

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.....

- Unifying dark matter constraints from dwarf galaxies and strong gravitational lensing;
- Developing constrained N-body simulations of Milky Way and strong lens analogs.

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

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

2020–

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

Highest Academic Honors: 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: Integrating *Gaia* data in dwarf galaxy searches;
- Yunchong Wang, Stanford: Modeling dwarf galaxy star formation histories;
- Sidney Mau, Stanford: Dwarf galaxy constraints on decaying dark matter;

Undergraduate & Post-baccalaureate Students

2018–

- Nyal McCrea, Central Washington '22 & NSBP: Visualizing subhalos in cosmological simulations;
- Resherle Verna, USC '20: Self-interacting dark matter in hydrodynamic simulations;
- Deveshi Buch, Stanford '23: Cosmological simulations of Milky Way-like halos;
- Veronica Pratt, Stanford '23: Statistics of Large Magellanic Cloud analogs in SAGA data;
- 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, and Electricity & Magnetism.*

Course Assistant (UCSB)

2015–16

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

Tutor (UCSB Campus Learning Assistance Services)

2015–16

- Held biweekly supplementary lectures for *Basic Physics, Linear Algebra, and 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

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 Constraints from a Unified Analysis of Strong Lenses and Satellite Galaxies

2021

LSST DESC Dark Matter Working Group*

Virginia Tech Center for Neutrino Physics, Journal Club*

The Faintest Galaxies and their Dark Matter Halos

2020–21

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*

Milky Way Satellites: Probes of Dark Matter Microphysics 2019

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

Modeling Subhalos and Satellites in Milky Way-like Systems 2018

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](#)]

Predicting Realistic Subhalo Populations 2017

KITP, The Galaxy–Halo Connection Across Cosmic Time

*invited presentation

First & Co-Authored Publications

E. O. Nadler, S. Birrer, D. Gilman, R. H. Wechsler, X. Du, A. Benson *et al.* *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**, 32.

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

D. Nguyen, D. Sarnaik, K. K. Boddy, **E. O. Nadler**, and V. Gluscevic. *Observational constraints on dark matter scattering with electrons*. [2107.12380](#) (PRD 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).

A. Drlica-Wagner, J. Carlin, D. L. Nidever *et al.* (DELVE Collaboration). *The DECam Local Volume Exploration Survey: Overview and First Data Release*. [2103.07476](#) (ApJ submitted).

Y. Wang, **E. O. Nadler 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 et al.** *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, 46](#).

- 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). *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). *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). *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 2nd Place Prize: Changing Views in Data Science over Fifty Years*.