Adrienne L. Erickcek

Assistant Professor
Department of Physics & Astronomy
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RESEARCH INTERESTS

Theoretical cosmology: dark matter, the early Universe and inflation, dark energy, alternate theories of gravity, the cosmic microwave background.

PROFESSIONAL EXPERIENCE

July 2013-present UNIVERSITY OF NORTH CAROLINA AT CHAPEL HILL
DEPARTMENT OF PHYSICS AND ASTRONOMY
Assistant Professor; July 2013 – present

Sept. 2009-Aug. 2013 CANADIAN INSTITUTE FOR THEORETICAL ASTROPHYSICS
PERIMETER INSTITUTE FOR THEORETICAL PHYSICS
Joint CITA/PI Postdoctoral Fellow; Sept. 2009 – Aug. 2011
CIFAR Global Scholar in Cosmology and Gravitation; Sept. 2011 – Aug. 2013

EDUCATION

Sept. 2004-June 2009 CALIFORNIA INSTITUTE OF TECHNOLOGY
Ph.D. in Physics
Thesis: "The Consequences of Modifying Fundamental Cosmological Theories"
Advisor: Prof. Marc Kamionkowski

Oct. 2003-June 2004 UNIVERSITY OF CAMBRIDGE
Master of Advanced Study in Mathematics *with Distinction*

Sept. 1999-June 2003 PRINCETON UNIVERSITY
Bachelor of Arts in Physics *summa cum laude*
Thesis: "A New Constraint on Strongly Interacting Dark Matter from X-Ray Quantum Calorimetry"
Advisor: Prof. Paul Steinhardt

HONORS

2018 NSF Faculty Early Career Development (CAREER) award
2011 CIFAR Junior Fellowship in Cosmology and Gravitation
2009 Stemple Memorial Prize in Physics (Caltech)
2009 Everhart Lecturer (Caltech)
2007 PEO Scholar Award
2003 NSF Graduate Fellowship
2003 Churchill Scholarship to Cambridge University
2003 Sigma Xi Book Award in Physics (Princeton University)
2003 The Allen G. Shenstone Prize in Physics (Princeton University)
2002 Barry M. Goldwater Scholarship
2002 elected to Phi Beta Kappa
2002 The George B. Wood Legacy Junior Prize (Princeton University)

EXTERNAL FUNDING

August 1, 2018- NATIONAL SCIENCE FOUNDATION
July 31, 2023 Award No. PHY-1752752
PI: Adrienne Erickcek
"CAREER: Illuminating the Early Universe with Dark Matter"
$400,000

Jan. 1, 2017- NASA FERMI GUEST INVESTIGATOR CYCLE 10
Dec. 31, 2018 Award No. 80NSSC17K0751
PI: Adrienne Erickcek
"Using Fermi Dark Matter Annihilation Constraints to Probe the Early Universe"
$55,000

August 1, 2014- NATIONAL SCIENCE FOUNDATION
July 31, 2018 Award No. PHY-1417446
PI: Adrienne Erickcek
"Using Dark Matter Microhalos to Probe the Universe's First Second"
$143,994

TEACHING EXPERIENCE

UNIVERSITY OF NORTH CAROLINA AT CHAPEL HILL

Fall 2017 ASTR 202 Introduction to Astrophysics
ASTR 301 Stars, Galaxies, and Cosmology
Spring 2017 ASTR 504 Cosmology
ASTR 704 Cosmology
Fall 2016 ASTR 102 Introduction to Astronomy: Stars, Galaxies, and Cosmology
Co-instructor: Sheila Kannappan
ASTR 301 Stars, Galaxies, and Cosmology
Fall 2015 ASTR 102 Introduction to Astronomy: Stars, Galaxies, and Cosmology
Co-instructor: Sheila Kannappan
ASTR 301 Stars, Galaxies, and Cosmology
Spring 2015 ASTR 504 Cosmology
ASTR 704 Cosmology
Fall 2014 ASTR 301.001 Stars, Galaxies, and Cosmology
ASTR 301.002 Stars, Galaxies, and Cosmology
Spring 2014 PHYS 391 Senior Seminar
ASTR 704 Cosmology

