M. Sten Delos

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RESEARCH INTERESTS

October 31, 2022

Dark matter and gravitational dynamics

Origins of matter and structure in the universe

PROFESSIONAL EXPERIENCE

Sept. 2020-present	**Max Planck Institute for Astrophysics** Postdoctoral Fellow	[Garching, Germany]
May 2020-Sept. 2020	**University of North Carolina at Chapel Hill** Postdoctoral Research Associate	[Chapel Hill, NC, USA]
Aug. 2016-May 2020	**University of North Carolina at Chapel Hill** Graduate Research Assistant Graduate Teaching Assistant	[Chapel Hill, NC, USA]
Jan. 2016-May 2016	**Guilford Technical Community College** Adjunct Instructor	[Jamestown, NC, USA]
Aug. 2010-May 2012	**State University of New York at Stony Brook** Graduate Teaching Assistant	[Stony Brook, NY, USA]

EDUCATION

May 2020	**University of North Carolina at Chapel Hill** Ph.D. in Physics Thesis: “Probing the early universe using dark matter minihalos” Advisor: Adrienne Erickcek	[Chapel Hill, NC, USA]
May 2015	**State University of New York at Stony Brook** M.A. in Physics	[Stony Brook, NY, USA]
May 2010	**University of Virginia** B.S. in Physics and Mathematics *with Highest Distinction*	[Charlottesville, VA, USA]

HONORS

2020 MPA Postdoctoral Fellowship

2019 Dissertation Completion Fellowship (UNC-Chapel Hill)

2019 North Carolina Space Grant Graduate Research Fellowship

2019 Kenan Trust Graduate Student Research Grant (UNC-Chapel Hill)

2010 Sigma Pi Sigma Physics Honor Society

PROFESSIONAL SERVICE

Referee for *Monthly Notices of the Royal Astronomical Society* and *Physical Review D*

Organizer of cosmology group meetings at the Max Planck Institute for Astrophysics

Senior graduate student pre-candidacy mentoring team at UNC-Chapel Hill

PRESENTATIONS

Invited Conference and Seminar Presentations

"Prompt cusps and the dark matter annihilation signal." SFB1258 Neutrinos and Dark Matter colloquium; Garching, Germany; October 2022.

"Prompt cusps of the first halos." Cosmology Seminar at the Max Planck Institute for Astrophysics; Garching, Germany; September 2022.

"Prompt cusps of the first halos." ICAP Meeting at the Institut d'Astrophysique de Paris; Paris, France; September 2022.

"Density profiles of the first halos & microhalo evolution through stellar encounters." *News from the Dark 7*; Montpellier, France; June 2022.

"Stellar streams and dark substructure." Munich Dark Matter Meeting; Munich, Germany; March 2022

"Observational signatures of early matter domination." Particle seminar at Carleton University; Ottawa, Canada; September 2021.

"Perturbed stellar streams in the diffusion regime." Ringberg Meeting of the MPA Galaxy Group; Kreuth, Germany; July 2021.

"The first dark matter halos as probes of cosmology." CGI Seminar at the University of California, Santa Cruz; Santa Cruz, CA, USA; April 2021.

"Probing cosmology using dark matter microhalos." Joint Cambridge-LMU online cosmology workshop; January 2021.

"Probing cosmology using dark matter microhalos." Fermilab CPC Seminar; Batavia, IL, USA; November 2020.

"Predicting the dark matter distribution at the smallest scales." Munich/Garching *Dark Matter Day* mini-workshop; Garching, Germany; October 2020.

"The first dark matter halos as probes of cosmology." Institute Seminar at the Max Planck Institute for Astrophysics; Garching, Germany; October 2020.

"Probing cosmology using dark matter microhalos." Seminar at the Perimeter Institute; Waterloo, ON, Canada; February 2020.

Contributed Conference Presentations

"Prompt cusps of the first halos." *COSMO'22*; Rio de Janeiro, Brazil; August 2022.

"The gamma-ray signature of an early matter-dominated era." *APS April Meeting*; Denver, CO, USA; April 2019.

"The gamma-ray signature of an early matter-dominated era." *Eighth International Fermi Symposium*; Baltimore, MD, USA; October 2018.

"Constraining the primordial power spectrum using minihalos." *APS April Meeting*; Columbus, OH, USA; April 2018.

PUBLICATION LIST

Submitted Journal Articles

M. Sten Delos and Joseph Silk. "Ultradense dark matter haloes accompanying primordial black holes." Submitted to *MNRAS Letters* October 2022 [arXiv:2210.04904].

M. Sten Delos and Simon D. M. White. "Prompt cusps and the dark matter annihilation signal." Submitted to *Nature Astronomy* September 2022 [arXiv:2209.11237].

