

Aliaksandra (Sasha) Levina

alevinal@jhu.edu,
(720) 496 - 3502

Research Interests Gravitational wave astrophysics, black hole and neutron star merger rates and properties, binary and stellar evolution; I am interested in how gravitational waves can be used to study the properties of double compact objects and their progenitors in order to better understand stellar and binary evolution over cosmic history.

Education **Johns Hopkins University**, Baltimore, MD August 2023 - present
Ph.D., Astronomy (expected 2028)
Advisors: Floor Broekgaarden, Emanuele Berti

Haverford College, Haverford, PA August 2019 - May 2023
B.S., Astronomy & Physics
Concentration: Scientific Computing
Senior thesis: “Applying Wind Roche-Lobe Overflow in Binary Evolution using MESA and POSYDON”

Research *Effect of the Metallicity-Dependent Star Formation Rate History on the Binary Black Hole Merger Population* August 2023 - present

Johns Hopkins University, Baltimore, MD

Advisors: Floor Broekgaarden, Emanuele Berti, Lieke van Son

- Model the star formation rate density (SFRD) and cosmic chemical enrichment in the cosmological gravo-magnetohydrodynamic simulation IllustrisTNG using a parameterized model for the metallicity-dependent SFRD
- Optimize and validate the parametric model for the metallicity-dependent SFRD
- Test the effect of resolution and assumptions in six runs of the IllustrisTNG simulation on the metallicity-dependent SFRD and the binary black hole (BBH) merger population
- Investigate the impact of metallicity evolution over cosmic time on the merger rates and properties (e.g. primary mass distribution) of the BBH merger population using the rapid population synthesis code COMPAS

Modeling Wind Roche-Lobe Overflow in Binary Evolution June 2022 - May 2023

Northwestern University, Evanston, IL

CIERA REU

Advisors: Vicky Kalogera, Meng Sun, Zoheyr Doctor

- Implemented a new physical mechanism for wind mass-transfer into the stellar evolution simulation code MESA (Modules for Experiments in Stellar Astrophysics) and the detailed binary population synthesis code POSYDON (POPulation SYnthesis with Detailed binary-evolution simuLatiONs)
- Simulated and analyzed binary system evolution using MESA
- Used the Quest High-Performance Computing Cluster to run population synthesis simulations using POSYDON
- The work culminated in a senior thesis (May 2023) and a paper published in ApJ in June 2024

Analyzing Crab Pulsar X-ray Emission

June 2020 - May 2023

Haverford College, Haverford, PA
Advisor: Andrea Lommen

- Developed code in Python and used a high-performance Linux computing cluster to analyze data and construct plots using observational data
- Developed a script that efficiently calculates pulse phases for pulsar timing data
- Contributed code to the NANOGrav pulsar timing analysis software PINT
- Used NICERSoft, HEASoft, and PINT to download and process data
- Used Bayesian statistics to fit models to observational data
- Utilized large quantities of pulsar timing data from NICER (Neutron star Interior Composition Explorer)

Publications

Sun, M., **Levina, S.**, Gossage, S., Kalogera, V., Leiner, E. M., Geller, A. M., Doctor, Z., “Wind Roche-lobe Overflow in Low-mass Binaries: Exploring the Origin of Rapidly Rotating Blue Lurkers.” *ApJ* 969 8. DOI: 10.3847/1538-4357/ad47c1

Susobhanan, A., et al... **Levina, S.**..., “PINT: Maximum-likelihood estimation of pulsar timing noise parameters.” accepted for publication in *ApJ*.

Awards and Grants

William H. Miller III Graduate Fellowship 2023
Johns Hopkins University

NSF Research Experiences for Undergraduates 2022
Northwestern CIERA REU

Talks and Poster Presentations

“The effect from uncertainties in cosmological simulations on the binary black hole merger population”

- Lorentz Center workshop: Gravitational waves: a new ear on the chemistry of galaxies, Leiden, the Netherlands. April 2024

“The effect from uncertainties within cosmological simulations on the binary black hole merger population”

- Nordic Winter School on Multimessenger Astrophysics, Skeikampen, Norway. January 2024

“Applying wind Roche-lobe overflow in binary evolution using MESA and POSYDON”

- Senior thesis poster session, Haverford College, May 2023
- 241st Meeting of the American Astronomical Society, January 2023
- Summer research symposium, Haverford College, September 2022
- CIERA REU poster session, Northwestern University, August 2022

“Pulse-to-pulse intensity modulation of the Crab Pulsar using NICER”

- NANOGrav 2022 Fall Meeting poster session, University of Wisconsin-Milwaukee, October 2022

“Pulse-to-pulse intensity modulation of three X-ray pulsars using NICER data”

- NANOGrav 2021 Fall Meeting poster session, Vanderbilt University, October 2021
- Summer research symposium, Haverford College, September 2021
- 237th Meeting of the American Astronomical Society, January 2021
- NANOGrav 2020 Fall Meeting, October 2020
- Summer research symposium, Haverford College, September 2020

Workshops	Code/Astro, CIERA, July 2024
	3rd MaNiTou Summer School on Gravitational Waves, July 2024
	Gravitational waves: a new ear on the chemistry of galaxies, Lorentz Center, April 2024
	Stable mass transfer in binaries: from onset to remnant, Center for Computational Astrophysics, March 2024
	Nordic Winter School on Multimessenger Astrophysics, January 2024
Outreach	“Physics and astronomy research talks” and “Careers in STEM” Q&A panel at City Neighbors High School, December 2023
Skills	<ul style="list-style-type: none"> • Programming Languages: Python, Fortran, MatLab, HTML, CSS • Operating systems: Mac OS, Windows OS, Linux • Software: LaTeX, Git, Mathematica • Other: High-Performance Computing Clusters
Professional Memberships	<p>American Astronomical Society</p> <p>American Physical Society</p> <p>Society of Physics Students and Sigma Pi Sigma Physics Honor Society</p>