

NICOLE E. DRAKOS CURRICULUM VITÆ

CONTACT INFORMATION

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RESEARCH INTERESTS

I am a theoretical astrophysicist, studying structure formation in the Universe. I lead the Simulations Working Group for the James Webb Space Telescope's COSMOS-Web survey, and was a member of Nancy Grace Roman Space Telescope's Extragalactic Potential Observations Team. In addition to these collaborations, I develop dynamical models of dark matter halo evolution, in order to answer questions about galaxy formation, cosmology, and the nature of dark matter.

EMPLOYMENT

- 08/2023 - PRESENT Visiting Assistant Professor
University of Hawaii, Hilo
- 09/2021 - 08/2023 NSERC Postdoctoral Fellow
University of California, Santa Cruz | Faculty Mentor: BRANT ROBERTSON
- 09/2019 - 08/2023 Postdoctoral Scholar
University of California, Santa Cruz | Faculty Mentor: BRANT ROBERTSON

EDUCATION

- 2015-2019 Doctor of Philosophy in PHYSICS AND ASTRONOMY
University of Waterloo | Advisor: JAMES TAYLOR
Thesis: "The Evolution of Dark Matter Haloes in Mergers"
- 2013-2015 Master of Science in APPLIED MATHEMATICS
Mathematical Biology with Scientific Computing
Western University | Advisor: LINDI WAHL
Thesis: "The Effect of Diversification on the Dynamics of Mobile Genetic Elements in Prokaryotes: The Birth-Death-Diversification Model"
- 2011-2013 Bachelor Degree in SCIENCE
Honors Double Major in Applied Mathematics and Astrophysics
Western University
- 2007-2011 Bachelor Degree in MEDICAL SCIENCE
Honors Specialization in Medical Science
Western University

HONOURS AND AWARDS

- 09/2020-08/2022 NSERC Postdoctoral Fellowship (\$90,000 CAD)
National postdoctoral fellowship for researchers in the natural sciences or engineering.
- 05/2017-04/2019 NSERC Postgraduate Scholarship (\$42,000 CAD)
National merit-based scholarship for doctoral students in the natural sciences or engineering.
- 05/2016-04/2017 Ontario Graduate Scholarship (\$15,000 CAD)
Provincial merit-based scholarship for graduate students.
- 05/2016-04/2019 Waterloo's President's Graduate Scholarship (\$30,000 CAD)
Awarded to graduate students who hold major competition-based scholarships.
- 05/2014-04/2015 Queen Elizabeth II Scholarship (\$15,000 CAD)
Provincial merit-based scholarship for graduate students in science or technology.
- AWARDED 06/2013 Dillon Gold Medal
Awarded to the student graduating with the highest standing in any Honors Applied Mathematics program.
- AWARDED 06/2013 Western Gold Medal in Astrophysics
Awarded to the student graduating with the highest standing in the Astrophysics module.

FUNDED PROPOSALS

- 08/2023 Chasing Giants: Discovering a Large Population of $z > 3$ Massive Quiescent Galaxies with ALMA
ALMA Cycle 10 proposal 2023.1.00885.S, 29.2 hours PI: Long, A
- 08/2023 The COSMOS High-z ALMA-MIRI Population Survey (CHAMPS): A Wide-Area Comprehensive Survey of the Dusty Universe
ALMA Cycle 10 proposal 2023.1.00180.L, 143.5 hours PI: Faisst, A
- 08/2023 Caught in the Web: ALMA Data for Every Sub-Millimeter Galaxy Over the COSMOS-Web Survey Field
ALMA Cycle 10 proposal 2023.1.00170.S, 6.7 hours PI: McKinney, J
- 12/2021 The Webb Epoch of Reionization Lyman-alpha Survey (WERLS)
NASA Key Strategic Mission Support, 29 nights PI: Casey, C. and Kartaltepe, J.
- 03/2021 COSMOS-Webb: The Webb Cosmic Origins Survey
James Webb Space Telescope Cycle 1 proposal 1727, 208.6 hours PI: Kartaltepe, J. and Casey, C.

SELECTED INVITED TALKS

- 3/2023 *New Insights Into Structure Formation*
Duke Seminar, Durham, North Carolina, USA
- 2/2023 *New Insights Into Structure Formation*
UVa Seminar, Charlottesville, Virginia, USA
- 6/2022 *DREaMing of a Roman Ultra-Deep Field*
AAS Annual Meeting (Roman Splinter Session), Pasadena, California, USA
- 4/2022 *DREaM Synthetic Galaxy Catalogs for a Roman Ultra Deep Field*
IPAC Seminar, Pasadena, California, USA (virtual)
- 09/2021 *Using the DREaM synthetic galaxy catalog to study the science returns of a Roman Ultra Deep Field*
Roman Virtual Lecture Series
- 07/2021 *Preparing for Deep Galaxy Surveys with Mock Catalogs*
Astro Seminar Series, Waterloo Centre for Astrophysics (virtual)

