

Ethan Nadler | Curriculum Vitae

Carnegie Observatories & University of Southern California

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Research

Dark Matter.....

- Linking dark matter particle properties to small-scale structure throughout cosmic history;
- Modeling dark matter–baryon interactions, self-interactions, and production mechanisms.

Computational Astrophysics.....

- Emulating the impact of baryons on small scales using cosmological simulations;
- Empirically modeling the connection between faint galaxies and dark matter halos.

Near-field Cosmology.....

- Developing a semi-analytic framework to extract primordial physics from Milky Way satellites;
- Unifying dark matter constraints from near-field probes of cosmic structure.

Positions

Carnegie Observatories & University of Southern California

2021–

Postdoctoral Research Fellow

Education

Stanford University

2021

Ph.D., Physics

Thesis: [Faint Galaxies and Small Halos: Probes of Galaxy Formation and Dark Matter](#)

University of California, Santa Barbara

2016

B.S., Physics

Thesis: Universality in the Structure and Abundance of Dark Matter Halos

Scientific Collaborations

Satellites Around Galactic Analogs Survey: Member

2019–

DECam Local Volume Exploration (DELVE) Survey: Member

2019–

Rubin LSST Dark Energy Science Collaboration: Member, Dark Matter Working Group

2018–

Dark Energy Survey: Member, Milky Way Working Group

2018–

Fellowships & Awards

Carnegie DEI Grant: CreateNow + Carnegie: Dark Matter Visualizations for Art and Science

2022–

XSEDE Allocation: Cosmological Simulations of Milky Way-like Systems with Galactic Disks

2022–

XSEDE Allocation: Simulations of Milky Way Halos with Large Magellanic Cloud Analogs

2020–21

NSF Graduate Research Fellow: National Science Foundation

2018–21

Faculty Committee Commendation of Excellence: UCSB College of Creative Studies

2016

Outstanding Senior Award: UCSB Department of Physics

2016

Mentoring

Graduate Students

2021–

- Trey Driskell, USC: Generating constrained dark matter merger trees;
- Noah Glennon, University of New Hampshire: Soliton orbital evolution with axion self-interactions;
- Elise Darragh-Ford, Stanford: Searching for dwarf galaxies in *Gaia* data;
- Yunchong Wang, Stanford: Modeling dwarf galaxy star formation histories;
- Sidney Mau, Stanford: Dwarf galaxy constraints on decaying dark matter;

Undergraduate & Post-baccalaureate Students

2018–

- Shuxing Fang, USC '22: Large Magellanic Cloud infall in self-interacting dark matter;
- Nyal McCrea, CWU '22 & Simons-NSBP Scholar: Visualizing subhalos in cosmological simulations;
- Resherle Verna, USC '20: Evolution of subhalo populations in SIDM hydrodynamic simulations;
- Deveshi Buch, Stanford '23: Constrained simulations of Milky Way-like systems;
- Veronica Pratt, Stanford '23: Statistics of Large Magellanic Cloud analogs in the SAGA Survey;
- Nicel Mohamed-Hinds, Stanford '19 → UW: Emulating hydrodynamic zoom-in simulations;
- Abigail Lee, UPenn '19 → UChicago: Subhalo disruption in galaxy clusters.

Teaching

Teaching Assistant (Stanford)

2017–21

- *Structure Formation & Galaxy Formation, Modern Astrophysics, Cosmology & Extragalactic Astrophysics, Origin & Development of the Cosmos, Electricity & Magnetism.*

Course Assistant (UCSB)

2015–16

- *Relativistic Quantum Mechanics, Kinetic Theory & Relativity, Mechanics & Waves, Newtonian Mechanics.*

Tutor (UCSB Campus Learning Assistance Services)

2015-16

- Held biweekly supplementary lectures for *Basic Physics, Linear Algebra, Differential Equations.*

Service & Outreach

USC Physics Climate Committee (Member)

2021–

UCSB Physics NSF REU (Speaker)

2021

San Mateo County Astronomical Society (Speaker) [[video](#)]

2021

Journal Referee (*ApJ*, *Astropart. Phys.*, *JCAP*, *MNRAS*)

2019–

Astronomy on Tap San Francisco (Speaker and Volunteer)

2018–20

Stanford Future Advancers of Science and Technology (Physics Mentor)

2017–19

Media

KIPAC Research Highlight, [Between the worlds of the visible and invisible lies: Dark Matter](#)

2021

Fermilab Press Release, [DES census of the smallest galaxies hones the search for dark matter](#)

2020

SLAC Press Release, [Milky Way satellites reveal link between dark matter and galaxy formation](#)

2020

AAS Nova Research Highlight, [Constraining collisions of dark matter](#)

2019

SLAC Press Release, [Satellite galaxies provide new clues about dark matter](#)

2019

KIPAC Research Highlight, [Dark matter subhalo disruption: insights from machine learning](#)

