

Lina Necib

Curriculum Vitae

🏠 Kavli Institute for Astrophysics and Space Research
Massachusetts Institute of Technology
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Degrees

PhD in Theoretical Particle Physics – Massachusetts Institute of Technology 2012 – 2017

Advisor: Prof. Jesse Thaler

B.A. in Physics and Mathematics – Boston University 2008 – 2012

Employment

Associate Professor of Physics 2026– Present
Massachusetts Institute of Technology

Assistant Professor of Physics 2021– 2026
Massachusetts Institute of Technology
Maternity Leave: Spring 2021, Spring 2024

Postdoctoral Fellow 2020– 2021
Carnegie Observatories

University of California Presidential Fellow 2020– 2020
University of California, Irvine

Sherman Fairchild Postdoctoral Fellow 2017 – 2020
California Institute of Technology

Honors

Committed to Caring Mentoring Award 2025–2027
MIT Office of Graduate Education

NSF CAREER Award 2024
National Science Foundation

Sloan Fellowship 2024
Sloan Foundation

George E. Valley, Jr. Prize 2023
American Physical Society

University of California Presidential Fellowship 2020
University of California Irvine

Carnegie Observatories Postdoctoral Fellowship 2020
Carnegie Observatories

Sherman Fairchild Postdoctoral Fellowship 2017
California Institute of Technology

Sergio Vazquez Prize 2016
Massachusetts Institute of Technology

Praecis Presidential Graduate Fellowship 2012
Massachusetts Institute of Technology

Alumni Prize for Excellence in Physics Boston University	2012
Phi Beta Kappa Boston University	2012
College Scholar Boston University	2011
Dean's List Boston University	2009-2012
Mentoring	

High School Students

- *Michael Huang*, (RSI) Summer 2022 & Fall 2022, Graduated: Spring 2023.
After Graduation: Undergraduate student at MIT.
- *Celine Housna*, (RSI) Summer 2024.
- *Angie Zaatari*, (RSI) Summer 2025.

Undergraduate Students

- *Kate Habich*, (UROP - Wellesley) Fall 2021, Graduated: Spring 2022.
- *Peter M Berggren*, (UROP) Spring 2022 & Summer 2022, Graduated: Spring 2025.
- *Hang Su*, (MSRP) Summer 2022-Spring 2023, Graduated: Spring 2023.
After Graduation: Graduate student at the University of Michigan.
- *Marina Malta Nogueira*, (UROP) Spring 2023, Expected graduation: Spring 2026.
- *Zeineb Mezghanni*, (MSRP) Summer 2023-Spring 2025, Graduated: Spring 2025.
After Graduation: Graduate student at MIT.
- *Anna Orgel*, (UROP) Summer 2023, Graduated: Spring 2025.
- *Hanna Chen*, (UROP) Summer 2023-Fall 2023, Expected graduation: Spring 2026.
- *Charlotte Myers*, (UROP) Fall 2024-Spring 2025, Expected graduation: Spring 2027.
- *Alpha Andrew Pham*, (UROP) IAP 2025-IAP 2026, Expected graduation: Spring 2028.
- *Jason Zhang*, (UROP) Spring 2025-Summer 2025, Expected graduation: Spring 2028.
- *Andreas Thoyas*, (Northeastern University) Spring 2025-Summer 2026, Expected graduation: Spring 2027.
- *Amir Abdulgadir*, (MSRP) Summer 2025, Expected graduation: Spring 2028.
- *Guangyuan Leon Chen*, (UROP) Spring 2026-Summer 2026, Expected graduation: Spring 2029.
- *Jaylee Bouwhuis*, (UROP) Spring 2026, Expected graduation: Spring 2029.
- *Jailee Young*, (UROP) Spring 2026-Summer 2026, Expected graduation: Spring 2029.
- *Mark Gaskins*, (MSRP) Summer 2026, Expected graduation: Spring 2028.

PhD Students

- *Tri Nguyen*, 2022 - 2024. "Decoding Dark Matter Halos through the lens of Machine Learning."
After MIT: CIERA Fellow at Northwestern University.

- *Xiaowei Ou*, 2021 - 2025. “Understanding the Milky Way with Stars.”
After MIT: GECO/Cosmic AI Fellow at the University of Virginia.
- *Xiuyuan Zhang*, 2022 - in progress. “Probing the nature of dark matter”
- *Abdelaziz Hussein*, 2022 - in progress. “The Dark Matter Distribution at the Center of Galaxies”
- *Zeineb Mezghanni*, 2025 - in progress.

Postdoctoral Associates

- *Dr. Nora Shipp*, Fall 2021-Summer 2023.
After MIT: NSF Fellowship at CMU (2023-2024),
Assistant Professor at the University of Washington starting 2024.
- *Dr. Nathan Starkman*, Brinson Prize Fellow, Fall 2024 - Present.
- *Dr. Elliot Davies*, Fall 2025 - Present.
- *Dr. Gonzalo Herrera*, NTN Fellow Fall 2025 - Present.

Teaching Experience

8.012, Physics I, Recitation Instructor	Fall 2025
8.01L, Physics I, Recitation Instructor	
8.012, Physics I, Lecturer	Fall 2024
8.012, Physics I, Lecturer	Fall 2023
8.012, Physics I, Lecturer	Fall 2022
8.012, Physics I, Recitation Instructor	Fall 2021

Service

Internal Service

IAIFI Fellowship Selection Committee	Fall 2025
Pappalardo Fellowship Selection Committee	Fall 2025
Thesis Committee Member for: Jeffrey Krupa, MIT	Graduated Summer 2024
Thesis Committee Member for: Alexander Yelland, MIT	In progress
Thesis Committee Member for: Alexandra Klipfel, MIT	In progress
Thesis Committee Member for: Fatima Zaidouni, MIT	In progress
Speaker at MITCOBx	Spring 2025
Panelist for Laureates & Leaders Faculty Admission Panel	Fall 2024, Fall 2025
Panelist for MISTI	Fall 2023, Fall 2024
Astronomy Colloquium Organizer	Fall 2023, Spring 2024, Fall 2024
PhysPop Orientation	Fall 2023, Fall 2024, Fall 2025
Written Exam committee member	Spring 2023, Fall 2023, Fall 2024
Graduate Admissions committee member	Winter 2023, 2024, 2025
Barrett Prize committee member	Spring 2022
Attended Commencement	Spring 2022, Spring 2025, Spring 2026
Chair of Public Engagement Committee at IAIFI	Summer 2022-Spring 2025

