SCOTT LUCCHINI

Institute for Theory and Computation (he/him)
Center for Astrophysics | Harvard & Smithsonian
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Research Interests: Hydrodynamical galaxy simulations, gas dynamics, the circumgalactic medium, high-velocity clouds, the Magellanic System, galaxy formation and evolution

EDUCATION

University of Wisconsin – Madison — **Madison, WI**
PhD in Physics — *August 2023*
Master of Arts in Physics (GPA: **4.0**/4.0) — *August 2020*

University of Edinburgh — **Edinburgh, UK**
Master of Science with Distinction in Theoretical Physics (**1st Class**, US equivalent: **A**) — *August 2017*

University of Rochester — **Rochester, NY**
Bachelor of Science in Physics and Astronomy (GPA: **3.91**/4.0) — *May 2014*

RESEARCH AND PROFESSIONAL EXPERIENCE

ITC Fellow — **Cambridge, MA**
Center for Astrophysics | Harvard & Smithsonian — *September 2023 – present*
Using hydrodynamical galaxy simulations to understand the evolution and fate of cold, dense clouds in the multiphase circumgalactic medium.

PhD Research — **Madison, WI**
UW Madison Department of Physics — *January 2019 – August 2023*
Thesis: *The Magellanic Corona and its Role in the Evolution of the Magellanic Stream*
Advisor: Prof. Elena D'Onghia
Used hydrodynamical simulations of the Magellanic Clouds to study the formation of the Stream and the role of the Large Magellanic Cloud's circumgalactic gas, the Magellanic Corona.

Master's Dissertation — **Edinburgh, UK**
University of Edinburgh Department of Physics — *August 2016 – August 2017*
Thesis: *The Quantum Nature of Self-Dual Yang-Mills Theory*
Advisor: Prof. Donal O'Connell
Calculated the one-loop effective action in self-dual Yang Mills quantum theory. Utilized the double copy methodology to explore the one-loop effective action in self-dual gravity.

Software Developer — **Rochester, NY**
Heretto — *June 2014 – August 2016*
Worked on easyDITA software as a service product. Built customized front-end capabilities for individual customers using Java and XML-based scripting languages.

Research Assistant — **Rochester, NY**
University of Rochester Department of Physics and Astronomy — *August 2012 – April 2013*
Advisor: Prof. Eric Blackman
Used analytical techniques and Mathematica to compare multiple competing theories for proto-planetary nebula jet formation.

Solar REU Intern — **Cambridge, MA**
Harvard-Smithsonian Center for Astrophysics — *June – August 2012*
Advisor: Dr. Steve Saar
Developed automated solar "canopy" region detection program using IDL and UNIX. Analyzed regions over time and identified a possible connection between canopies and filaments.

Astronomy REU Intern — **Oswego, NY**
State University of New York at Oswego — *June – August 2011*
Advisor: Prof. Shashi Kanbur
Compared pulsation characteristics of ultra-long period Cepheid variable stars with characteristics of well-known classical Cepheids and Mira variables using Fourier transformation analysis.

REFEREED PUBLICATIONS – ADS

*mentored students are underlined

8. Properties of the Magellanic Corona Model for the formation of the Magellanic Stream
Lucchini, S., D'Onghia, E., Fox, A. J. ApJ, 967, 16. (2023) 10.3847/1538-4357/ad3c3b

7. Constraining the Milky Way Bar Pattern Speed using Hercules and Gaia DR3
Lucchini, S., D'Onghia, E., Aguerri, J. A. L. MNRAS, 531, L14. (2024) 10.1093/mnrasl/slae024

6. Moving Groups Across Galactocentric Radius with Gaia DR3
Lucchini, S., Pellett, E., D'Onghia, E., & Aguerri, J. MNRAS, 519, 1. (2023) 10.1093/mnras/stac3519

5. Observations of a Magellanic Corona
Krishnarao, D., Fox, A. J., D'Onghia E., Wakker B. P., Cashman F. H., Howk, C. J., **Lucchini S.**, French D. M., Lehner, N. Nature, 609, 915. (2022) 10.1038/s41586-022-05090-5
Contribution: Provided properties of predicted Magellanic Corona from simulations

4. First evidence of a stripped star cluster from the Small Magellanic Cloud
Piatti, A. E., & **Lucchini, S.** MNRAS, 515, 4005. (2022) 10.1093/mnras/stac1980
Contribution: Integrated cluster orbits within the evolution of the Magellanic Clouds

3. The Magellanic Stream at 20 kpc: A New Orbital History for the Magellanic Clouds
Lucchini, S., D'Onghia, E., & Fox, A. J. ApJL, 921, L36. (2021) 10.3847/2041-8213/ac3338

