MAGDALENA SIWEK

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EDUCATION

Harvard University 2018-May 2024

University of Glasgow 2016- 2017 University of Glasgow 2012 - 2016

PhD in Astronomy and Astrophysics. Thesis: Signatures of Circumbinary Disk Dynamics in Massive Black Hole Binary Populations. Successful thesis defense on 05/01/2024, degree conferral on 05/23/2024. Advisor: Lars HERNQUIST · lhernquist@cfa.harvard.edu

MSc Physics and Astronomy. Thesis: Hydrodynamic Simulations of AGN Outflows. Advisors: Ramesh NARAYAN rnarayan@cfa.harvard.edu, Graham WoAN Graham.Woan@glasgow.ac.uk

BSc Physics and Astronomy. Thesis: Measuring General Relativistic effects around pulsar PSR B0329+54. Advisors: Graham WOAN · Graham.Woan@glasgow.ac.uk

RESEARCH POSITIONS

Postdoctoral Fellow. I am currently a Junior Fellow with the Simons Society of Fellows at Columbia University Columbia University. My research spans topics related to Circumbinary Accretion Disks, including Sep 2024 stellar binaries, planet formation in Circumbinary Disks, and multi-messenger detection of Massive Black Hole Binaries.

Postdoctoral Researcher. I am a postdoctoral researcher at Harvard University, working on multi-messenger astrophysics involving massive black hole binaries.

Research Assistant. I develop high resolution hydrodynamic simulations of circumbinary disks (CBDs) using the moving-mesh code AREPO. I use results from my simulations to investigate the effect of CBD driven evolution on binaries on all scales, including multi-messenger signatures of binary supermassive black holes.

Summer School Student. Improving convergence in C++ Hydrodynamics simulations to 5th order using the WENO method: https://github.com/mssiwek/WENO. Advisor: Jonathan ZRAKE · jonathan.zrake@gmail.com

Research Assistant. Statistical Analysis of Supernovae resulting in a highly cited publication: Host galaxies of type Ic/Ic-BL supernovae from the Palomar Transient Factory: Implications for Jet production. Advisor: Maryam MODJAZ · mmodjaz@nyu.edu

Research Assistant. Development of numerical simulations studying winds from accretion disks, leading to a publication: Numerical Simulations of ULX outflows with KORAL. Advisors: Ramesh NARAYAN • rnarayan@cfa.harvard.edu, Aleksander SADOWSKI • asadowski@mit.edu

Research Assistant. Statistical analysis of Time-Series data in H Ly- α in Solar flares. Development of Solar Flare Detection Algorithms in GOES 15 data. Advisor: Nicolas LABROSSE · Nicolas.Labrosse@glasgow.ac.uk

Research Assistant. Statistical Analysis of Galactic Morphology and Mergers in 2dFLenS data. Implications for and Detection of Strong Gravitational Lensing in Galaxies. Advisor: Chris BLake \cdot cblake@swin.edu.au

ESA Trainee. First statistical analysis of the Gaia space telescope. Discovery of a glitch in Gaia's star detection algorithm which was later solved by a spacecraft upgrade. Advisor: Edmund SERPELL Edmund.Serpell@esa.int

SELECTED PUBLICATIONS

Siwek et al. (2024): Signatures of Circumbinary Disk Dynamics in Multi-Messenger Population Studies of Massive Black Hole Binaries

NANOGrav collaboration (incl. Siwek; 2023a): The NANOGrav 15 yr data set: Evidence for a gravitational-wave background

NANOGrav collaboration (incl. Siwek; 2023b): The NANOGrav 15 yr Data Set: Constraints on Supermassive Black Hole Binaries from the Gravitational-wave Background

Harvard University May 2024 - Sep 2024 Harvard University 2018 - May 2024

Center for Computational Astrophysics, 2019

New York University Jan - July 2018

Harvard University Jun - Sep 2016

University of Glasgow Aug - Sep 2015 Swinburne

University May -Aug 2015

European Space Agency Jun - Sep 2014

Siwek et al. (2023b): Orbital Evolution of Binaries in Circumbinary Disks

Siwek et al. (2023a): Preferential Accretion and Circumbinary Disk Precession in Eccentric Binary Systems

Siwek et al. (2020): The effect of differential accretion on the Gravitational Wave Background and the present day MBH Binary population

Siwek et al. (2017): Optical and X-ray luminosities of expanding nebulae around ultraluminous X-ray sources.

Full publication record: ADS.