External Service

Grant Reviews

Panelist for the Austrian Science Fund (FWF)	Spring 2026
Panelist for the Department of Energy (DOE) Early Career Award	Spring 2025
Panelist for the Swiss National Science Foundation	Spring 2025
Panelist for the Dutch Research Council	Spring 2024
Panelist on University Research Fellowships (URF)	Spring 2023
Panelist on ERC Grant	Spring 2022
Panelist on DOE Grant	Spring 2022
Panelist on NSF CAREER Grant	Fall 2021

Panels

Panelist for Future Faculty Fellowship Symposium at Princeton	Spring 2023
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Meeting Organization

Boston-Area Workshop on Machine Learning	Fall 2024
Aspen Summer Conference 2024 Workshop on Machine Learning	Spring 2024
Generative AI Meeting at MIT/Harvard, January 2024	Fall 2023
FIRE Collaboration PI Meeting	Summer 2023
Gaia Hackathon	Summer 2022, IAP 2025, IAP 2026

Paper Referee

Referee for the Journal of Undergraduate Research in Physics & Astronomy	Since 2026
Referee for the Astronomy and Computing Journal	Since 2022
Referee for the Astrophysical Journal Letters (ApJL)	Since 2021
Referee for Journal of Cosmology and Astroparticle Physics (JCAP)	Since 2021
Referee for Monthly Notices of the Royal Astronomical Society (MNRAS)	Since 2018
Referee for Physics Review Letters (PRL)	Since 2018
Referee for Journal of High Energy Physics (JHEP)	Since 2018
Referee for Physics Review D (PRD)	Since 2017

International Thesis Committees

Wassim Tenachi, Universite de Strasbourg, France	Summer 2024
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Public Engagement

Education

Keynote Speaker at CU*IP, New York University	Winter 2025
Speaker at Cafe STEAM, International School of Boston	Winter 2024
Keynote Speaker at the Future Faculty Fellowship Symposium at Princeton	Spring 2023
Introducing Galaxy Zoo to K12 and educators	Spring 2023, Spring 2025
Lecturer for Warrior Scholar Project	Summer 2022
Luncheon with CCNY Physics Club	Spring 2022
Skype a Scientist	Spring 2020

Podcasts

Ga3da Falakia, Tunisian Podcast	Since Spring 2022
Physics in your native language video series	Fall 2021
Interview with The Cosmic Companion	Summer 2020
Mindscape Podcast with Sean Carroll	Spring 2020

Public Events

Presenting at Museum of Science Planetarium	Summer 2025
Speaker at MITCOBx	Spring 2025
Organized Exhibit at Cambridge Science Festival	Fall 2022, Fall 2023
Panelist for AstroCareers at the Museum of Science	Summer 2022
Astronomy on TAP, Santa Barbara, CA	Spring 2019
‘Science on Saturday,’ Cambridge, MA	Spring 2015

Publications

Necib Group members are underlined. Papers arising from a supervised PhD thesis are indicated with an *. Author list in theoretical high energy physics is ordered alphabetically, while that of astronomy is ordered by contribution. For clarity, the lead author is designated by a ‡.

44) *Euclid Collaboration*, Nathaniel Starkman,[‡], Jacob Nibauer, Sarah Pearson, Siriu Wu, Michael Walmsley, **Lina Necib**, et al. Submitted to A&A
arXiv:2606.21774
Euclid Quick Data Release (Q1): The geometry of dark matter halos from extragalactic streams

43) Charlotte Myers,[‡] Nathaniel Starkman, **Lina Necib** Submitted to ApJ
arXiv:2606.18386
Reconstructing Galactic Gravitational Potentials from Stellar Kinematics with Physics-Informed Neural Networks

42) Maya Silverman,[‡] Abdelaziz Hussein, Arpit Arora, Mariangela Lisanti, Manoj Kaplinghat, **Lina Necib**, Andreas Thoyas, Stephanie O’Neil, Robyn E. Sanderson, Xuejian Shen, Jorge Moreno Submitted to ApJ
arXiv:2606.02566
Mergers Matter: Gravothermal Collapse in Dwarf Halos with Self-Interacting Dark Matter

41) **Lina Necib**,[‡] Dylan Folsom, Elliot Y. Davies, Nathaniel Starkman, Andreas Thoyas Submitted to ApJ
arXiv:2605.04138
Galactic Amnesia: The Information Washout of the Milky Way Merger History

40) Gonzalo Herrera,[‡] Abdelaziz Hussein, **Lina Necib**, Elliot Y. Davies, Xuejian Shen Submitted to ApJ
arXiv:2605.01023
Formation and Redshift Evolution of Dark Matter Spikes

39) Tal Shpigel,[‡] Dylan Folsom, Mariangela Lisanti, **Lina Necib**, Mark Vogelsberger, Lars Hernquist ApJ 1003 no.1, 102
arXiv:2510.21914
How to Build an Empirical Speed Distribution for Dark Matter in the Solar Neighborhood

38) Dylan Folsom,[‡] Carlos Blanco, Mariangela Lisanti, **Lina Necib**, Mark Vogelsberger, Lars Hernquist PRL 135 no.21, 211004
arXiv:2505.07924
Dark Matter Velocity Distributions for Direct Detection: Astrophysical Uncertainties are Smaller Than They Appear

37*) Xiuyuan Zhang,[‡] **Lina Necib**, Denis Erkal Submitted to JCAP
arXiv:2504.13247
Darkness in the Crust: Searching for the truly “Dark” Subhalos with Paleo-detectors