2. The Magellanic Corona as the key to the formation of the Magellanic Stream
Lucchini, S., D'Onghia, E., Fox, A. J., Bustard, C., Bland-Hawthorn, J., & Zweibel, E. Nature, 585, 203. (2020) 10.1038/s41586-020-2663-4 arXiv:2009.04368

1. Using kinematic properties of pre-planetary nebulae to constrain engine paradigms
Blackman, E. G., & **Lucchini, S.** MNRAS, 440, L16. (2014) 10.1093/mnrasl/slu001

INVITED TALKS

Apr. 2024 — **Via Science Meeting** — Cambridge, MA
Center for Astrophysics | Harvard & Smithsonian

Nov. 2023 — **Institute for Astrophysics Colloquium** — Virtual
University of Vienna

Sept. 2023 — **ITC Luncheon Seminar** — Cambridge, MA
Center for Astrophysics | Harvard & Smithsonian [Recording Link]

Apr. 2023 — **The Astrophysical & Planetary Sciences Friday Lunch Seminar** — Boulder, CO
University of Colorado – Boulder

Mar. 2023	**Center for Theory and Computation Seminar** University of Maryland	College Park, MD
Oct. 2022	**Galaxy Evolution Group Meeting Seminar** Center for Computational Astrophysics	New York, NY
Oct. 2022	**Seminar** Columbia University	New York, NY
Oct. 2022	**Low Density Universe Seminar** Space Telescope Science Institute	Baltimore, MD
Oct. 2022	**Hernquist Group Meeting Seminar** Center for Astrophysics | Harvard & Smithsonian	Cambridge, MA
Jul. 2022	**Public Talk** Madison Astronomical Society [Recording Link]	Madison, WI
Jun. 2022	**Invited Talk** Green Bank Observatory HVCs Workshop	Green Bank, WV
Mar. 2022	**Galaxies and AGN Seminar** Space Telescope/Johns Hopkins	Virtual
Aug. 2021	**Invited Talk** 31st Annual Wisconsin Space Conference	Milwaukee, WI
Sept. 2019	**Galaxy Dynamics Group Meeting Seminar** Center for Computational Astrophysics	New York, NY

CONTRIBUTED TALKS

Feb. 2024	**Conference Talk** XMC Workshop: Milky Clouds Over Manhattan	New York, NY
Apr. 2022	**Conference Talk** 53rd Division on Dynamical Astronomy of the AAS Annual Meeting	New York, NY
May 2021	**Conference Talk** 52nd Division on Dynamical Astronomy of the AAS Annual Meeting	Virtual
Jan. 2021	**Conference Talk** 237th American Astronomical Society Meeting	Virtual
Sept. 2019	**Conference Talk** A synoptic view of the Magellanic Clouds: VMC, Gaia and beyond	Garching, Germany
Aug. 2017	**Master's Dissertation Seminar** University of Edinburgh Department of Physics	Edinburgh, UK
Jan. 2013	**Poster Presentation** 221st American Astronomical Society Meeting	Long Beach, CA

SERVICE AND ORGANIZATIONS

Peer Review

AAS Journals	*since 2022*
Monthly Notices of the Royal Astronomical Society	*since 2021*

Collaboration and Society Membership

GASKAP	*since 2022*

American Astronomical Society *since 2023*
AAS Division on Dynamical Astronomy *since 2021*

Committees

ITC Luncheon Coordinator *since 2023*
UW Physics Outreach, Museum, Web Content & Events committee *2022-2023*

LEADERSHIP AND MENTORING

Vincent Lu (UW-Madison Undergraduate) *Sept 2021 – May 2023*
Applied the MGWave code to chemical data from APOGEE and SDSS-V. Also investigated the origin of the Arcturus moving group.

Emil Pellett (UW-Madison Undergraduate) *Feb 2020 – Sept 2021*
Developed the MGwave open-source Python wavelet transformation code. Resulted in publication of *Moving Groups through Galactocentric Radius with Gaia DR3*.

TEACHING EXPERIENCE

UW Madison Co-instructor *Summer 2022*

General Physics – PHY 103
Taught five lectures over the eight-week session including active learning components (clicker questions) and live demonstrations. Rewrote two lectures including pre-lecture and bridge material and wrote new problems for exams and discussion worksheets.

UW Madison Guest Lecture *Spring 2022*

Our Exploration of the Solar System – AST 104

UW Madison Review Lecture *Spring 2020*

General Physics – PHY 103
Wrote an hour-long review lecture with slides and new worked problems compiling all the material from Unit 1. Wrote new example problems for student practice.