M. Sten Delos and Simon D. M. White. "Inner cusps of the first dark matter haloes: Formation and survival in a cosmological context." Submitted to *MNRAS* July 2022 [arXiv:2207.05082].

Refereed Journal Articles

M. Sten Delos and Tim Linden. "Dark matter microhalos in the solar neighborhood: Pulsar timing signatures of early matter domination." *Phys. Rev. D* **105**, 123514 (2022) [arXiv:2109.03240].

M. Sten Delos and Fabian Schmidt. "Stellar streams and dark substructure: the diffusion regime." *MNRAS* **513**, 3682 (2022) [arXiv:2108.13420].

Rouzbeh Allahverdi, Mustafa A. Amin, Asher Berlin, Nicolás Bernal, Christian T. Byrnes, **M. Sten Delos**, Adrienne L. Erickcek, Miguel Escudero, Daniel G. Figueroa, Katherine Freese, *et al*. "The First Three Seconds: a Review of Possible Expansion Histories of the Early Universe." *Open J. Astrophys.* **4** (2021) [arXiv:2006.16182].

M. Sten Delos, Tim Linden, and Adrienne L. Erickcek. "Breaking a dark degeneracy: The gamma-ray signature of early matter domination." *Phys. Rev. D* **100**, 123546 (2019) [arXiv:1910.08553].

Carlos Blanco, **M. Sten Delos**, Adrienne L. Erickcek, and Dan Hooper. "Annihilation signatures of hidden sector dark matter within early-forming microhalos." *Phys. Rev. D* **100**, 103010 (2019) [arXiv:1906.00010].

M. Sten Delos. "Evolution of dark matter microhalos through stellar encounters." *Phys. Rev. D* **100**, 083529 (2019) [arXiv:1907.13133].

M. Sten Delos. "Tidal evolution of dark matter annihilation rates in subhalos." *Phys. Rev. D* **100**, 063505 (2019) [arXiv:1906.10690].

M. Sten Delos, Margie Bruff, and Adrienne L. Erickcek. "Predicting the density profiles of the first halos." *Phys. Rev. D* **100**, 023523 (2019) [arXiv:1905.05766].

M. Sten Delos, Adrienne L. Erickcek, Avery P. Bailey, and Marcelo A. Alvarez. "Density profiles of ultracompact minihalos: Implications for constraining the primordial power spectrum." *Phys. Rev. D* **98**, 063527 (2018) [arXiv:1806.07389].

M. Sten Delos, Adrienne L. Erickcek, Avery P. Bailey, and Marcelo A. Alvarez. "Are ultracompact minihalos really ultracompact?" *Phys. Rev. D Rapid Communications* **97**, 041303(R) (2018) [arXiv:1712.05421].

TEACHING EXPERIENCE

University of North Carolina at Chapel Hill [Chapel Hill, NC, USA]

Spring 2019	Cosmology (TA)
Fall 2017	Graduate Quantum Mechanics I (TA)
Summer 2017	Introductory Calculus-based Electromagnetism and Quanta (TA)
Spring 2017	Introductory Calculus-based Electromagnetism and Quanta (TA)
Fall 2016	Introductory Calculus-based Mechanics and Relativity (TA)

Guilford Technical Community College [Jamestown, NC, USA]

Spring 2016	Conceptual Physics

State University of New York at Stony Brook [Stony Brook, NY, USA]

Spring 2012	Physics for Life Sciences I (TA)
Fall 2011	Physics for Life Sciences II (TA)
Spring 2011	Physics for Life Sciences II (TA)
Fall 2010	Physics for Life Sciences I (TA)

CO-ADVISED STUDENTS

Himanish Ganjoo (2019-present) [Faculty Advisor: Katherine Mack]
Graduate Student, *North Carolina State University* & *Perimeter Institute*

Margie Bruff (2018-2019) [Faculty Advisor: Adrienne Erickcek]
Undergraduate Student, *University of North Carolina at Chapel Hill*

REFERENCES

Simon White
Emeritus Director, *Max Planck Institute for Astrophysics*
swhite@mpa-garching.mpg.de

Fabian Schmidt
Scientific Staff, *Max Planck Institute for Astrophysics*
fabians@mpa-garching.mpg.de

Adrienne Erickcek (Ph.D. Thesis Advisor)
Associate Professor of Physics and Astronomy, *University of North Carolina at Chapel Hill*
erickcek@physics.unc.edu

Joseph Silk
Professor of Physics, *Institut d'astrophysique de Paris, Université Pierre-et-Marie-Curie*
Homewood Professor of Physics and Astronomy, *Johns Hopkins University*
Emeritus Savilian Professor, *University of Oxford*
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