POSTDOCS SUPERVISED

Cosmin Ilie (September 2014 - July 2016)

GRADUATE STUDENTS SUPERVISED

M. Sten Delos: started Fall 2016
Carisa Miller: started Fall 2014
Kayla Redmond: started Fall 2014
M.A. awarded May 2018
Ph.D. thesis title: "Observational Signatures of Kination:" thesis proposal approved May 2018
Isaac Raj Waldstein: started Fall 2014

UNDERGRADUATE SENIOR THESES SUPERVISED

Sheridan Green: April 2017
"Constraining an Early Matter-Dominated Era through Cosmological Simulations"

UNDERGRADUATE STUDENTS SUPERVISED

Margie Bruff, UNC, PHYS 295 Spring 2018
Sheridan Green, UNC, PHYS 295 Fall 2015, Honors Thesis, September 2016-April 2017
Autumn Ficker, UNC, PHYS 295 Spring 2017
Erin Conn, UNC, PHYS 295 Fall 2016
Anthony Trezza, UNC, PHYS 295 Fall 2015
Avery Bailey, University of Virginia, CAP REU Participant, May-August, 2015
Lucas deHart, UNC, funded by NC Space Grant, January-August, 2015
Joshua Horowitz, UNC, funded by NSF PHY-1417446, January-August, 2015
Kate Storey-Fisher, Brown University, CAP REU Participant May-August, 2014
Dayton Ellwanger, UNC**,** funded by start-up, September 2013- August 2014
Nick Priore, UNC, PHYS 482L Spring 2014
Ansel Dow, UNC, January-May 2014
Michael Winer, University of Guelph, CITA Summer Student, May-August 2013
Matus Rybak, St. Andrews University, PI Summer Student, May-August 2012
Fangda Li, University of Toronto, CITA Summer Student, May-August 2011

PROFESSIONAL SERVICE

Departmental Service:

Spring 2018	Astronomy Faculty Search Committee
Fall 2017	APS Bridge Partnership Committee (co-chair)
	Astronomy Faculty Search Committee
	Graduate Affairs & Studies Committee
	Target of Opportunity Hiring Committee
AY 2016-2017	APS Bridge Partnership Committee (co-chair)
	Astronomy Faculty Search Committee
	Diversity Committee
	Graduate Affairs & Studies Committee
Fall 2015	Colloquia Committee
	Graduate Affairs & Studies Committee
AY 2014-2015	Graduate Recruiting Committee
	Doctoral Written Exam Committee
AY 2013-2014	Graduate Recruiting Committee (co-chair)
	Graduate Retention and Diversity Committee

Exam Committees:

Preliminary and Ph.D. Committee: Kathleen Eckert (S. Kannappan's student)
Preliminary and Ph.D. Committee: Thomas Osburn (C. Evans' student)
Preliminary and Ph.D. Committee: Zachary Nasipak (C. Evans' student)
Preliminary and Ph.D. Committee: Casey Berger (J. Drut's student)
Masters Committee: Zachary Nasipak (C. Evans' student)
Masters Committee: John Dupuy (F. Heitsch's student)

Interdepartmental Service:

Fall 2017	Churchill Scholar Nomination Committee
Fall 2016	Churchill Scholar Nomination Committee

Fall 2015 Churchill Scholar Nomination Committee
Fall 2013 Churchill Scholar Nomination Committee

External Service:
Churchill Scholar National Selection Committee
NASA Astrophysics Theory Review Panel
NSF Astronomy CAREER Review Panel
NSF High Energy Theory/Cosmology Review Panel

Referee:
Physical Review D, *Physical Review Letters, Journal of Cosmology and Astroparticle Physics, European Physics Letters, Nature Physics*