UW Madison Teaching Assistant *Fall 2017 – Spring 2020*

General Physics – PHY 103, 104, 202, 207
Created worksheets and quizzes each week integrating course materials and writing new questions. Led discussion sections and labs where group work and interactive learning was encouraged.

University of Rochester Teaching Intern *Fall 2010 – Fall 2012*

Led labs and workshop sessions and graded coursework and exams for a variety of courses.

TEACHING AND LEADERSHIP AWARDS

Apr. 2022 **Joseph R. Dillinger Award for Teaching Excellence**

May 2020 **UW Madison Best TA Award – Fall 2019**
General Physics – PHY 104

May 2018 **UW Madison Best TA Award – Fall 2017**
General Physics – PHY 207

May 2013 **University of Rochester Undergraduate Teaching Award**

Nov. 2010 **Phi Beta Kappa Iota Book Award 2010**

RESEARCH AWARDS AND GRANTS

Aug. 2024 **International Astronomical Union PhD Prize**

Jun. 2022	**NASA Wisconsin Space Grant Consortium Research Fellowship**	$5k
Apr. 2022	**Division on Dynamical Astronomy 2022 Duncombe Prize**	$600
Apr. 2022	**Division on Dynamical Astronomy Travel Award**	$175
Apr. 2022	**UW Student Research Grant**	$600
Jul. 2021	**Karl Guthe Jansky and Alice Knapp Jansky Scholarship**	$3k
Apr. 2021	**NASA Wisconsin Space Grant Consortium Research Fellowship**	$5k
Dec. 2020	**Stebbins Award**	$2k
May 2020	**Karl Guthe Jansky and Alice Knapp Jansky Scholarship**	$3k
Apr. 2020	**NASA Wisconsin Space Grant Consortium Research Fellowship**	$5k
Mar. 2020	**UW Student Research Grant**	$600

AWARDED OBSERVATIONAL PROPOSALS

Feb. 2023	**Period 111 Very Large Telescope Proposal** Co-I: "The Distance to the Magellanic Stream"	26h
Jun. 2022	**Cycle 30 Hubble Space Telescope Archival Research Proposal** Co-I: "The Cool CGM of the Large Magellanic Cloud"	
Jun. 2021	**Cycle 29 Hubble Space Telescope Archival Research Proposal** Co-I: "The LMC's Galactic Wind through the Eyes of ULYSSES"	$110k
May 2020	**Cycle 28 Hubble Space Telescope Archival Research Proposal** Co-I: "Searching for the LMC Corona: The missing element for the formation of the Magellanic Stream"	$276k

MEDIA AND PRESS

For: **The Magellanic Stream at 20 kpc: A New Orbital History for the Magellanic Clouds** Lucchini, S., et al. *ApJL*, 921, L36. (2021)

- UW News: "Magellanic Stream arcing over Milky Way may be five times closer than previously thought" [Article Link]
- Phys.org: "Magellanic Stream arcing over Milky Way may be five times closer than previously thought" [Article Link]
- Science Alert: "The Magellanic Stream May Be 5 Times Closer to Us Than We Ever Realized" [Article Link]
- Live Science: "This hot 'stream' of star gas will collide with our galaxy sooner than we thought" [Article Link]

For: **The Magellanic Corona as the key to the formation of the Magellanic Stream** Lucchini, S., et al. Nature, 585, 203. (2020)

- UW News: "Huge Halo of Warm Gas around Magellanic Clouds is Key to Formation of Magellanic Stream" [Article Link]
- Univ. Sydney: "How the Milky Way stole an enormous gas halo from our dwarf neighbours" [Article Link]
- Nature: "Galactic coronae" [Article Link]
- Phys.org: "Massive halo finally explains stream of gas swirling around the Milky Way" [Article Link]
- Universe Today: "The Milky Way is Already Starting to Digest the Magellanic Clouds, Starting With Their Protective Halos of Hot Gas" [Article Link]
- CNET: "Astronomers crack '50-year puzzle' of cosmic stream ripped apart by Milky Way" [Article Link]
- VICE: "Astronomers Are Hunting for a 'Hidden' Halo Orbiting the Milky Way" [Article Link]

- Cosmos Magazine: “Massive haloes explain a massive gas stream” [Article Link]
- Sci News: “Huge Halo of Warm Gas around Magellanic Clouds is Key to Formation of Magellanic Stream” [Article Link]
- Science Daily: “Massive halo finally explains stream of gas swirling around the Milky Way” [Article Link]
- Science Alert: “We May Finally Know The Origins of A Mysterious Stream Circling The Milky Way” [Article Link]