2018

Presentations

Dark Matter Physics + Rubin LSST

2022

AAS 239, Dark Energy Science Collaboration Special Session*

Towards Precision Near-Field Cosmology

2021–

UC Riverside, Astronomy Seminar*

Fermilab, Cosmic Physics Center Seminar*

<i>Dark Matter Constraints from a Unified Analysis of Strong Lenses and Satellite Galaxies</i> LSST DESC Dark Matter Working Group* Virginia Tech Center for Neutrino Physics, Journal Club*	2021
<i>The Faintest Galaxies and their Dark Matter Halos</i> Caltech, TAPIR Seminar* Minnesota Institute for Astrophysics, Cosmology Lunch Seminar* Harvard-Smithsonian Center for Astrophysics, GCSP Seminar [video] International Centre for Theoretical Sciences, Less Travelled Path of Dark Matter* [video , slides] UC Santa Cruz, FLASH Seminar* UC Berkeley Center for Cosmological Physics, Cosmology Seminar* [slides] STScI, The Local Group: Assembly and Evolution KITP, The Galaxy–Halo Connection Across Cosmic Time: Recent Updates [video] LineA, Webinar* [video , slides] KIPAC, Astrophysics Colloquium* [video] Fermilab, New Perspectives [slides] USC, CosmoLab Seminar* BSM Pandemic Seminar* [video , slides] Fermilab, Wine & Cheese*	2020–21
<i>Milky Way Satellites: Probes of Dark Matter Microphysics</i> University of Chicago, Cosmic Controversies [slides] KICP, LSST Dark Matter Workshop* [slides] Institute for Advanced Study, Astro Coffee* Johns Hopkins, High Energy Physics/Cosmology Seminar* UC Berkeley, LSST DESC Winter Collaboration Meeting	2019
<i>Modeling Subhalos and Satellites in Milky Way-like Systems</i> KICP, Near-Field Cosmology with DES DR1* [slides] KITP, The Small-Scale Structure of Cold(?) Dark Matter [video , slides] UC Berkeley Center for Cosmological Physics, Cosmology Seminar* [slides]	2018
<i>Predicting Realistic Subhalo Populations</i> KITP, The Galaxy–Halo Connection Across Cosmic Time *invited presentation	2017

First & Co-Authored Publications

- E. O. Nadler**, A. Banerjee, S. Adhikari, Y.-Y. Mao, and R. H. Wechsler. *The Effects of Dark Matter and Baryonic Physics on the Milky Way Subhalo Population in the Presence of the Large Magellanic Cloud*. 2021, [ApJL](#), **920**, L11.
- E. O. Nadler**, S. Birrer, D. Gilman, R. H. Wechsler, X. Du, A. Benson, A. Nierenberg, and T. Treu. *Dark Matter Constraints from a Unified Analysis of Strong Gravitational Lenses and Milky Way Satellite Galaxies*. 2021, [ApJ](#), **917**, 7.
- S. Das & **E. O. Nadler**. *Constraints on the epoch of dark matter formation from Milky Way satellites*. 2021, [PRD](#) **103**, 043517.
- E. O. Nadler** & A. Drlica-Wagner *et al.* (DES Collaboration). *Constraints on Dark Matter Properties from Observations of Milky Way Satellite Galaxies*. 2021, [PRL](#) **126**, 091101.
- E. O. Nadler**, A. Banerjee, S. Adhikari, Y.-Y. Mao, and R. H. Wechsler. *Signatures of Velocity-dependent Dark Matter Self-interactions in Milky Way-mass Halos*. 2020, [ApJ](#), **896**, 112.
- E. O. Nadler** & R. H. Wechsler *et al.* (DES Collaboration). *Milky Way Satellite Census. II. Galaxy-Halo Connection Constraints Including the Impact of the Large Magellanic Cloud*. 2020, [ApJ](#), **893**, 48.
- E. O. Nadler**, V. Gluscevic, K. K. Boddy, and R. H. Wechsler. *Constraints on Dark Matter Microphysics from the Milky Way Satellite Population*. 2019, [ApJL](#), **878**, L32.

- E. O. Nadler**, Y.-Y. Mao, G. M. Green, and R. H. Wechsler. *Modeling the Connection between Subhalos and Satellites in Milky Way-like Systems*. 2019, [ApJ](#), 873, 34.
- E. O. Nadler**, Y.-Y. Mao, R. H. Wechsler, S. Garrison-Kimmel, and A. Wetzel. *Modeling the Impact of Baryons on Subhalo Populations with Machine Learning*. 2018, [ApJ](#), 859, 129.
- E. O. Nadler**, A. Perko, and L. Senatore. *On the bispectra of very massive tracers in the Effective Field Theory of Large-Scale Structure*. 2018, [JCAP](#), 1, 058.
- E. O. Nadler**, S. P. Oh, and S. Ji. *On the apparent power law in CDM halo pseudo-phase space density profiles*. 2017, [MNRAS](#), 470, 500.