ApJ 994 no.1, 128

- 36*) Xiaowei Ou,[‡] **Lina Necib**, Andrew Wetzel, Anna Frebel, Jeremy Bailin, Micah Oeur
Decoding the Galactic Twirl: The Downfall of Milky Way-mass Galaxies Rotation Curves in the FIRE Simulations
arXiv:2503.05877
- 35*) Tri Nguyen,[‡] Justin I. Read, **Lina Necib**, Siddharth Mishra-Sharma, Claude-André Faucher-Giguère, Andrew Wetzel
Trial by FIRE: Probing the dark matter density profile of dwarf galaxies with GraphNPE
MNRAS 541 no. 3, 2707
arXiv:2503.03812
- 34*) Abdelaziz Hussein,[‡] **Lina Necib**, Manoj Kaplinghat, Stacy Y. Kim, Andrew Wetzel, Justin I. Read, Martin P. Rey, Oscar Agertz
Theoretical Predictions for the Inner Dark Matter Distribution in the Milky Way Informed by Simulations
Submitted to PRD
arXiv:2501.14868
- 33) Nora Shipp,[‡] Alexander Riley, Christine Simpson, Rebekka Bier, **Lina Necib**, Arpit Arora, Francesca Fragkoudi, Facundo Gomez, Robert J. J. Grand, Federico Marinacci
Auriga Streams II: orbital properties of tidally disrupting satellites of Milky Way-mass galaxies
MNRAS 542, no. 2, 1109
arXiv:2410.09143
- 32) Adriana Dropulic,[‡] Nora Shipp, Stacy Kim, Zeineb Mezghanni, **Lina Necib**, Mariangela Lisanti
StreamGen: Connecting Populations of Streams and Shells to Their Host Galaxies
ApJ 990, no. 2, 162
arXiv:2409.13810
- 31) Dylan Folsom,[‡] Mariangela Lisanti, **Lina Necib**, Danny Horta, Mark Vogelsberger, Lars Hernquist
Cosmological Simulations of Stellar Halos with Gaia Sausage-Enceladus Analogues: Two Sausages, One Bun?
ApJ 983 no. 2, 119
arXiv:2408.02723
- 30) Cian Roche,[‡] **Lina Necib**, Tongyan Lin, Xiaowei Ou, Tri Nguyen
The Escape Velocity Profile of the Milky Way from Gaia DR3
ApJ 972 no. 1, 70
arXiv:2402.00108
- 29*) Tri Nguyen[‡], Xiaowei Ou[‡], Nondh Panithanpaisal, Nora Shipp, **Lina Necib**, Robyn Sanderson, Andrew Wetzel
Synthetic Gaia DR3 surveys from the FIRE cosmological simulations of Milky-Way-mass galaxies
ApJ 966 no. 1, 108
arXiv:2306.16475
- 28*) Xiaowei Ou[‡], Anna-Christina Eilers, **Lina Necib**, Anna Frebel
The Dark Matter Profile of the Milky Way Inferred from its Circular Velocity Curve
MNRAS 528 no. 1, 693
arXiv:2303.12838
- 27) David Shih[‡], Matthew Buckley, **Lina Necib**
Via Machinae 2.0: Full-Sky, Model-Agnostic Search for Stellar Streams in Gaia DR2
MNRAS 529, no. 4, 4745
arXiv:2303.01529
- 26) Shuyu Wang[‡], **Lina Necib**, Alexander P. Ji, Xiaowei Ou, Mariangela Lisanti, Mithi A.C. de los Reyes, Allison L. Strom, Mimi Truong
High-Resolution Chemical Abundances of the Nyx Stream
ApJ 955 no. 2, 129
arXiv:2210.15013
- 25*) Tri Nguyen[‡], Siddharth Mishra-Sharma, Reuel Williams, **Lina Necib**
Uncovering dark matter density profiles in dwarf galaxies with graph neural networks
PRD 107 no.4, 043015
arXiv:2208.12825
- 24) Nora Shipp[‡], Nondh Panithanpaisal, **Lina Necib**, Robyn Sanderson, Denis Erkal, Ting S. Li, Isaiah B. Santistevan, Andrew Wetzel, Lara R. Cullinane, Alexander P. Ji, Sergey E. Koposov, Kyler Kuehn, Geraint F. Lewis, Andrew B. Pace; Daniel B. Zucker, Joss Bland-Hawthorn, Emily C. Cunningham, Stacy Y. Kim, Sophia Lilleengen, Jorge Moreno, Sanjib Sharma

Streams on FIRE: Populations of Detectable Stellar Streams in the Milky Way and FIRE

23*) **Xiaowei Ou**[‡], **Lina Necib**, Anna Frebel

Robust Clustering of the Local Milky Way Stellar Kinematic Substructures with Gaia eDR3

MNRAS 521 no.2, 2623

arXiv:2208.01056

22) Xuejian Shen[‡], Philip F. Hopkins, **Lina Necib**, Fangzhou Jiang,
Michael Boylan-Kolchin, Andrew Wetzel

ApJ 966 no.1, 131

arXiv:2206.05327

Dissipative Dark Matter on FIRE: II. Observational signatures and constraints from local dwarf galaxies

21) David Shih[‡], Matthew R. Buckley, **Lina Necib**, John Tamasas

Via Machinae: Searching for Stellar Streams using Unsupervised Machine Learning

MNRAS 509 no.4, 5992

arXiv:2104.12789

20) Xuejian Shen[‡], Philip F. Hopkins, **Lina Necib**, Fangzhou Jiang,
Michael Boylan-Kolchin, Andrew Wetzel

MNRAS 506 no.3, 4421

arXiv:2102.09580

Dissipative Dark Matter on FIRE: I. Structural and kinematic properties of dwarf galaxies

19) **Lina Necib**[‡], Tongyan Lin

Substructure at High Speed II: The Local Escape Velocity and Milky Way Mass with Gaia eDR3

ApJ 926 no.2, 189

arXiv:2102.02211

18) **Lina Necib**[‡], Tongyan Lin

Substructure at High Speed I: Inferring the Escape Velocity in the Presence of Kinematic Substructure

ApJ 926 no.2, 188

arXiv:2102.01704

17) Laura J. Chang[‡], **Lina Necib**

Dark Matter Density Profiles in Dwarf Galaxies: Linking Jeans Modeling Systematics and Observation.

MNRAS 507 no.4, 4715

arXiv:2009.00613

16) Joshua Berger[‡], Yanou Cui, Matthew Graham, **Lina Necib**,
Gianluca Petrillo, Dane Stocks, Yun-Tse Tsai, Yue Zhao.

Prospects for Detecting Boosted Dark Matter in DUNE through Hadronic Interactions.

PRD 103 no.9, 095012

arXiv:1912.05558

15) **Lina Necib**[‡], Bryan Ostdiek, Mariangela Lisanti,
Timothy Cohen, Marat Freytsis, Shea Garrison-Kimmel.

Chasing Accreted Structures within Gaia DR2 using Deep Learning.

