Kaila Nathaniel

kjn9240 AT rit DOT edu kailanathaniel.com

ORCID ID: 0000-0003-2430-9515 Last updated: February 25, 2025

Education:

2022 – present	**PhD in Astrophysical Sciences and Technology** (AST) Rochester Institute of Technology (RIT) Advisor: Richard O'Shaughnessy	Rochester, NY
2022	**MS in Astrophysics**, University of Bonn Thesis: "Spindown and envelope inflation of massive main sequence stars in the Milky Way", Advisor: Norbert Langer	Bonn, Germany
2019	**BS in Physics**, minors in Math and Astronomy, *magna cum laude* Virginia Polytechnic Institute and State University (Virginia Tech)	Blacksburg, VA

External Experience:

2023 – present	**LSSTC Data Science Fellow**, LSST Corporation
2024	**McFacts Hack Week 2024**, Center for Computational Astrophysics NYC, NY.
2023	**Kavli Summer Program in Astrophysics**, Max Planck Institute for Astrophysics Garching, Germany. Project Advisor: Alejandro Vigna-Gómez. *Effect of rejuvenated accretors on the population of Thorne-Żytkow Objects*
2019	**Advancing Theoretical Astrophysics Summer School** Anton Pannekoek Institute for Astronomy, University of Amsterdam (The Netherlands)
2018	**LIGO Summer Undergraduate Research Fellow**, California Institute of Technology Pasadena, CA. Project Advisor: Brittany Kamai. Poster, SACNAS 2018: *Could a seismic cloak help LIGO?*
2017	**International REU Student**, School of Physics and Astronomy University of Birmingham, United Kingdom. Project Advisor: Ilya Mandel. *Chemically homogeneous evolution: a rapid population synthesis approach*
2016 – 2017	**Nancy Grace Roman Space Telescope Winter Intern** NASA Goddard Space Flight Center, Greenbelt, MD.

Awards and Honors:

2023	**LSSTC Data Science Fellowship**	LSSTC Data Science Fellowship Program
2023	**Kavli Summer Program Fellowship**	Kavli Foundation
2023	**Opportunity Fellowship**	AST/New York Space Grant Consortium
2019	**MS Honors Scholarship**	Bonn-Cologne Graduate School
2019	**Ladies of Robeson Award**	Department of Physics, Virginia Tech
2018	**Sigma Pi Sigma Honor Society Inductee**	Department of Physics, Virginia Tech

Skills:

Software & Tools:	McFACTS, MESA, COMPAS, GitHub, LaTeX, HTML
Computer Languages:	Python (numpy, scipy, matplotlib, pandas, etc.), Bash, FORTRAN, Java, C++
Human Languages:	English (Native), German (B2)

Publications:

1. "Spindown of massive main sequence stars in the Milky Way"
   Nathaniel, K., Langer, N., Simón-Díaz, et al. 2025. *Submitted to A&A*, arXiv: 2502.12107 .
2. "Population synthesis of Thorne-Żytkow objects: Rejuvenated donors and unexplored progenitors in the common envelope formation channel"
   Nathaniel, K., Vigna-Gómez, A., Grichener, A., et al. 2025. *A&A* 694, A83. DOI: 10.1051/0004-6361/202451531.
3. "McFACTS III: Compact binary mergers from AGN disks over an entire synthetic universe"
   Delfavero, V., Ford, K.E.S., McKernan, B., et al. (8 authors, including **Nathaniel, K.**). 2024. *Submitted to ApJ*, arXiv: 2410.18815.
4. "McFACTS II: Mass Ratio–Effective Spin Relationship of Black Hole Mergers in the AGN Channel"
   Cook, H.E., McKernan, B., Ford, K.E.S., et al. (8 authors, including **Nathaniel, K.**). 2024. *Submitted to ApJ*, arXiv: 2411.10590.
5. "McFACTS I: Testing the LVK AGN channel with Monte Carlo For AGN Channel Testing & Simulation (McFACTS)"
   McKernan, B., Ford, K.E.S., Cook, H.E., et al. (8 authors, including **Nathaniel, K.**). 2024. *Submitted to ApJ*, arXiv: 2410.16515.
6. "Detailed models of interacting short-period massive binary stars"
   Sen, K., Langer, N., Marchant, P., et al., (13 authors, including **Nathaniel, K.**). 2022. *A&A* 659, A98. DOI: 10.1051/0004-6361/202142574.
7. "Chemically homogeneous evolution: a rapid population synthesis approach"
   Riley, J., Mandel, I., Marchant, P., et al., (8 authors, including **Nathaniel, K.**). 2021. *MNRAS* 505, 663-676. DOI: 10.1093/mnras/stab1291.
8. "Multi-Messenger Observations of a Binary Neutron Star Merger"

Abbott, B. P., et al., (3538 authors, including **Nathaniel, K.**) . 2017. *ApJ* 848, L12. DOI: 10.3847/2041-8213/aa91c9.

Conference Presentations and Invited Talks:

Planned: Adding stars to the McFacts AGN compact binary formation model. APS Global Physics Summit. Apr. 2025. Oral presentation.

Adding stars to the McFacts AGN compact binary formation model. AAS Winter Meeting. Jan. 2025. Oral presentation.

Just the McFACTS: Modeling the AGN channel for LIGO-Virgo-KAGRA. CMU GW-MMA Meeting. Oct. 2024. Invited talk.

Population synthesis of Thorne-Żytkow objects: rejuvenated donors and unexplored progenitors. AMNH Seminar Series. Sept. 2024. Invited talk.

Population synthesis of Thorne-Żytkow objects. APS April Meeting. Apr. 2024. Oral presentation.

TŻOs can be found: Population synthesis of Thorne-Żytkow objects. COMPAS Team Call. Nov. 2023.

Spindown and envelope inflation of massive main sequence stars in the Milky Way. RIT. Jan. 2023. AST Lunch Talk.

Teaching Experience:

2022 – 2023 Graduate Teaching Assistant, RIT
Stars and Galaxies PHYS 104
Stellar Astrophysics AST 370

2020 – 2022 Graduate Teaching Assistant, University of Bonn
Stellar Structure and Evolution ASTRO 811
Nucleosynthesis in Stars ASTRO 858

2017 – 2018 Learning Assistant, Virginia Tech: General Physics I PHYS 2205

Outreach and Service Experience:

2023 – present Pen Pal, Letters to a Pre-Scientist (*Science outreach to middle school students*)
2023 – present Secretary/Treasurer for American Physical Society, RIT Chapter
2023 – present Board Member, Doctoral Student Association, RIT
2023 – present AST Program Mentor, RIT (*Mentor to four first-year AST PhD students*)
2023 – present Imagine RIT Exhibit Leader (*University-wide community outreach*)
2024 Graduate Representative, AST Admissions Committee, RIT
2023 Executive Secretary, NASA Proposal Review Panel
2022 Activity Leader, RIT Observatory Open House for Girl Scout Troop 61046
2021 – 2022 Volunteer for Astronomy on Tap Bonn. Bonn, Germany
2018 – 2019 Student Representative, Department of Physics Undergraduate Committee. Virginia Tech.