SERVICE

Committees

- 06/2022-PRESENT Lead of the COSMOS-Web Simulations Working Group
- 01/2022-04/2022 Member of the PoSTER Conference Organizing Committee
- 09/2021-10/2022 UCSC DEI Committee Member
- 07/2020-09/2022 UCSC Postdoc Representative
- 06/2020-08/2021 UCSC Cosmology–Galaxy–IGM Seminar Organizer
- 09/2019-09/2022 UCSC Cosmology–Galaxy ArXiv Discussion Leader/Organizer
- 01/2016-08/2018 Waterloo Astronomy ArXiv Discussion Leader
- 10/2013-10/2014 Applied Mathematics Representative for the Society of Graduate Studies
- 09/2013-08/2015 Co-chair of the Applied Mathematics Social Committee

Outreach

- 04/2023 Nā Hōkū Huihui tree planting – *volunteer*
- 05/2023 Astroday – *volunteer*
- 12/2021 JWST: Countdown to Launch Event – *volunteer*
- 07/2020 Santa Cruz Astronomy On Tap – *speaker*

Academic Service

- REVIEWER:** NASA FINESST 2020, 2021, 2022; NASA ROSES 2020, 2022
- REFEREE:** *Monthly Notices of the Royal Astronomical Society*

TEACHING AND MENTORING

Course Instruction

FALL 2023 **ASTR 110 - General Astronomy**, 30 students

A survey of modern astronomy intended for non-science majors; the structure and evolution of the solar system, stars, stellar systems, and the Universe.

PHYS 170 - Gen Phys I: Mechanics, 25 students

Introductory physics designed for students majoring in physical sciences or engineering. Covers mechanics of particles, extended bodies, rotational dynamics, conservation laws, fluids, and wave motion.

ASTR 350L - Stellar Astrophysics Lab, 8 students

A laboratory course in experimental astrophysics where students obtain data of stars, star clusters, and star-forming regions with small, portable telescopes and telescopes on Maunakea. Weekly laboratory projects use data obtained with telescopes, cameras, and spectrographs and solidify theoretical concepts.

Undergraduate Mentoring

10/2021-PRESENT Alexandra Junell Brown (UCSC): *Galaxy–Halo Connection with Normalizing Flows*
 10/2021-06/2023 Tali Oh (UCSC): *Identifying Low Redshift Interlopers with EBMs*
 10/2021-08/2022 Fenix Lopez (UCSC): *Dimension Reduction of High-Redshift Galaxy Catalogs*
 06/2021-PRESENT Bradley Arias (Lamat Student): *Tidal Stripping of Two-Component Systems*
 06/2021-08/2021 Pablo Flores-Rodriguez (Lamat Student): *Transfer Learning in Morpheus*
 06/2020-08/2020 Peter Santana-Rodriguez (Lamat Student): *Tidal Stripping Simulations*
 06/2020-08/2020 Miguel Montalvo (Lamat Student): *Clustering in Abundance Matching*

Professional Development

09/2023-05/2024 Piko Hawai'i Faculty Development Program
 07/2021 Lamat Mentor Training

Other Teaching Experience

BOOTCAMPS: Lamat Python Bootcamp (2020,2021,2022)

TEACHING ASSISTANTSHIPS: *University of Waterloo: Cosmology (PHYS 787: Winter 2019); Modern Physics Laboratory (PHYS 360/460: Fall 18); Astronomical Observations, Instrumentation and Data Analysis Laboratory (PHYS 270L: Winter 2018); Computational Physics (PHYS 236: Fall 2017); Physics 2 Laboratory (PHYS 112L: Fall 2016, Winter 2017); Mechanics Laboratory (PHYS121L/131L: Fall 2016, Fall 2015); Introduction to the Universe (PHYS 175: Winter 2016). University of Western Ontario: Calculus and Probability with Biological Applications (AM 1201: Winter 2014, Winter 2015); Applied Mathematical and Numerical Methods for Mechanical Engineers (AM 2413: Fall 2014); Calculus I (CALC 1000: Fall 2013).*

PUBLICATIONS

[ADS Library](#)

Mercier, W. et al. The COSMOS-Web ring: in-depth characterisation of an Einstein ring lensing system at $z \sim 2$ *Submitted to Astronomy & Astrophysics*, [arXiv:2309.15986](#).

Cooper, O.R. et al. The Web Epoch of Reionization Lyman- α Survey (WERLS) I. MOSFIRE Spectroscopy of $z \sim 7-8$ Lyman- α Emitters? *Submitted to The Astrophysical Journal*, [arXiv:2308.00830](#).

Casey, C.M., et al. COSMOS-Web: Intrinsically Luminous $z \gtrsim 10$ Galaxy Candidates Test Early Stellar Mass Assembly *Submitted to The Astrophysical Journal*, [arXiv:2309.06656](#).

Drakos, N.E., Taylor, J.E. and Benson A.J. Do assumptions about the central density of subhaloes effect dark matter annihilation and lensing calculations? *Submitted to Monthly Notices of the Royal Astronomical Society*, [arXiv:2308.00830](#).