ApJ 903 no.1, 25

arXiv:1907.07681

14) **Lina Necib**[‡], Bryan Ostdiek, Mariangela Lisanti,
Timothy Cohen, Marat Freytsis, Shea Garrison-Kimmel, Philip F. Hopkins,
Andrew Wetzel, Robyn Sanderson.

Evidence for a Vast Prograde Stellar Stream in the Solar Vicinity.

Nature Astronomy (2020)

arXiv:1907.07190

13) Bryan Ostdiek[‡], **Lina Necib**, Timothy Cohen,
Marat Freytsis, Mariangela Lisanti, Shea Garrison-Kimmel,
Andrew Wetzel, Robyn E. Sanderson, Philip F. Hopkins.

Cataloging Accreted Stars within Gaia DR2 using Deep Learning.

A&A 636 A75

arXiv:1907.06652

12) **Lina Necib**[‡], Mariangela Lisanti, Shea Garrison-Kimmel, Andrew Wetzel,
Robyn Sanderson, Philip F. Hopkins, Claude-André Faucher-Giguère,
Dušan Kereš.

Under the Firelight: Stellar Tracers of the Local Dark Matter Velocity Distribution in the Milky Way.

ApJ 883 no.1, 27

arXiv:1810.12301

- 11) **Lina Necib**[‡], Mariangela Lisanti, Vasily Belokurov. *Inferred Evidence for Dark Matter Kinematic Substructure with SDSS-Gaia.* ApJ 874 no.3, 22
arXiv:1807.02519
- 10) Frédéric A. Dreyer[‡], **Lina Necib**, Gregory Soyez, Jesse Thaler. *Recursive Softdrop.* JHEP 1806 093/arXiv:1804.03657
- 9) Jonah Herzog-Arbeitman, Mariangela Lisanti, **Lina Necib**[‡]. *The Metal-Poor Stellar Halo in RAVE-TGAS and its Implications for the Velocity Distribution of Dark Matter.* JCAP 1804 052/arXiv:1708.03635
- 8) Gordan Krnjaic[‡], Pedro A. N. Machado, **Lina Necib**. *Distorted Neutrino Oscillations From Ultralight Scalar Dark Matter.* PRD 97 no.7, 075017
arXiv:1705.06740
- 7) Jonah Herzog-Arbeitman, Mariangela Lisanti, Piero Madau, **Lina Necib**[‡]. *Empirical Determination of Dark Matter Velocities using Metal-Poor Stars.* PRL 120 no.4, 041102
arXiv:1704.04499
- 6) **Lina Necib**[‡], Jarrett Moon, Taritree Wongjirad, Janet Conrad. *Boosted Dark Matter at Neutrino Experiments.* PRD 95 no.7, 075018
arXiv:1610.03486
- 5) Ian Mould, **Lina Necib**[‡], Jesse Thaler. *New Angles on Energy Correlation Functions.* JHEP 1612 153
arXiv:1609.07483
- 4) Mariangela Lisanti, Siddharth Mishra-Sharma[‡], **Lina Necib**, Benjamin R. Safdi. *Deciphering Contributions to the Extragalactic Gamma-Ray Background from 2 GeV to 2 TeV.* ApJ 832 no.2, 117
arXiv:1606.04101
- 3) Nicolas Bernal, **Lina Necib**[‡], Tracy R. Slatyer. *Spherical Cows in Dark Matter Indirect Detection.* JCAP 1612 no. 030
arXiv:1606.00433
- 2) Nayara Fonseca, **Lina Necib**[‡], Jesse Thaler. *Dark Matter, Shared Asymmetries, and Galactic Gamma Ray Signals.* JCAP 1602, no. 052
arXiv:1507.08295
- 1) Kaustubh Agashe, Yanou Cui, **Lina Necib**[‡], Jesse Thaler. *(In)direct Detection of Boosted Dark Matter.* JCAP 1410, no. 062
arXiv:1405.7370

N-th Author Papers

- 25) Emma Tasso, Madeline Lucey, Robyn Sanderson, Aritra Kundu, **Lina Necib** Submitted to MNRAS
The Dynamics of Old Inner Galaxy Stars in Milky Way-mass Galaxies Using FIRE-2 Simulations arXiv:2606.16079
- 24) Ethan Lilie, Jonah C. Rose, Mariangela Lisanti, Alex M. Garcia, Paul Torrey, Kassidy E. Kollmann, Jiaxuan Li, Olivia Mostow, Bonny Y. Wang, Stephanie O'Neil, Xuejian Shen, Alyson M. Brooks, Arya Farahi, Nitya Kallivayalil, **Lina Necib**, Andrew B. Pace, Mark Vogelsberger *The DREAMS Project: Disentangling the Impact of Halo-to-Halo Variance and Baryonic Feedback on Milky Way Dark Matter Speed Distributions* ApJ 1002 no. 2, 168
arXiv:2512.04157
- 23) Alex M. Garcia, Jonah C. Rose, Paul Torrey, Andrea Caputo, Mariangela Lisanti, Andrew B. Pace, Hongwan Liu, Abdelaziz Hussein, Haozhe Liu, Francisco Villaescusa-Navarro, John Barry, Ilem Leisher, Belen Costanza, Jonathan Kho, Ethan Lilie, Jiaxuan Li, Niusha Ahvazi, Aklant Bhowmick, Tri Nguyen, Stephanie O'Neil, Xiaowei Ou, Xuejian Shen, Arya Farahi, Nitya Kallivayalil, **Lina Necib**, Mark Vogelsberger ApJ 1002 no. 1, 8
arXiv:2512.03132

The DREAMS Project: Disentangling the Impact of Halo-to-Halo Variance and Baryonic Feedback on Milky Way Dark Matter Density Profiles

22) Jonah C. Rose, Mariangela Lisanti, Paul Torrey, Francisco Villaescusa-Navarro, Alex M. Garcia, Arya Farahi, Carrie Filion, Alyson M. Brooks, Nitya Kallivayalil, Kassidy E. Kollmann, Ethan Lilie, Jiaxuan Li, Olivia Mostow, Akaxia Cruz, Tri Nguyen, Sandip Roy, Andrew B. Pace, Niusha Ahvazi, Stephanie O'Neil, Xuejian Shen, Francis-Yan Cyr-Racine, Adrian M. Price-Whelan, Marla Geha, **Lina Necib**, Mark Vogelsberger, Julian B. Munoz, Julianne J. Dalcanton
The DREAMS Project: Disentangling the Impact of Halo-to-Halo Variance and Baryonic Feedback on Milky Way Satellite Galaxies

