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

Offered 2023	CITA National Fellowship (<i>Declined</i>) National postdoctoral fellowship for fellows working in theoretical astrophysics.
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.

OBSERVING PROPOSALS

2024, КЕСК 2024в	Mapping a Large Ionized Bubble at z = 7.68. 1 <i>night, ID</i> #H478, PI: <u>Drakos, N.</u>
2023, ALMA CYCLE 10	Chasing Giants: Discovering a Large Population of z > 3 Massive Quiescent Galaxies with ALMA 29.2 hours, 2023.1.00885.S, PI: Long, A.
2023, ALMA CYCLE 10	The COSMOS High-z ALMA-MIRI Population Survey (CHAMPS): A Wide-Area Comprehensive Survey of the Dusty Universe 143.5 hours, 2023.1.00180.L, PI: Faisst, A
2023, ALMA CYCLE 10	Caught in the Web: ALMA Data for Every Sub-Millimeter Galaxy Over the COSMOS-Web Survey Field 6.7 hours, 2023.1.00170.S, , PI: McKinney, J
2021, Keck 2022A	The Webb Epoch of Reionization Lyman-alpha Survey (WERLS)

29 nights, NASA Key Strategic Mission Support. PIs: Casey, C. and Kartaltepe, J.

2021, JWST CYCLE 1 COSMOS-Web: The Webb Cosmic Origins Survey 208.6 hours, ID#1727, PIs: Kartaltepe, J. and Casey, C.

SELECTED INVITED TALKS

3/2023	<i>New Insights Into Structure Formation</i> Duke Seminar, Durham, North Carolina, USA
2/2023	<i>New Insights Into Structure Formation</i> UVa Seminar, Charlottesville, Virgina, 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	<i>Preparing for Deep Galaxy Surveys with Mock Catalogs</i> Astro Seminar Series, Waterloo Centre for Astrophysics (virtual)

TEACHING AND MENTORING

Course Instruction

ASTR 110: General Astronomy, UHH - SPRING 2024 (18 students), FALL 2023 (28 students) *A survey of modern astronomy intended for non-science majors.*

ASTR/PHYS 260: Computational Physics, UHH - SPRING 2024 (9 students)

Computational techniques in physics and astronomy, with an emphasis on fundamental algorithms and development of code in Python.

ASTR/PHYS 260L: Computational Physics Lab, UHH - SPRING 2024 (9 students)

An introduction to programming skills relevant to astronomy and physics.

PHYS 170: Gen Phys I Mechanics, UHH - SPRING 2024 (18 students), FALL 2023 (21 students) *Introductory physics designed for students majoring in physical sciences or engineering.*

ASTR 350L: Stellar Astrophysics Lab, UHH - FALL 2023 (8 students)

A laboratory course in experimental astrophysics where students obtain data of stars, star clusters, and starforming regions with small, portable telescopes and telescopes on Maunakea.

Undergraduate Mentoring

06/2024-present	James Zisk (UHH): Dark Matter Halo Merger Simulations
06/2024-present	Ian Padgett (Akamai Internship): Peculiar Velocities
06/2021-PRESENT	Bradley Arias (Lamat REU): Tidal Stripping of Two-Component Systems
10/2021-01/2024	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
06/2021-08/2021	Pablo Flores-Rodriguez (Lamat REU): Transfer Learning in Morpheus
06/2020-08/2020	Peter Santana-Rodriguez (Lamat REU): Tidal Stripping Simulations
06/2020-08/2020	Miguel Montalvo (Lamat REU): Clustering in Abundance Matching

Professional Development

09/2023-Present	Piko Hawai'i Faculty Development Program
05/2024	Akamai Mentor Training
03/2024	safeTALK Suicide Alertness Training
07/2021	Lamat Mentor Training

Other Teaching Experience

DIRECTED STUDIES: Koji Miyakawa (Spring 2024) **BOOTCAMPS:** Lamat Python Bootcamp (2020,2021,2022)

TEACHING ASSISTANTSHIPS: University of Waterloo: Cosmology (PHYS 787: Winter 2019); Modern Physics Labratory (PHYS 360/460: Fall 2018); Astronomical Observations, Instrumentation and Data Analysis Laboratory (PHYS 270L: Winter 2018); Computational Physics (PHYS 236: Fall 2017); Physics 2 Labratory (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).

SERVICE

Committees

01/2024-present	UHH Retention Committee
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
09/2013-08/2015	Co-chair of the Applied Mathematics Social Committee

<u>Outreach</u>

05/2024 Astroday, UHH booth – *volunteer* 04/2024 UHH Eclipse Event – *volunteer*

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

Academic Service

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

PUBLICATIONS

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

Submitted & In Press

Faisst, A.L. et al. COSMOS-Web: The Role of Galaxy Interactions and Disk Instabilities in Producing Starbursts at *z* < 4. *Submitted to The Astrophysical Journal*.

Gentile, F. et al. Not-so-little Red Dots: Two massive and dusty starbursts at $z \sim 5-7$ pushing the limits of star formation discovered by JWST in the COSMOS-Web survey. *Submitted to The Astro-physical Journal*.

Tanaka, **S.T. et al.** The $M_{\rm BH}$ – M_* relation up to z~2 through decomposition of COSMOS-Web NIR-Cam images. *Submitted to The Astrophysical Journal*, arXiv:2401.13742.

Berman, E.M. et al. Efficient PSF Modeling with ShOpt.jl: A PSF Benchmarking Study with JWST NIRCam Imaging. *Submitted to The Astrophysical Journal*, arXiv:2401.11625.

Wilkins, S.M. et al. Cosmic Evolution Early Release Science (CEERS) survey: The colour evolution of galaxies in the distant Universe. *Submitted to Monthly Notices of the Royal Astronomical Society,* arXiv:2311.08065.

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.

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 $z \ge 9$ Galaxies in the first epoch of COSMOS-Web. *Submitted to The Astrophysical Journal*, arXiv:2308.00751.

Mercier, W. et al. The COSMOS-Web ring: in-depth characterisation of an Einstein ring lensing system at z~2. *Astronomy & Astrophysics, in press,* arXiv:2309.15986.

Published

Casey, C.M., et al. COSMOS-Web: Intrinsically Luminous $z \gtrsim 10$ Galaxy Candidates Test Early Stellar Mass Assembly. *The Astrophysical Journal* 965:1:98, 2024, arXiv:2309.06656.

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* 527:2:3459-3473, 2023, arXiv:2311.03580.

McKinney, J., et al. A Near-Infrared Faint, Far-Infrared-Luminous Dusty Galaxy at z ~ 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 Astro-physical 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.

<u>Drakos, N.E.</u>, 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.

Sove, R.J., <u>**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.</u>

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.

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.