SCOTT LUCCHINI

University of Wisconsin – Madison (he/him)
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Research Interests: Hydrodynamical galaxy simulations, gas dynamics, the Magellanic System, the circumgalactic medium, high-velocity clouds, galaxy formation and evolution

EDUCATION

University of Wisconsin – Madison — **Madison, WI**
PhD in Physics — *expected June 2023*
Master of Arts in Physics (GPA: **4.0**/4.0) — *August 2020*
Advisor: Prof. Elena D'Onghia

University of Edinburgh — **Edinburgh, UK**
Master of Science with Distinction in Theoretical Physics (**1st Class**, US equivalent: **A**) — *August 2017*
Thesis: *The Quantum Nature of Self-Dual Yang-Mills Theory*
Advisor: Prof. Donal O'Connell

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

REFEREED PUBLICATIONS – ADS

*mentored students are underlined

7. Moving Groups Across Galactocentric Radius with Gaia DR3
Lucchini, S., Pellett, E., D'Onghia, E., & Aguerri, J. A. L. MNRAS, submitted. (2022) arXiv:2206.10633
6. 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
5. First evidence of a stripped star cluster from the Small Magellanic Cloud
Piatti, A. E., & **Lucchini, S.** MNRAS, 515, 4005. (2022) arXiv:2207.05034
Contribution: Integrated cluster orbits within the evolution of the Magellanic Clouds
4. 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) arXiv:2110.11355
3. 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) arXiv:2009.04368
2. Using kinematic properties of pre-planetary nebulae to constrain engine paradigms
Blackman, E. G., & **Lucchini, S.** MNRAS, 440, L16. (2014) arXiv:1312.5372
1. Preliminary Analysis of ULPC Light Curves Using Fourier Decomposition Technique
Ngeow, C.-C., **Lucchini, S.**, Kanbur, S., Barrett, B., & Lin, B. IEEE IconSpace2013 proceedings. (2013) arXiv:1309.4297

RESEARCH AND PROFESSIONAL EXPERIENCE

PhD Research — Madison, WI
UW Madison Department of Physics — *January 2019 – present*

Advisor: Prof. Elena D'Onghia

I use hydrodynamical N-body simulations to study the formation of the Magellanic Stream. My work has showed that the Magellanic Corona of warm gas around the Large Magellanic Cloud can account for the ionized component of the Stream. I use the UW Madison HPC cluster to generate galaxy initial conditions and execute GIZMO simulation runs. I write custom analysis code in Python to compare simulations with observations in a variety of ways including plotting spatial extents, column densities, velocities, and ionization states, in addition to calculating masses and temperatures.

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

Performed calculations in quantum field theory to determine the effective action of self-dual Yang-Mills theory at one-loop. 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. Developed features and fixed bugs in the back-end codebase 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 several cases with interesting evolutionary properties possibly indicating a 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.

INVITED TALKS

Oct. 2022 **Seminar** — New York, NY
CCA Galaxy Evolution Group Meeting

Oct. 2022 **Seminar** — New York, NY
Columbia University

Oct. 2022 **Seminar** — Baltimore, MD
Space Telescope Science Institute

Oct. 2022 **Seminar** Cambridge, MA
Harvard-Smithsonian Center for Astrophysics

Jul. 2022 **Public Talk** Madison, WI
Madison Astronomical Society [Recording Link]

Jun. 2022 **Invited Talk** Green Bank, WV
Green Bank Observatory HVCs Workshop

Mar. 2022 **Seminar** Virtual
Space Telescope/Johns Hopkins Galaxies and AGN Seminar

Aug. 2021 **Invited Talk** Milwaukee, WI
31st Annual Wisconsin Space Conference

Sept. 2019 **Seminar** New York, NY
CCA Galactic Dynamics Group Meeting

CONTRIBUTED TALKS

Apr. 2022 **Conference Talk** New York, NY
53rd Division on Dynamical Astronomy of the AAS Annual Meeting

May 2021 **Conference Talk** Virtual
52nd Division on Dynamical Astronomy of the AAS Annual Meeting

Jan. 2021 **Conference Talk** Virtual
237th American Astronomical Society Meeting

Sept. 2019 **Conference Talk** Garching, Germany
A synoptic view of the Magellanic Clouds: VMC, Gaia and beyond

Aug. 2017 **Master's Dissertation Seminar** Edinburgh, UK
University of Edinburgh Department of Physics

Jan. 2013 **Poster Presentation** Long Beach, CA
221st American Astronomical Society Meeting

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*
AAS Division on Dynamical Astronomy *since 2021*

University Committees
UW Physics Outreach, Museum, Web Content & Events committee *since 2022*

LEADERSHIP AND MENTORING

Vincent Lu (UW-Madison Undergraduate) *Sept 2021 – present*
Mentoring Vincent throughout his Undergraduate Research Scholars project. He is applying the MGWave code to chemical data from APOGEE and SDSS-V. He is also investigating the origin of the Arcturus moving group.

Emil Pellett (UW-Madison Undergraduate) *Feb 2020 – Sept 2021*

Mentored Emil throughout his undergraduate research project in which we 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. Lectures included active learning components (clicker questions) and live demonstrations. Rewrote two lectures on rotational motion including reworking pre-lecture and bridge set material. Developed a new live demonstration for the torque lecture. Wrote new problems for use in exams and in 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 discussion worksheets and quizzes each week including 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

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

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]