Submitted to ApJ
arXiv:2512.02095

21) Isabel S. Sands, Philip F. Hopkins, Sam B. Ponnada, Dusan Keres, **Lina Necib**, Yen-Hsing Julius Lin
Galactic Center Gamma-Ray Emission in MHD Galaxy Formation Simulations with Full Cosmic Ray Spectra

Submitted to ApJ
arXiv:2509.18351

20) Michal Oeur, Sarah R. Loebman, Adrian M. Price-Whelan, Arpit Arora, **Lina Necib**, Danny Horta
OTI on FIRE: Testing the Efficacy of Orbital Torus Imaging to Recover the Galactic Potential

ApJ 993, 1 no. 29
arXiv:2505.05590

19) Francisco J. Mercado, Jorge Moreno,..., **Lina Necib**, et al.
Effects of Galactic Environment on Size and Dark Matter Content in Low-mass Galaxies

ApJ 983, no. 2, 93
arXiv:2501.04084

18) Maria C. Straight, Michael Boylan-Kolchin,..., **Lina Necib**, et al.
Central densities of dark matter halos in FIRE-2 simulations of low-mass galaxies with cold dark matter and self-interacting dark matter

MNRAS 543, no. 3, 1995
arXiv:2501.16602

17) Tri Nguyen, Francisco Villaescusa-Navarro,..., **Lina Necib**, et al.
How DREAMS are made: Emulating Satellite Galaxy and Subhalo Populations with Diffusion Models and Point Clouds

ApJ 997 no. 2, 336
arXiv:2409.02980

16) Arpit Arora, Robyn E. Sanderson, Sukanya Chakrabarti, Andrew Wetzel, Thomas II Donlon, Danny Horta, Sarah R. Loebman, **Lina Necib**, Micah Oeur
The imprint of dark matter on the Galactic acceleration field

ApJ 974, no. 2, 223
arXiv:2406.12957

15) Jonah C. Rose, Paul Torrey,..., **Lina Necib**, et al.
Introducing the DREAMS Project: DaRk mattEr and Astrophysics with Machine learning and Simulations

ApJ 982, no. 2, 68
arXiv:2405.00766

14) Isabel S. Sands, Philip F. Hopkins, Xuejian Shen, Michael Boylan-Kolchin, James Bullock, Claude-André Faucher-Giguère, Francisco J. Mercado, Jorge Moreno, **Lina Necib**, Xiaowei Ou, Sarah Wellons, Andrew Wetzel
Confronting the Diversity Problem: The Limits of Galaxy Rotation Curves as a tool to Understand Dark Matter Profiles

ApJ 1000, no.1, 127
arXiv:2404.16247

13*) Xiaowei Ou, Anirudh Chiti, Nora Shipp, Joshua D. Simon, Marka Geha, Anna Frebel, Mohammad K. Mardini, Denis Erkal, **Lina Necib**
Signatures of Tidal Disruption of the Hercules Ultrafaint Dwarf Galaxy

ApJ 966, no.1, 33
arXiv:2403.00921

12) Danny Horta, Emily C. Cunningham, Robyn E. Sanderson, Kathryn V. Johnston, Alis Deaon, Andrew Wetzel, Fiona McClusky, Nicolas Garavito-Camargo, **Lina Necib**, Claude-André Faucher-Giguère, Arpit Arora, Pratik J. Gandhi
The proto-galaxy of Milky Way-mass haloes in the FIRE simulations

MNRAS 527, no.4, 9810
arXiv:2307.15741

- 11) Danny Horta, Emily C. Cunningham, Robyn E. Sanderson, Kathryn V. Johnston, Nondh Panithanpaisal, Arpit Arora, **Lina Necib**, Andrew Wetzel, Jeremy Bailin, Claude-André Faucher-Giguère
The observable properties of galaxy accretion events in Milky Way-like galaxies in the FIRE-2 cosmological simulations
ApJ 943, no.2, 158
arXiv:2211.05799
- 10) Philip F. Hopkins, Andrew Wetzel, ..., **Lina Necib**, et al.
FIRE-3: Updated Stellar Evolution Models, Yields, & Microphysics and Fitting Functions for Applications in Galaxy Simulations
MNRAS 519, no.2, 2
arXiv:2203.00040
- 9) Henrique Reggiani, Alexander P. Ji, Kevin C. Schlaufman, Anna Frebel, **Lina Necib**, Tyler Nelson, Keith Hawkins, Jhon Yana Galarza
The Chemical Composition of Extreme-Velocity Stars
AJ 163, no. 6 252
arXiv:2203.16364
- 8) Daniel McKeown, James S. Bullock, Francisco J. Mercado, Zachary Hafen, Michael Boylan-Kolchin, Andrew Wetzel, **Lina Necib**, Philip F. Hopkins, Sijie Yu
Amplified f-factors in the Galactic Center for velocity-dependent dark matter annihilation in FIRE simulations
MNRAS 513 no.1, 55
arXiv:2111.03076
- 7) Arka Banerjee, Kimberly K. Boddy, ..., **Lina Necib**, et al.
Snowmass2021 Cosmic Frontier White Paper: Cosmological Simulations for Dark Matter Physics
arXiv:2203.07049
- 6) Shin'ichiro Ando, Sebastian Baum, ..., **Lina Necib**, et al.
Snowmass2021 Cosmic Frontier: Synergies between dark matter searches and multiwavelength/multimessenger astrophysics
arXiv:2203.06781
- 5) Anirudh Chiti, Anna Frebel, Joshua D. Simon, Denis Erkal, Laura J. Chang, **Lina Necib**, Alexander P. Ji, Helmut Jerjen, Dongwon Kim, John E. Norris
An Extended Halo Around an Ancient Dwarf Galaxy.
Nature Astronomy (2021)
arXiv:2012.02309
- 4) Carine Babusiaux, Maria Bergemann, Adam Burgasser, ..., **Lina Necib**, et al.
The Detailed Science Case for the Maunakea Spectroscopic Explorer
arXiv:1904.04907
- 3) Keith Bechtol, Alex Drlica-Wagner, Kevork N. Abazajian, ..., **Lina Necib**, et al.
Dark Matter Science in the Era of LSST
arXiv:1903.04425
- 2) Keith Bechtol, Adam S. Bolton, Jo Bovy, ..., **Lina Necib**, et al.
Astrophysical Tests of Dark Matter with Maunakea Spectroscopic Explorer
arXiv:1903.03155
- 1) Alex Drlica-Wagner, Yao-Yuan Mao, ..., **Lina Necib**, et al.
Probing the Fundamental Nature of Dark Matter with the Large Synoptic Survey Telescope
arXiv:1902.01055

