

- University of Wisconsin at Madison Colloquium, November 18, 2021 (invited; upcoming).
- University of Arizona Galaxy Crawl Seminar, April 28, 2021 (invited; remote).
- UC Davis Cosmology & Astronomy Seminar, Davis, CA, September 27, 2018 (invited).
- University of Washington DIRAC Institute Seminar, Seattle, WA, May 16, 2018 (invited).
- UC Santa Cruz Colloquium, Santa Cruz, CA, December 13, 2017 (invited).

Selected Recent Conference Presentations

- EAS Annual Meeting, S1: A holistic view of the Milky Way: linking ages, chemistry and kinematics. July 1, 2021.
- GALAH Science Meeting 2021, June 22, 2021 (invited) (video [here](#)).
- STScI Virtual Symposium: The Local Group Assembly and Evolution, September 2, 2020 (video [here](#); beginning at 49:00).

Flatiron-wide Algorithms and Mathematics, New York, NY, October 31, 2019.

Santa Cruz Galaxy Workshop, Santa Cruz, CA, August 9, 2018 (video [here](#)).

"Stellar Halos Across the Cosmos." Max Planck Institute for Astronomy, Heidelberg, Germany, July 2018.

"Science with Precision Astrometry." Space Telescope Science Institute, Baltimore, MD, March 2018 (video [here](#)).

Teaching

Guest Lecturer

University of Pennsylvania: Survey of the Universe, Prof. Robyn Sanderson November 20, 2020

Columbia University: Graduate Course in Galactic Archaeology, Prof. Melissa Ness April 2, 2020

Head Teaching Assistant

Associate Instructor for Astro205 (Fall Quarter 2016). September 2016-August 2017

Responsible for UC Santa Cruz Astronomy Department T.A. training and management.

Instructor, Castilleja School

September 2015-September 2017

Co-instructor for research based seminars for high school students.

Instructor, Project for Inmate Education

September 2014-September 2016

Instructor for pre-algebra and algebra classes at Santa Cruz County Jail

Teaching Assistant

Fall 2013

UCSC ASTR3: The Solar System (Prof. Jonathan Fortney).

Mentoring

Undergraduate Mentoring

Jen Locke, University of Pennsylvania '22 March 2021-present
Supervising project on stream metallicity gradients in the FIRE simulations. Summer project into senior thesis.

Matthew Werneken, Columbia '24 Nov 2020-present
Supervising project on wake signatures in the halo velocity field from both Sagittarius and the LMC.

Madison Harris, UCSC '18 October 2016-January 2018
Mentored in research during junior and senior years, including senior thesis research project on the white dwarf sample in HALO7D.

Graduate Student Mentoring

Alex Riley, Texas A&M University (Ph.D. Expected 2022) July 2021-present
Advising project (that began at CCA Dynamics Summer School) on measuring velocity dipoles in FIRE simulations.

Danny Horta, Liverpool John Moores University (Ph.D. Expected 2022) July 2020-present
Advising project on the chemodynamical properties of early massive merges in the Latte suite of FIRE-2 simulations.

Kevin McKinnon, UCSC (Ph.D. Expected 2023) September 2017-present
Co-advising on measuring stellar abundances from HALO7D spectra.

High School Student Mentoring

Scientific Internship Program Summer 2016-Summer 2018
Mentored summer research projects for two groups of three high school students.

Modern High School, Kolkata, India Summer 2014
Mentored three high school students for their presentation on the HALO7D Survey at the Pacific Astronomy & Engineering Summit.

Service

Scientific Organizing Committee, Big Apple Dynamics Summer School Summer 2021
Helped select mentors and students, developed workshops, and mentored projects.

Referee

Astrophysical Journal, Nature Astronomy

Publications

E.C. Cunningham, R.E. Sanderson, K.V. Johnston, N. Panithanpaisal, M.K. Ness, A. Wetzel, S.R. Loebman, I. Escala, D. Horta, and C.-A. Faucher-Giguère. *Reading the CARDS: the Imprint of Accretion History in the Chemical Abundances of the Milky Way's Stellar Halo*. arXiv:2110.02957 (submitted to ApJ).

E.C. Cunningham, N. Garavito-Camargo, A.J. Deason, K.V. Johnston, D. Erkal, C.F.P. Laporte, G. Besla, R. Luger, and R.E. Sanderson. *Quantifying the Stellar Halo's Response to the LMC's Infall with Spherical Harmonics*. ApJ, 898, 4, 2020.

E.C. Cunningham, A.J. Deason, R.E. Sanderson, S.T. Sohn, J. Anderson, P. Guhathakurta, C.M. Rockosi, R.P. van der Marel, S.R. Loebman, and A. Wetzel. *HALO7D II. The Halo Velocity Ellipsoid and Velocity Anisotropy with Distant Main Sequence Stars*. ApJ, 879, 120, 2019.

E.C. Cunningham, A.J. Deason, C.M. Rockosi, P. Guhathakurta, Z.G. Jennings, E.N. Kirby, E. Toloba, and G. Barro. *HALO7D I: The Line of Sight Velocities of Distant Main Sequence Stars in the Milky Way Halo*. ApJ, 876, 124, 2019.

E.C. Cunningham, A.J. Deason, P. Guhathakurta, C.M. Rockosi, R.P. van der Marel, E. Toloba, K.M. Gilbert, S.T. Sohn, and C.E. Dorman. *Isotropic at the Break? 3D Kinematics of Milky Way Halo Stars in the Foreground of M31*. ApJ, 820, 18, 2016.