Franco, M. et al. Unveiling the distant Universe: Characterizing $z \geq 9$ Galaxies in the first epoch of COSMOS-Web. *Submitted to The Astrophysical Journal*, [arXiv:2308.00751](#).

Amoura, Y., Drakos, N.E., Berrouet, A., and Taylor, J.E. Halo Growth and Merger Rates as a Cosmological Test. *Monthly Notices of the Royal Astronomical Society*, *in press*, [arXiv:2311.03580](#).

McKinney, J., et al. A Near-Infrared Faint, Far-Infrared-Luminous Dusty Galaxy at $z \sim 5$ in COSMOS-Web. *The Astrophysical Journal* 956:2:72, 2023, [arXiv:2304.07316](#).

Akins, H.B., et al. Two massive, compact, and dust-obscured candidate galaxies discovered by JWST. *The Astrophysical Journal* 956:1:61, 2023, [arXiv:2304.12347](#).

Casey, C.M., Kartaltepe, J.S., Drakos, N.E., et al. COSMOS-Web: An Overview of the JWST Cosmic Origins Survey. *The Astrophysical Journal* 954:1:31, 2023, [arXiv:2211.07865](#).

Hausen, R., et al. Revealing the Galaxy-Halo Connection Through Machine Learning. *The Astrophysical Journal* 945:2:122, 2023, [arXiv:2204.10332](#).

Drakos, N.E., Taylor, J.E. and Benson A.J. A universal model for the evolution of tidally stripped systems. *Monthly Notices of the Royal Astronomical Society* 516:1:106, 2022, [arXiv:2207.14803](#).

Drakos, N.E. et al. Deep Realistic Extragalactic Model (DREaM) Galaxy Catalogs: Predictions for a Roman Ultra-Deep Field. *The Astrophysical Journal* 926:2:194, 2022, [arXiv:2110.10703](#).

Amoura, Y., Drakos, N.E., Berrouet, A., and Taylor, J.E. Cluster Assembly Times as a Cosmological Test. *Monthly Notices of the Royal Astronomical Society* 508:1:100-117, 2021, [arXiv:2109.08986](#).

Balogh, M.L. et al. The GOGREEN and GCLASS Surveys: Data Release. *Monthly Notices of the Royal Astronomical Society* 500:1:358-387, 2021, [arXiv:2009.13345](#).

Drakos, N.E., Taylor, J.E. and Benson A.J. Mass-loss in tidally stripped systems: the energy-based truncation method. *Monthly Notices of the Royal Astronomical Society* 494:1:378-395, 2020, [arXiv:2003.09452](#).

Drakos, N.E., Taylor, J.E., Berrouet, A., Robotham, A.S.G., and Power, C. Major mergers between dark matter haloes – II: Profile and concentration changes. *Monthly Notices of the Royal Astronomical Society* 487:1:1008-1024, 2019, [arXiv:1811.12844](https://arxiv.org/abs/1811.12844).

Drakos, N.E., Taylor, J.E., Berrouet, A., Robotham, A.S.G., and Power, C. Major mergers between dark matter haloes – I: Predictions for size, shape, and spin. *Monthly Notices of the Royal Astronomical Society* 487:1:993-1007, 2019, [arXiv:1811.12839](https://arxiv.org/abs/1811.12839).

Sove, R.J., Drakos, N.E., Fraser, G.M. and Ellis C.G. Using digital inpainting to estimate incident light intensity for the calculation of red blood cell oxygen saturation from microscopy images. *Journal of Biophotonics* e201800103, 2018.

Drakos, N.E., Taylor, J.E. and Benson A.J. The phase-space structure of tidally stripped haloes. *Monthly Notices of the Royal Astronomical Society* 468.2:2345-2358, 2017, [arXiv:1703.07836](https://arxiv.org/abs/1703.07836).

Drakos, N.E. and Wahl, L.M. Extinction probabilities and stationary distributions of mobile genetic elements in prokaryotes: the birth-death-diversification model. *Theoretical Population Biology* 106: 22-31, 2015.

OTHER RESEARCH CONTRIBUTIONS

Transient Classifications (*performed as part of the ASTR350L class.*)

- Matheson, P. et al. Spectroscopic Classifications with the SNIFS spectrograph on the UH88-inch Telescope. *The Astronomer's Telegram* 16256, 2023.
- Ward, E. et al. Spectroscopic Classification of SN 2023teg with the SNIFS spectrograph on the University of Hawai'i 88-inch Telescope. *The Astronomer's Telegram* 16252, 2023.

Code Development

- Drakos, N.E., and Taylor, J.E. ICICLE: Initial Conditions for Isolated CoLLisionless systEMs, <https://github.com/ndrakos/ICICLE>.

News Highlights

- [Simulated Image Shows How NASA's Roman Could Expand on Hubble's Deepest View](#)
- [James Webb Space Telescope program aims to map the earliest structures of the universe](#)