Invited Presentations

Colloquia

- Mapping out the Dark Matter in the Milky Way
Harvard University, ITC Colloquium
May 1, 2025
- Mapping out the Dark Matter in the Milky Way
University of New Hampshire, Physics Colloquium
April 18, 2025
- Mapping out the Dark Matter in the Milky Way
John's Hopkins University/STScI, Astronomy Colloquium
March 5, 2025
- Mapping out the Dark Matter in the Milky Way
UMass Amherst, Astronomy Colloquium
February 25, 2025

Mapping out the Dark Matter in the Milky Way <i>Northwestern University, Physics & Astronomy Colloquium</i>	January 31, 2025
Mapping out the Dark Matter in the Milky Way <i>University of Chicago, Astronomy Colloquium</i>	December 11, 2024
Mapping out the Dark Matter in the Milky Way <i>University of Connecticut, Physics Colloquium</i>	November 22, 2024
(Machine) Learning of Dark Matter <i>University of North Carolina Chapel Hill, Physics and Astronomy Colloquium</i>	November 6, 2023
Shining Light on Dark Matter <i>Cornell Physics Colloquium</i>	April 24, 2023
Tracing Dark Matter with Stars <i>UMass Boston Physics Colloquium</i>	February 8, 2023
Searching for the Dark with the Light <i>Latin-American Webinars in Physics</i>	November 23, 2022 <u>Remote</u>
Tracing Dark Matter with Stars around the Milky Way <i>Dartmouth Physics Colloquium</i>	September 30, 2022
Searching for the Dark with the Light: Stars as Tracers of Dark Matter <i>MIT Physics Colloquium</i>	March 31, 2022
Tracing Dark Matter with Stars <i>Brown University Physics Colloquium</i>	October 25, 2021
Tracing Dark Matter with Stars <i>University of Heidelberg Colloquium</i>	October 21, 2021 <u>Remote</u>
Tracing Dark Matter with Stars <i>Boston University Physics Colloquium</i>	September 2021
Tracing Dark Matter with Stars <i>Carnegie Observatories Colloquium</i>	June 2021 <u>Remote</u>
Tracing Dark Matter with Stars <i>Southern Methodist University Physics Colloquium</i>	February 2021 <u>Remote</u>
Dark Matter in the Era of <i>Gaia</i> <i>University of Indiana Physics Colloquium</i>	October 2020
Dark Matter in the Era of <i>Gaia</i> <i>Emory University Physics Colloquium</i>	September 2020
Dark Matter in the Era of <i>Gaia</i> <i>KIPAC Stanford Astrophysics Colloquium</i>	July 2020
Dark Matter in the Era of <i>Gaia</i> <i>Carnegie Observatories Colloquium</i>	December 2019
Dark Matter in the Era of <i>Gaia</i>	September 2019

MIT Astronomy Colloquium

Dark Matter in the Era of *Gaia*
California Institute of Technology Physics Colloquium

May 2019

Seminar Talks

Mapping out the Dark Matter in the Milky Way
University of Notre Dame, Physics and Astronomy Seminar

April 21, 2025

Mapping out Dark Matter in the Milky Way
Sydney Consortium for Particle Physics and Cosmology

February 20, 2025
Remote

(Machine) Learning of Dark Matter
Rutgers University

September 5, 2023

(Machine) Learning of Dark Matter
Princeton University

April 21, 2023

Searching for the Dark with the Light: Stars as Tracers of Dark Matter
University of Southern California

October 28, 2022

Tracing Dark Matter with Stars
Brookhaven National Laboratory

April 21, 2022

Tracing Dark Matter with Stars
University of California Berkeley/LBNL seminar

February 2022

Tracing Dark Matter with Stars
Kavli IPMU, University of Tokyo

November 2021

Tracing Dark Matter with Stars
Harvard University

October 2021

Tracing Dark Matter with Stars, Part II
SLAC

June 2021

Tracing Dark Matter with Stars
TRIUMF

March 2021

Tracing Dark Matter with Stars
SLAC

February 2021

Tracing Dark Matter with Stars
Queen University

January 2021

Tracing Dark Matter with Stars
University of Texas Austin

December 2020

Dark Matter in the Era of *Gaia*
Tsung-Dao Lee Institute

December 2020

Dark Matter in the Era of *Gaia*
Colorado University, Boulder

October 2020

Tracing Dark Matter with Stars

September 2020

Virginia Tech

Tracing Dark Matter with Stars
Fermilab

July 2020

Dark Matter in the Era of *Gaia*
University of California Irvine

April 2020

Dark Matter in the Era of *Gaia*
University of Surrey

January 2020

Dark Matter in the Era of *Gaia*
Perimeter Institute

October 2019

Dark Matter in the Era of *Gaia*
Harvard University

October 2019

Dark Matter in the Era of *Gaia*
Boston University

September 2019

Properties of Dark Matter in the Era of *Gaia*
LHC Results Forum

September 2019

Dark Matter in the Era of *Gaia*
Fermilab

September 2019

Dark Matter in the Era of *Gaia*
Texas A&M

September 2019

Dark Matter in the Era of *Gaia*
Ohio State University

July 2019

Dark Matter in the Era of *Gaia*
Los Alamos National Laboratory

May 2019

The Stellar Local Velocity Distribution and its Implications for Dark Matter
California Institute of Technology

April 2019

Dark Matter in Disequilibrium and Implications for Direct Detection
University of California Irvine

March 2019

Dark Matter in Disequilibrium and Implications for Direct Detection
SLAC

January 2019

Dark Matter in Disequilibrium and Implications for Direct Detection
University of California Santa Barbara

December 2018

Dark Matter in Disequilibrium and Implications for Direct Detection
John's Hopkins University

December 2018

Dark Matter in Disequilibrium and Implications for Direct Detection
University of Maryland

December 2018

Dark Matter in Disequilibrium and Implications for Direct Detection
KICP, University of Chicago