W. Wang, S. Kassin, S.M. Faber, D.C. Koo, **E.C. Cunningham** et al. *The Baltimore Oriole's Nest: Cool Winds from the Inner and Outer Parts of a Star-Forming Galaxy at $z = 1.3$* . arXiv:2109.12133 (submitted to ApJ).

M.K. Ness, A.J. Wheeler, K. McKinnon, D. Horta, A.R. Casey, **E.C. Cunningham**, A.M. Price-Whelan. *The homogeneity of the star forming environment in the Milky Way disk over time*. arXiv:2109.05722 (submitted to ApJ).

E. Kado-Fong, R. Sanderson, J. Greene, **E.C. Cunningham**, et al. *The In-situ Origins of Dwarf Stellar Outskirts in FIRE-2*. arXiv:2109.05034 (submitted to ApJ).

S.K. Grunblatt, J.C. Zinn, A.M. Price-Whelan, R. Angus, N. Saunders, M. Hon, A. Stokholm, E.P. Bellinger, S.L. Martell, B. Mosser, **E.C. Cunningham**, J. Tayar, D. Huber, J. Lysgaard Rørsted, V. Silva Aguirre. *Age-Dating Red Giant Stars Associated with Galactic Disk and Halo Substructures*. ApJ, 916, 88, 2021.

N. Panithanpaisal, R.E. Sanderson, A. Wetzel, **E.C. Cunningham**, J. Bailin, and C.-A. Faucher-Giguère. *The Galaxy Progenitors of Stellar Streams around Milky Way-mass Galaxies in the FIRE Cosmological Simulations*. arXiv:2104.09660 (accepted to ApJ).

S. Tacchella, C. Conroy, S.M. Faber, B.D. Johnson, J. Leja, G. Barro, **E.C. Cunningham**, A.J. Deason, P. Guhathakurta, Y. Guo, L. Hernquist, D. C. Koo, K. McKinnon, C.M. Rockosi, J. S. Speagle, P. van Dokkum, H. M. Yesuf. *Fast, Slow, Early, Late: Quenching Massive Galaxies at $z \sim 0.8$* . arXiv: 2102.12494 (submitted to ApJ).

N. Garavito-Camargo, G. Besla, C.F.P. Laporte, A.M. Price-Whelan, **E.C. Cunningham**, K.V. Johnston, M.D. Weinberg, F.A. Gomez. *Quantifying the impact of the Large Magellanic Cloud on the structure of the Milky Way's dark matter halo using Basis Function Expansions*. ApJ, 919, 109.

I. Escala, E.N. Kirby, K.M. Gilbert, J. Wojno, **E.C. Cunningham**, and P. Guhathakurta. *Elemental Abundances in M31: Properties of the Inner Stellar Halo*. ApJ, 902, 51, 2020.

J.A.S. Hunt, K.V. Johnston, A.R. Pettitt, **E.C. Cunningham**, D. Kawata, and D.W. Hogg. *The power of co-ordinate transformations in dynamical interpretations of Galactic structure*. MNRAS, 497, 818, 2020.

- I. Escala, K.M. Gilbert, E.N. Kirby, **E.C. Cunningham**, J. Wojno, P. Guhathakurta. *Elemental Abundances in M31: A Comparative Analysis of Iron and Alpha Element Abundances in the Outer Disk, Giant Stellar Stream, and Inner Halo of M31*. *ApJ*, 889, 177, 2020.
- I. Escala, E.N. Kirby, K.M. Gilbert, **E.C. Cunningham**, J. Wojno. *Elemental Abundances in M31: Alpha and Iron Abundances from Low-resolution Resolved Stellar Spectroscopy in the Stellar Halo*. *ApJ*, 878, 42, 2019.
- H.M. Yesuf, D.C. Koo, S.M. Faber, J.X. Prochaska, Y. Guo, F.S. Liu, **E.C. Cunningham**, A.L. Coil, and P. Guhathakurta. *No Evidence for Feedback: Unexceptional Low-ionization Winds in Host Galaxies of Low Luminosity Active Galactic Nuclei at Redshift $z \sim 1$* . *ApJ*, 841, 83, 2017.
- K.A. Plant, B. Margon, P. Guhathakurta, **E.C. Cunningham**, E. Toloba, and J.A. Munn. *Runaway Dwarf Carbon as Candidate Supernova Ejecta*. *ApJ*, 833, 232, 2016.
- C. Liu, E.W. Peng, E. Toloba, J.C. Mihos, L. Ferrarese, K. Alamo-Martinez, H.-X. Zhang, P. Cote, J.-C. Cuillandre, **E.C. Cunningham**, P. Guhathakurta, S. Gwyn, G. Herczeg, S. Lim, T.H. Puzia, J. Roediger, R. Sánchez-Janssen, and J. Yin. *The Most Massive Ultra-compact Dwarf Galaxy in the Virgo Cluster*. *ApJL*, 812, L2, 2015.
- A.J. Deason, V. Belokurov, K.M. Hamren, S.E. Koposov, K.M. Gilbert, R.L. Beaton, C.E. Dorman, P. Guhathakurta, S.R. Majewski, and **E.C. Cunningham**. *TriAnd and its Siblings: Satellites of Satellites in the Milky Way Halo*. *MNRAS*, 444, 3975, 2014.
- E. Boettcher, B. Willman, R. Fadely, J. Strader, M. Baker, E. Hopkins, T. Tasnim Ananna, **E.C. Cunningham**, T. Douglas, J. Gilbert, A. Preston, A.P. Sturner. *A Search for RR Lyrae Stars in Segue 2 and Segue 3*. *AJ*, 146, 94, 2013.