Nth-Author Publications

- J. F. Wu, J. E. G. Peek, E. J. Tollerud, Y.-Y. Mao, **E. O. Nadler et al.** *Extending the SAGA Survey (xSAGA) I: Satellite Radial Profiles as a Function of Host Galaxy Properties*. [2112.01542](#) (ApJ submitted).
- S. Bhattacharyya, S. Adhikari, A. Banerjee, S. More, A. Kumar, **E. O. Nadler et al.** *The Signatures of Self-Interacting Dark Matter and Subhalo Disruption on Cluster Substructure*. [2106.08292](#) (ApJ submitted).
- D. Nguyen, D. Sarnaik, K. K. Boddy, **E. O. Nadler**, and V. Gluscevic. *Observational constraints on dark matter scattering with electrons*. 2021, [PRD](#) 104, 103521.
- A. Drlica-Wagner, J. Carlin, D. L. Nidever et al. (DELVE Collaboration, incl. **E. O. Nadler**). *The DECam Local Volume Exploration Survey: Overview and First Data Release*. 2021, [ApJS](#), 256, 2.
- Y. Wang, **E. O. Nadler**, Y.-Y. Mao, S. Adhikari, R. H. Wechsler et al. *UNIVERSEMACHINE: Predicting Galaxy Star Formation over Seven Decades of Halo Mass with Zoom-in Simulations*. 2021, [ApJ](#) 915, 116.
- Major contributions: Interpretation of dwarf galaxy star formation history predictions, simulation analysis.
- E. Darragh-Ford, **E. O. Nadler**, S. McLaughlin, and R. H. Wechsler. *Searching for Dwarfs in Gaia DR2 Phase-space Data using Wavelet Transforms*. 2021, [ApJ](#) 915, 48.
- Major contributions: Pilot study, search algorithm development, predictions for number of detected dwarfs.
- K. Maamari, V. Gluscevic, K. K. Boddy, **E. O. Nadler**, and R. H. Wechsler. *Bounds on velocity-dependent dark matter–proton scattering from Milky Way satellite abundance*. 2021, [ApJL](#) 907, L46.
- Major contributions: Development of numerical techniques to constrain interacting dark matter models.
- Y.-Y. Mao, M. Geha, R. H. Wechsler, B. Weiner, E. J. Tollerud, **E. O. Nadler et al.** *The SAGA Survey. II. Building a Statistical Sample of Satellite Systems around Milky Way-like Galaxies*. 2021, [ApJ](#), 907, 85.
- Major contributions: Interpretation of SAGA observations in the context of galaxy–halo connection models.
- A. Drlica-Wagner, K. Bechtol, S. Mau, M. McNanna, **E. O. Nadler et al.** (DES Collaboration). *Milky Way Satellite Census. I. The Observational Selection Function for Milky Way Satellites in DES Y3 and Pan-STARRS DR1*. 2020, [ApJ](#), 893, 47.
- Major contributions: Machine-learning modeling of satellite detection sensitivity, simulation analysis.
- S. Mau & W. Cerny et al. (DELVE Collaboration, incl. **E. O. Nadler**). *Two Ultra-Faint Milky Way Stellar Systems Discovered in Early Data from the DECam Local Volume Exploration Survey*. 2020, [ApJ](#), 890, 136.
- C. E. Martínez-Vázquez et al. (DES Collaboration, incl. **E. O. Nadler**). *Search for RR Lyrae stars in DES ultrafaint systems: Grus I, Kim 2, Phoenix II, and Grus II*. 2019, [MNRAS](#) 490, 2183.
- K. M. Stringer et al. (DES Collaboration, incl. **E. O. Nadler**). *Identification of RR Lyrae stars in multiband, sparsely-sampled data from the Dark Energy Survey using template fitting and Random Forest classification*. 2019, [AJ](#) 158, 16.

White Papers

V. Gluscevic *et al.* *Cosmological Probes of Dark Matter Interactions: The Next Decade*. 2019, [1903.05140](#).

J. Simon *et al.* *Dynamical Masses for a Complete Census of Local Dwarf Galaxies*. 2019, [1903.047435](#).

K. Bechtol *et al.* *Dark Matter Science in the Era of LSST*. 2019, [1903.04425](#).

A. Drlica-Wagner & Y.-Y. Mao *et al.* *Probing the Fundamental Nature of Dark Matter with the Large Synoptic Survey Telescope*. 2019, [1902.01055](#).

○ Major contributions: Forecasts and theoretical development for LSST dwarf galaxy dark matter constraints.

Interdisciplinary Studies

D. Guilbeault, E. O. Nadler *et al.* *Color associations in abstract semantic domains*. 2020, [Cognition 201, 104306](#).

B. S. Desikan, T. Hull, E. O. Nadler *et al.* *comp-syn: Perceptually Grounded Word Embeddings with Color*. 2020, [Proceedings of the 28th International Conference on Computational Linguistics, 1744](#).

Stanford Art of Science 2020, *The Graduate Students in Electrical Engineering Prize: Changing Views in Data Science over Fifty Years*.