November 2018

Dark Matter in Disequilibrium and Implications for Direct Detection <i>Lawrence Berkeley National Laboratory</i>	November 2018
Dark Matter in Disequilibrium and Implications for Direct Detection <i>Rutgers University</i>	October 2018
Dark Matter in Disequilibrium and Implications for Direct Detection <i>University of Kentucky</i>	October 2018
Dark Matter in Disequilibrium and Implications for Direct Detection <i>SuperCDMS Collaboration</i>	September 2018
Dark Matter in Disequilibrium: The Velocity Distribution <i>Fermilab</i>	June 2018
Empirical Determination of the Dark Matter Velocity Distribution <i>University of California San Diego</i>	May 2018
Empirical Determination of the Dark Matter Velocity Distribution <i>Princeton University</i>	March 2018
Boosted Dark Matter in Neutrino Experiments <i>Brookhaven National Laboratory</i>	March 2018
Empirical Determination of the Dark Matter Velocity Distribution <i>Brookhaven National Laboratory</i>	March 2018
Empirical Determination of the Dark Matter Velocity Distribution <i>New York University</i>	March 2018
Empirical Determination of the Dark Matter Velocity Distribution <i>University of Michigan Ann Arbor</i>	March 2018
Empirical Determination of the Dark Matter Velocity Distribution <i>Rutgers University</i>	February 2018
Empirical Determination of the Dark Matter Velocity Distribution <i>University of California Irvine</i>	December 2017
Empirical Determination of the Dark Matter Velocity Distribution <i>University of Oregon</i>	November 2017
Empirical Determination of the Dark Matter Velocity Distribution <i>Boston University</i>	November 2017
Empirical Determination of the Dark Matter Velocity Distribution <i>University of Illinois Urbana-Champaign</i>	October 2017
Empirical Determination of the Dark Matter Velocity Distribution <i>University of California Santa Barbara</i>	October 2017
Empirical Determination of the Dark Matter Velocity Distribution <i>California Institute of Technology</i>	October 2017
Using Simulations to Improve Dark Matter Searches <i>Harvard University</i>	February 2017

Spherical Cows of Dark Matter Indirect Detection <i>University of California Berkeley</i>	November 2016
Spherical Cows of Dark Matter Indirect Detection <i>Harvard University</i>	October 2016
Boosted Dark Matter in Neutrino Experiments <i>Harvard University</i>	October 2016
Spherical Cows of Dark Matter Indirect Detection <i>Cornell University</i>	October 2016
Spherical Cows of Dark Matter Indirect Detection <i>Princeton University</i>	September 2016
Boosted Dark Matter in Neutrino Experiments <i>Tufts University</i>	June 2016
(In)Direct Detection of Boosted Dark Matter <i>SLAC</i>	April 2016

Invited Conference Talks

Mapping out the Dark Matter in the Milky Way with Stars <i>Mitchell Conference, College Station, Texas, USA</i>	May 28, 2026
Mapping out the Dark Matter in the Milky Way with Stars <i>PONT D'Avignon 2026, Avignon, France</i>	April 26, 2026
Mapping out the Dark Matter in the Milky Way with Stars <i>Cosmology 2025, Elba Island, Italy</i>	September 8, 2025
Mapping out the Dark Matter in the Milky Way with Stars <i>Invisibles Workshop, CERN, Switzerland</i>	September 2, 2025
Mapping out the Dark Matter in the Milky Way <i>New approaches to dark matter in galaxies and the Local Group, Banff, Canada</i>	August 23, 2025
(Machine) Learning of Dark Matter <i>LAIFI Workshop, Cambridge, MA</i>	August 12, 2025
Mapping out the Dark Matter in the Milky Way with Stars <i>Dark Matter and Stars, Kingston, Ontario, Canada</i>	July 16, 2025
Phase Space Distribution of Dark Matter <i>DREAMS Workshop, NYC, NY, USA</i>	May 21, 2025
(Machine) Learning of the Dark Matter <i>Cosmic Horizons, Austin, TX, USA</i>	May 6, 2025 <u>Plenary-Remote</u>
(Machine) Learning the Genealogy of the Milky Way <i>Harvard Data Science Initiative, Cambridge, MA, USA</i>	February 2, 2024
(Machine) Learning of Dark Matter <i>Dark Camels, Center for Computational Astrophysics, Flatiron Institute, NYC, NY, USA</i>	December 4, 2023
	October 5, 2023

(Machine) Learning of Dark Matter around the Milky Way <i>Brookhaven Forum, Advancing Searches for New Physics, Upton, NY, USA</i>	Plenary-Remote
Shining Light on Dark Matter <i>Pheno 2023, University of Pittsburgh, PA, USA</i>	May 9, 2023 Plenary
Shining Light on Dark Matter <i>LCTP Workshop, University of Michigan Ann Arbor, MI, USA</i>	May 1, 2023
George E. Valley Jr. Prize: Shining Light on Dark Matter <i>APS April Meeting 2023, Minneapolis, MN, USA</i>	April 18, 2023
Identifying Kinematic Substructure with Machine Learning <i>Building a Physical Understanding of Galaxy Evolution with Data-driven Astronomy, Santa Barbara, CA, USA</i>	February 21, 2023
<i>Gaia</i> : An Insight into a Billion Stars <i>Workshop on Atomic Dark Matter, Pittsburgh, PA, USA</i>	January 27, 2023
Shining Light on Dark Matter <i>Kashiwa Dark Matter Symposium 2022, Kashiwa, Japan</i>	November 30, 2022 Plenary-Remote
Robust Clustering of Local Kinematic Stellar Structures with <i>Gaia</i> <i>Towards Real Time Galactic Dynamics, Leiden, Netherlands</i>	July 29, 2022
Clustering Stellar Structures and Connections to Dark Matter <i>Summitting the Unknown, Seattle, WA, USA</i>	July 14, 2022
Identifying Kinematic Substructure with Machine Learning <i>New Methods and Ideas at the Frontiers of Particle Physics, Aspen, CO, USA</i>	March 24, 2022
Identifying Kinematic Substructure with Machine Learning <i>Nature of Dark Matter on Small Scales, Remote</i>	March 17, 2022
Dark Matter in the Era of Simulations and Data <i>CERN-CKC Theory Workshop, Jeju Island, South Korea</i>	June 2021 Plenary-Remote
Dark Matter in the Era of <i>Gaia</i> <i>Exploring the Dark Side of the Universe, Pointe-A-Pitre, Guadeloupe</i>	March 2020 Plenary-Remote
Dark Matter in the Era of <i>Gaia</i> <i>Theory Meets Experiment, Quy Nhon, Vietnam</i>	January 2020 Plenary
Dark Matter in the Era of <i>Gaia</i> <i>Searching for new physics - Leaving no stone unturned!, Salt Lake City, UT, USA</i>	August 2019
Dark Matter in the Era of <i>Gaia</i> <i>234th AAS Meeting, Saint Louis, MO, USA</i>	June 2019
The Stellar Local Velocity Distribution and its Implications for Dark Matter <i>In the Balance: Stasis and Disequilibrium in the Milky Way, KITP, Santa Barbara, CA, USA</i>	April 2019
Dark Matter in Disequilibrium and its Implications on Direct Detection <i>Interplay between Particle and Astroparticle Physics, Cincinnati, OH, USA</i>	October 2018
Reconstructing the Dark Matter Velocity Distribution from the Stars <i>Galaxy Formation and Evolution in Southern California, Pasadena, CA, USA</i>	August 2018
	July 2018