Outreach:
- Speaker at "Astronomy on Tap: The Beginning and End of the Universe." Durham, NC; February 6, 2018.
- Speaker at the UNC Program in the Humanities and Human Values Adventures in Ideas Seminar: "The Art of Science and the Science of Art." Chapel Hill, NC; November 19, 2016
- Speaker at the UNC Program in the Humanities and Human Values Adventures in Ideas Seminar: "Earth, the Arts, and the Meaning of Nature." Chapel Hill NC; July 11, 2015.
- Hosted the July 2015 Carolina Science Café: "Big Bang 101." Chapel Hill, NC.
- Speaker at the Spring 2014 Symposium on Horizons in Astronomy and Physics Education (SHAPE). Chapel Hill, NCMay 3, 2014.
- Other Public Lectures:
  - Chapel Hill Astronomical & Observational Society; Chapel Hill, NC; November 10, 2015
  - Hawbridge School, Saxapahaw NC: November 6, 2015
  - Hawbridge School, Saxapahaw NC: May 14, 2014.
  - Mississauga Centre of the Royal Astronomical Society of Canada: Mississauga, ON; May 25, 2012.
  - Astronomy Public Tours, University of Toronto. Toronto, ON; September 6, 2012.
- Guided high-school students through a four-day investigation of dark matter as part of the International Summer School for Young Physicists at the Perimeter Institute. July 2012.

INVITED CONFERENCE AND SEMINAR PRESENTATIONS
- "Using Microhalos to Prove the Universe's First Second," invited presentation at the 13th Conference on the Intersections of Particle and Nuclear Physics (CIPANP); Palm Springs, CA; May 2018.
- "The Early Universe's Imprint on Dark Matter," invited presentation at the Mitchell Conference on Collider, Dark Matter, and Neutrino Physics; College Station, TX; May 2018.
- "The Early Universe's Imprint on Dark Matter," invited presentation at *Towards Dark Matter Discovery* KICP Workshop; Chicago, IL; April 2018.
- "The Early Universe's Imprint on Dark Matter," invited presentation at *The Particle Frontier* Aspen Center for Physics Winter Conference; Aspen, CO; March 2018
- "Using Microhalos to Probe the Universe's First Second," Dark Universe Science Center Seminar; University of Washington; Seattle, WA; January 2018.
- "The Universe's First Second," Haverford College Distinguished Visitor Colloquium; Haverford, PA; November 2017.

- "Signatures of an Early Matter Dominated Era," invited presentation at a dark matter workshop at Fermilab; Batavia, IL; September 2017.
- "The Universe's First Second," Aspen Center for Physics Colloquium; Aspen, CO; June 2017.
- "The Early Universe's Imprint on Dark Matter," invited presentation at the *CETUP* Dark Matter Physics Workshop*; Lead, SD; July 2016.
- "An Early-Universe Boost to the Dark Matter Annihilation Rate," Carnegie Mellon University Astrophysics Seminar; Pittsburgh, PA; September 2015
- "An Early-Universe Boost to the Dark Matter Annihilation Rate," Johns Hopkins University Cosmology and High Energy Theory Seminar; Baltimore, MA; October 2015
- "An Early-Universe Boost to the Dark Matter Annihilation Rate," Ohio State University CCAPP Seminar; Columbus, OH; October 2015
- "Using gamma-rays to probe the Universe's first second," East Carolina Physics Colloquium; Greenville, NC; September 2015
- "The Dark Matter Annihilation Boost from Low-Temperature Reheating", invited presentation at the *Mitchell Workshop on Collider and Dark Matter Physics;* Texas A&M; College Station, TX, May 2015
- "Using Microhalos to Probe the Origins of Dark Matter," Institute for Advanced Study Informal Astrophysics Seminar; Princeton, NJ; November 2014
- "Kicking Chameleons: early universe challenges for chameleon gravity," UNC Wilmington Physics Colloquium; Wilmington, NC; October 2014
- "The Dark Sector's First Second," Syracuse University HET/Cosmology/Relativity Seminar; Syracuse, NY; October 2014
- "The Dark Sector's First Second," Wake Forest Physics Colloquium; Winston-Salem, NC; September 2014
- "Gravity effects in the early universe," invited presentation at *Novel Probes of Gravity and Dark Energy Workshop*; University of Pennsylvania; Philadelphia, PA; April 2013
- "Using Dark Matter to Probe the Early Universe," invited presentation at *Dark Matter: From Colliders to the Cosmos Workshop*; Texas A&M; College Station, TX; March 2013
- "The Dark Sector's First Minute,"
  Institute for Advanced Study Informal Astrophysics Seminar; Princeton, NJ; February 2013
  University of California Riverside Physics Colloquium; Riverside, CA; March 2013
  University of North Carolina Chapel Hill Physics Colloquium; Chapel Hill, NC; March 2013
- "Kicking Chameleons: early universe challenges for chameleon gravity,"
  Case Western Reserve University Astroparticle Seminar; Cleveland, OH; October 2012.
  Perimeter Institute Cosmology Seminar; Waterloo, ON; October 2012.
- "Microhalos: Messengers from the Early Universe,"
  University of Illinois Astrophysics Colloquium; Urbana-Champaign, IL; March 2012.
  Rochester Institute of Technology Astronomy Colloquium; Rochester, NY; March 2012.
- "Dark matter microhalos: messengers from the early universe," KICP Friday noon seminar; University of Chicago; Chicago, IL; October 2011.