AWARDS

2024	Harvard University Eric Keto Prize: Awarded to the Best Doctoral Thesis in Theoretical Astrophysics at Harvard University
2022	Harvard University Derek Bok Center Certificate of Distinction in Teaching
2021	Harvard University Derek Bok Center Certificate of Distinction in Teaching
2018	Harvard Scholarship Foundation Germany Merit-based stipend supporting exceptionally gifted graduate students from Germany
2017	University of Glasgow Archibald McAulay Memorial Prize: Best Combined Physics MSci candidate
2016	University of Glasgow Mackay Smith Prize: Best Physics and Astronomy MSci candidate
2015	University of Glasgow Tannahill Bequest: Best Astronomy honours student

- 2015 Royal Society of Edinburgh: Cormack Research Scholarship
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MENTORING

- 2023 present Samir Goorachurn, undergraduate student at McGill University
- 2023 present Ruggero Valli, graduate student at Max Planck Institute for Astrophysics

TEACHING AND OUTREACH

- 2019 present Volunteer, Skype A Scientist: Hosting live Q&A sessions with classrooms around the world.
 - 2021 **Teaching Fellow**, Harvard University, ASTRON17: Galactic and Extragalactic Astronomy. Instructor: Daniel Eisenstein.
 - 2020 **Teaching Fellow**, Harvard University, ASTRON17: Galactic and Extragalactic Astronomy. Instructor: Daniel Eisenstein.

SERVICE AND LEADERSHIP

- 2023 **Blackboard Talk Series, ITC (Harvard)**: Initiated a new blackboard talk series focusing on topics in theoretical astrophysics at the ITC.
- 2020 present **Founder: Harvard University Astronomy Garden**: Founded and lead the Astronomy Garden (Asgard) at Harvard University. Won funding from the Harvard Astronomy department in the amount of \$15000.
 - 2020-2021 Harvard University Astronomy Graduate Program Committee: Advocating for graduate students' interests in academic policy, student wellness, and any other topics of general concern.

2019-2021 Harvard University GSAS Student Center Fellow: Leadership at the GSAS Student Center, building community across the graduate school of arts and science (GSAS).

2020-2023 **Harvard University Astronomy Peer Mentoring Program Coordinator**: Matching incoming graduate students with mentors and organizing mentoring events throughout the academic year.

2020 Harvard University Astronomy Admitted Students Visit Coordinator: Planning and organizing the annual visit of newly admitted graduate students.

SELECTED TALKS

Invited talk at science meeting in Barossa Valley "Connecting Simulations and Observations in June 2024 3D Across Cosmic Time" (Australia): Signatures of Circumbinary Disk Dynamics in Massive Black Hole Binary Populations Invited talk at Winter AAS Gravitational Wave Science Interest Group (New Orleans, LA, USA): January 2024 Multi-Messenger Signatures of Circumbinary Disk Physics in PTAs, LSST and LISA December 2023 Black Holes on Broadway Conference (New York, NY, USA): Signatures of Circumbinary Disks in Multi-Messenger Studies of Massive Black Hole Binaries Astrophysics and Relativity Seminar at New York University (New York, NY, USA): Orbital April 2023 Evolution of Binaries in Circumbinary Disks April 2023 Seminar at Institute for Advanced Study (Princeton, NJ, USA): Orbital Evolution of Binaries in Circumbinary Disks THEA Seminar at Columbia University (New York City, NY, USA): Orbital Evolution of Binaries April 2023 in Circumbinary Disks March 2023 Stellar Physics Seminar at Max Planck Insitute for Astrophysics (Garching, Germany): Orbital Evolution of Binaries in Circumbinary Disks March 2023 Cambridge University Department of Applied Mathematics and Theoretical Physics General Relativity Seminar (Cambridge, UK): Orbital Evolution of Binaries in Circumbinary Disks February 2023 ITC Lunch Seminar Talk at Harvard University (Cambridge, MA, USA): Orbital Evolution of Binaries in Circumbinary Disks Conference Talk at Gravitational Wave Physics and Astronomy Workshop (Melbourne, December 2022 Australia): Orbital Evolution of Binaries in Circumbinary Disks July 2022 Invited Talk at BHI BLack holes Across Space and Time (BLAST) workshop (virtual): Simulations of Supermassive Binary Black Holes December 2021 Conference Talk at Gravitational Wave Physics and Astronomy Workshop (Hannover, Germany): Preferential Accretion onto Eccentric Black Hole Binaries October 2021 Conference Talk at NANOGrav Fall Collaboration Meeting (Nashville, TN, USA): Preferential Accretion in MBHBs on Eccentric Orbits Conference Talk at NANOGrav Fall Collaboration Meeting (virtual): The effect of differential October 2020 accretion on the Gravitational Wave Background and the present-day MBHB population. May 2019 Cosmology Seminar at Max Planck Insitute for Astrophysics (Garching, Germany): Binary accretion and the Gravitational Wave Background.

July 2, 2024