Dark Matter in Disequilibrium and its Implications on Direct Detection <i>Identification of Dark Matter, Providence, RI, USA</i>	Plenary
Dark Matter in Disequilibrium: The Velocity Distribution <i>Near Field Cosmology Workshop, Chicago, IL, USA</i>	June 2018
Light Dark Matter at Neutrino Detectors <i>Light Dark World, Pittsburgh, PA, USA</i>	October 2017
Conference Talks	
Unveiling the Milky Way's Merger History Using Graph Neural Networks <i>Dancing with the Dark: When Galaxies Shape Galaxies, Sesto, Italy</i>	June 16, 2025
Extracting Dark Matter from Dwarfs <i>Valencia Workshop on the Small-Scale Structure of the Universe and Self-Interacting Dark Matter, Valencia, Spain</i>	June 9, 2025
Mapping out the Dark Matter in the Milky Way <i>UCLA Dark Matter, Los Angeles, CA, USA</i>	March 2025
Empirical Determination of the Dark Matter Velocity Distribution <i>UCLA Dark Matter, Los Angeles, CA, USA</i>	February 2018
Empirical Determination of Dark Matter Velocity Distribution <i>Dark Matter of Southern California, Pasadena, CA, USA</i>	September 2017
Empirical Determination of Dark Matter Velocity Distribution <i>TeVPA, Columbus, Ohio, USA</i>	August 2017
Constructing Stable Observables with Energy Correlation Functions <i>Jet Substructure "Planning for the Future", Fermilab, USA</i>	November 2016
Spherical Cows of Dark Matter Indirect Detection <i>TeVPA, CERN, Switzerland</i>	September 2016
Boosted Dark Matter in Neutrino Experiments <i>Dark Side of the Universe, Bergen, Norway</i>	July 2016
Dark Matter, Shared Asymmetries, and Galactic Gamma Ray Signals <i>Pheno Symposium, Pittsburgh, USA</i>	May 2016
(In)Direct Detection of Boosted Dark Matter <i>TAUP, Torino, Italy</i>	September 2015
Public Talks	
Mapping out Dark Matter in the Milky Way <i>Planetarium Show at the Museum of Science, Cambridge, MA, USA</i>	August 13, 2025
Mapping out Dark Matter in the Milky Way <i>Conference of Undergraduate Womxn in Physics, NYC, NY, USA</i>	January 24, 2025
(Machine) Learning the Genealogy of the Milky Way <i>Simons Presidential Lecture, NYC, NY, USA</i>	September 25, 2024
The Genealogy of the Milky Way and the Search for Dark Matter <i>Friends of KITP, Santa Barbara, CA, USA</i>	March 7, 2023
The Genealogy of the Milky Way and the Search for Dark Matter <i>Winter Aspen, Aspen, CO, USA</i>	March 23, 2022
Chasing Dark Matter with the <i>Gaia</i> Enceladus	April 2019

Research Contracts and Grants

Sloan Fellowship <i>Alfred P. Sloan Foundation</i>	09/2024-09/2026 \$75,000
CAREER: Building the Merger Tree of the Milky Way with Machine Learning <i>National Science Foundation</i>	07/2024-06/2029 \$835,053
Collaborative Research: CDS&E: Systematic Predictions for Dynamical Signatures of New Dark Matter Physics in Galaxies <i>National Science Foundation</i>	08/2023-07/2026 \$398,629
Shining Light on Dark Matter: Using Stars as Tracers of Dark Matter <i>Department of Energy</i>	06/2023-03/2026 \$107,000
Building merger trees with machine learning <i>The Simons Foundation</i>	02/2023-01/2025 \$25,857

Computing and Observing Allocations

Computing Allocations

TACC/Bridges-2, Stampede3 <i>Discover: 1,500,000 ACCESS Credits (PI)</i>	2025
TACC/Bridges-2, Stampede3 <i>Accelerate: 3,000,000 ACCESS Credits (PI)</i>	2025
TACC/Frontera <i>32,000 Node Hours (PI)</i>	2025
TACC/Frontera <i>23,000 Node Hours (PI)</i>	2025
TACC/Frontera: GPUs <i>3,600 Node Hours (PI)</i>	2024
TACC/Frontera <i>108,000 Node Hours (PI)</i>	2024
TACC/Frontera: GPUs <i>4,000 Node Hours (PI)</i>	2023
TACC/Frontera <i>194,000 Node Hours (PI)</i>	2023
XSEDE/Bridges-2: GPUs <i>5,000 Node Hours (PI)</i>	2022
XSEDE/Stampede <i>52,000 Node Hours (PI)</i>	2022
XSEDE/Stampede <i>1,600 Node Hours (PI)</i>	2019

Observing Allocations

Magellan/FIRE <i>High-resolution spectroscopy, 1 night (co-PI)</i>	Semester 2025B
Magellan/MIKE <i>High-resolution spectroscopy, 2 nights (PI)</i>	Semester 2021A

Magellan/MIKE	Semester 2020B
<i>High-resolution spectroscopy, 4 nights (PI)</i>	
Magellan/MIKE	Semester 2020A
<i>High-resolution spectroscopy, 2 nights (co-PI)</i>	
Keck/HIRES	Semester 2020A
<i>High-resolution spectroscopy, 1 night (PI)</i>	