- "What dark matter microhalos can tell us about reheating," invited presentation at *Unravelling Dark Matter Conference;* Perimeter Institute; Waterloo, ON; September 2011.
- "Astrometric microlensing by local subhalos: a new window on reheating?" invited presentation at *Dark Matter from Every Direction Workshop*; McGill University; Montreal, QC; April 2011.
- "Shining light through the darkness: detecting local dark matter with stellar astrometry," University of Waterloo Astronomy Seminar, Waterloo, ON; September 2010.
- "Origins of the CMB hemispherical power asymmetry," invited presentation at *Low-l, Large-Angle Anomaly Workshop*; Case Western Reserve University; Cleveland, OH; February 2010.
- "Looking Beyond the Cosmological Horizon," prize Everhart Lecture at Caltech; Pasadena, CA; March 2009.
- "Inflationary Origins of the Cosmic Power Asymmetry," invited presentation at *Perimeter Institute Young Researchers Conference*, Waterloo, ON; December 2008.
- "Structure Beyond the Horizon: Inflationary Origins of the Cosmic Power Asymmetry,"
  Fermilab theoretical astrophysics seminar, Batavia, IL; December 2008.
  KIPAC cosmology seminar, Stanford, CA; November 2008.
  Institute for Advanced Study informal seminar, Princeton, NJ; November 2008.
  UC Berkeley TAC Seminar, Berkeley, CA; October 2008.
  CITA Seminar, Toronto, ON; October 2008.
  Perimeter Institute Cosmology Seminar, Waterloo, ON; October 2008

PUBLICATION LIST
INSPIRE Citation Statistics as of June 20, 2018: 1420 total citations, h-index = 18.
Current and former members of my research group at UNC-CH are shown in boldface.

Submitted Articles

- **M. Sten Delos**, **Adrienne L. Erickcek**, **Avery P. Bailey**, Marcelo A. Alvarez. "The density profiles of ultracompact minihalos: implications for constraining the primordial power spectrum." Submitted to *Physical Review D* June 20, 2018. [arXiv: 1806.07389].

Refereed Articles

- **M. Sten Delos**, **Adrienne L. Erickcek**, Avery P. Bailey, Marcelo A. Alvarez. "Are ultracompact minihalos really ultracompact?" *Phys. Rev. D Rapid Communications* **97**, 041303(R) (2018) [arXiv:1712.05421].
- **Kayla Redmond** and **Adrienne L. Erickcek**. "New Constraints on Dark Matter Production during Kination." *Phys. Rev. D* **96**, 043511 (2017). [arXiv:1704.01056].
- **Isaac Raj Waldstein**, **Adrienne L. Erickcek**, and **Cosmin Ilie**. "A Quasi-Decoupled State for Dark Matter in Non-Standard Thermal Histories." *Phys. Rev. D* **95**, 123531 (2017). [arXiv:1609.05927]
- **Isaac Raj Waldstein** and **Adrienne L. Erickcek**. "Comment on 'Kinetic decoupling of WIMPs: Analytic expressions.'" *Phys. Rev. D* **95**, 088301 (2017). [arXiv:1707.03417].
- **Carisa Miller** and **Adrienne L. Erickcek**. "Quartic chameleons: Safely scale-free in the early Universe." *Phys. Rev. D* **94**, 104049 (2016). [arXiv:1607.07877].
- **Adrienne L. Erickcek**, Kuver Sinha, and Scott Watson. "Bringing Isolated Dark Matter Out of Isolation: Late-time Reheating and Indirect Detection." *Phys. Rev. D* **94**, 063502 (2016). [arXiv: 1510.04291].
- Saroj Adhikari, Sarah Shandera, and **Adrienne L. Erickcek**. "Large-scale anomalies in the cosmic microwave background as signatures of non-Gaussianity." *Phys. Rev. D* **93**, 023524 (2016) [arXiv:1508.06489]
- **Adrienne L. Erickcek**. "The Dark Matter Annihilation Boost from Low-Temperature Reheating." *Phys. Rev. D* **92**, 103505 (2015). [arXiv:1504.03335]
- **Adrienne L. Erickcek**, Neil Barnaby, Clare Burrage, and Zhiqi Huang. "Chameleons in the early universe: kicks, rebounds, and particle production." *Phys. Rev. D* **89**, 084074 (2014). [arXiv:1310.5149].
- Naoya Kobayashi, Takeshi Kobayashi, **Adrienne L. Erickcek**. "Rolling in the modulated reheating scenario." *Journal of Cosmology and Astroparticle Physics* **2014**, 036 (2014). [arXiv:1308.4154].
- Sarah Shandera, **Adrienne L. Erickcek**, Pat Scott, and Jhon Yana Galarza. "Number counts and non-Gaussianity." *Phys. Rev. D* **88**, 103506 (2013). [arXiv:1211.7361].
- **Adrienne L. Erickcek**, Neil Barnaby, Clare Burrage, and Zhiqi Huang. "Catastrophic consequences of kicking the chameleon." *Phys. Rev. Lett*, **110**, 171101 (2013). [arXiv:1304.0009].
- Jens Chluba, **Adrienne L. Erickcek**, and Ido Ben-Dayan. "Probing the inflaton: Small-scale power spectrum constraints from measurements of the CMB energy spectrum." *Astrophysical Journal* **758**, 76 (2012). [arXiv:1203.2681]

- Fangda Li, **Adrienne L. Erickcek**, and Nicholas M. Law. "A new probe of the small-scale primordial power spectrum: astrometric microlensing by ultracompact minihalos." *Phys. Rev. D* **86**, 043519 (2012). [arXiv:1202.1284]
- **Adrienne L. Erickcek** and Kris Sigurdson. "Reheating effects in the matter power spectrum and implications for substructure." *Phys. Rev. D* **84**, 083503 (2011). [arXiv:1106:0536]
- **Adrienne L. Erickcek** and Nicholas M. Law. "Astrometric microlensing by local dark subhalos." *Astrophysical Journal* **729**, 49 (2011) [arXiv:1007.4228]
- **Adrienne L. Erickcek**, Christopher M. Hirata, and Marc Kamionkowski. "A scale-dependent power asymmetry from isocurvature perturbations." *Phys. Rev. D* **80**, 083507 (2009). [arXiv:0907.0705]
- **Adrienne L. Erickcek**, Sean M. Carroll, and Marc Kamionkowski. "Superhorizon perturbations and the cosmic microwave background." *Phys. Rev. D* **78**, 083012 (2008). [arXiv:0808.1570]
- **Adrienne L. Erickcek**, Marc Kamionkowski, and Sean M. Carroll. "A hemispherical power asymmetry from inflation." *Phys. Rev. D* **78**, 123520 (2008). [arXiv:0806.0377]
- Tristan L. Smith, **Adrienne L. Erickcek**, Robert R. Caldwell, and Marc Kamionkowski. "Effects of Chern-Simons gravity on bodies orbiting the Earth." *Phys. Rev. D* **77**, 024015 (2008). [arXiv:0708.0001]
- **Adrienne L. Erickcek**, Paul J. Steinhardt, Dan McCammon, and Patrick C. McGuire. "Constraints on the interactions between dark matter and baryons from the x-ray quantum calorimetry experiment." *Phys. Rev. D* **76**, 042007 (2007). [arXiv:0704.0794]
- Takeshi Chiba, Tristan L. Smith, and **Adrienne L. Erickcek**. "Solar System constraints to general *f(R)* gravity." *Phys. Rev. D* **75,** 124014 (2007). [arXiv:astro-ph/0611867]
- **Adrienne L. Erickcek**, Tristan L. Smith, and Marc Kamionkowski. "Solar System tests *do* rule out *1/R* gravity." *Phys. Rev. D Rapid Communications* **74**, 121501(R) (2006). [arXiv:astro-ph/0610483]
- **Adrienne L. Erickcek**, Marc Kamionkowski, and Andrew J. Benson. "Supermassive black hole merger rates: uncertainties from halo merger theory." *Mon. Not. Roy. Ast. Soc.* **371**, 1992-2000 (2006). [arXiv:astro-ph/0604281]
- Mark A. Scheel, **Adrienne L. Erickcek**, Lior M. Burko, Lawrence E. Kidder, Harald P. Pfeiffer, and Saul A. Teukolsky. "3D simulations of linearized scalar fields in Kerr spacetimes." *Phys. Rev. D* **69**, 104006 (2004). [arXiv:gr-qc/0305027]

Non-Refereed Articles and Conference Proceedings

- **Adrienne L. Erickcek**, Tathagata Ghosh, Jayden Newstead, and Hasan Serce. "A summary of the CETUP* 2016 dark matter workshop discussion sessions." AIP Conf. Proc. **1900** 040010 (2017).
- **Adrienne L. Erickcek** and **Isaac Raj Waldstein**. "The early Universe's imprint on dark matter." AIP Conf. Proc. **1900** 040005 (2017).
- The Theia Collaboration: Celine Boehm, Alberto Krone-Martins, Antonio Amorin, Guillem Anglada-Escude,…**Adrienne Erickcek**…, Rosemary Wyse. "Theia: Faint objects in motion or the new astrometry frontier." [arXiv:1707.01348] (55 pages)
- Bhuvnesh Jain, Austin Joyce, Rodger Thompson, Amol Upadhye, James Battat, Philippe Brax, Anne-Christine Davis, Claudia de Rham, Scott Dodelson, **Adrienne Erickcek**, Gregory

Gabadadze, Wayne Hu, Lam Hui, Dragan Huterer, Marc Kamionkowski, Justin Khoury, Kazuya Koyama, Baojiu Li, Eric Linder, Fabian Schmidt, Roman Scoccimarro, Glenn Starkman, Chris Stubbs, Masahiro Takada, Andrew Tolley, Mark Trodden, Jean-Philippe Uzan, Vinu Vikram, Amanda Weltman, Mark Wyman, Dennis Zaritsky, Gongbo Zhao. "Novel Probes of Gravity and Dark Energy." Report from the "Dark Energy and CMB working group for the APS Long Term Planning Exercise ("Snowmass") 2013. [arXiv:1309.5389]