



# SARAH THIELE

Princeton, NJ, USA

1-(403)-467-2138 ♦ sarah.thiele@princeton.edu

## EDUCATION

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### Princeton University

*Sep 2022 – Present*

PhD Student in Astrophysical Sciences

*Current Project:* subgrid models for cosmic ray diffusion, supervised by Prof. Romain Teyssier

### University of British Columbia, Vancouver

*Sep 2017 – May 2022*

BSc. Combined Honours Physics and Astronomy + Science Co-op

*Honours Thesis:* “Investigating uniqueness of transient noise in gravitational wave data using the Temporal Outlier Factor,” supervised by Prof. Jess McIver.

## RESEARCH INTERESTS

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**Astrophysics:** High energy astrophysics, numerical hydrodynamics/MHD, computational astrophysics, black holes & accretion, black hole observation, binary star systems, compact objects, gravitational waves and detection. **Physics:** Applied mathematics (e.g. numerical methods of solving partial differential equations), fluid dynamics, climate modeling and atmospheric science, global circulation models, cloud formation, turbulence. **Other:** science communication, space policy and security, sustainable space development and orbital debris, astro-environmentalism.

## RESEARCH EXPERIENCE

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### [1] Outer Space Institute

*Sep 2020 - Present*

*Junior Research Fellow*

- Supervised by Prof. Aaron Boley and Prof. Michael Byers, computed collisional risks of anti-satellite and missile defense tests in a LEO environment with satellite megaconstellations. Group home page: <http://outerspaceinstitute.ca>

### [2] Ongoing Astronomy Research

*Sep 2020 - Feb 2023*

*Undergraduate Student Researcher*

- A continuation from my summer 2020 project at CITA, wrote a code package called **hush** with Dr. Katelyn Breivik to simulate galaxies of double white dwarf star binaries detectable by the space-based detector LISA which implements a metallicity-dependent binary fraction and utilizes the **Show Your Work!** framework.

### [3] Institute for Research on Exoplanets (iREx)

*May - Sep 2021*

*Undergraduate Summer Intern*

- Worked with Prof. Andrew Cumming to create 2-dimensional models of atmospheric recycling (high-entropy gas advection) in planetary envelopes.

### [4] UBC-LIGO Gravitational Wave Group

*Sep - Dec 2020*

*Research Assistant*

- Through the group's detector characterization team under Prof. Jessica McIver, worked on characterizing transient noise signals that interfere with detection of astrophysical events using software such as Gravity Spy

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Note: [#] indicates associated activities

- [5] **Canadian Institute for Theoretical Astrophysics (CITA)** *May - Sep 2020*  
*University of Toronto Summer Undergraduate Research Program (SURP)*
- Worked with Dr. Katelyn Breivik, predicting gravitational wave signals from simulated binary star populations observable by the future space-based detector LISA.

- [6] **UBC Department of Physics and Astronomy** *May - Sep 2019*  
*Research Assistant*
- Worked with Prof. Harvey Richer, writing Python scripts to analyze data from the Gaia DR2 Catalog, searching for massive white dwarf stars within open star clusters. Assisted in writing observation proposals and papers.

## PUBLICATIONS

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- [2] **Thiele, S.**, Breivik, K., Sanderson, R.E., and Luger, R. Applying the metallicity-dependent binary fraction to double white dwarf formation: Implications for LISA. *The Astrophysical Journal*, 945, 162. doi:10.3847/1538-4357/aca7be. *March 2023*
- [1] **Thiele, S.** and Boley, A.C. Investigating the risks of debris-generating ASAT Tests. *Journal of the Astronautical Sciences*, 69, 1797–1820 (2022). doi:10.1007/s40295-022-00356-6 *Jan 2023*
- [4] Ashton, G., **Thiele, S.**, Lecoecue, Y., McIver, J., and Nuttall, L.K. Parameterised population models of transient non-Gaussian noise in the LIGO gravitational-wave detectors. *Classical and Quantum Gravity*, 39, 175004. doi:10.1088/1361-6382/ac8094. *Aug 2022*
- [6] Richer et al. Massive White Dwarfs in Young Star Clusters. *The Astrophysical Journal*, 912, 165. doi:10.3847/1538-4357/abdeb7. *Jan 2021*
- [6] Caiazzo et al. Intermediate-Mass Stars Become Magnetic White Dwarfs. *The Astrophysical Journal Letters*, 901, L14. doi:10.3847/2041-8213/abb5f7. *Sep 2020*

## HONOURS AND AWARDS

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- Centennial Fellowship in the Natural Sciences and Engineering** *Sep 2022*  
*Princeton University Graduate School*
- [3] **2021 Trottier Excellence Grant for Summer Interns** *May 2021*  
*Institute for Research on Exoplanets (iREx) and Department of Physics of the Université de Montréal (UdeM)*
- [3] **NSERC Undergraduate Student Research Award** *May 2021*  
*Natural Sciences and Engineering Research Council (NSERC) and McGill University*
- [5] **NSERC Undergraduate Student Research Award** *May 2020*  
*NSERC and Canadian Institute for Theoretical Astrophysics (CITA)*
- [6] **NSERC Undergraduate Student Research Award** *May 2019*  
*UBC Department of Physics and Astronomy*

**Alexander Rutherford Scholarship**  
*Alberta Education*

*Sep 2017*

**Governor General's Academic Medal**  
*Alberta Education*

*June 2016*

## **ACADEMIC INVOLVEMENTS AND OUTREACH**

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### **Princeton Public Observing Program**

*Sep 2022 - Present*

Help to run the Astrophysical Sciences Department's public observing nights and private educational events. Observing nights involve a combination of manning the telescope and giving informational talks.

### **[1] "Banning Space Weapons?" Centre for Global Law and Governance Roundtable Panelist**

*Oct 2021*

Spoke along with Victoria Samson of the Secure World Foundation and Dr. Michael Byers of UBC/the Outer Space Institute regarding the scientific context of space weapons like anti-satellite weapons and their consequences for space sustainability, a live-streamed event through University of St. Andrews.

### **[1] Outer Space Institute's International Open Letter on Kinetic Anti-Satellite (ASAT) Testing**

*Sep 2021*

Took part in discussions leading up to the formation of this letter which encourages the ban of kinetic anti-satellite weapons and its included calculations, and was an early signatory upon its release to the public.

### **[3] YouTube Tutorial: Eclipse Challenge**

*June 2021*

Took part in the Discover the Universe Eclipse Challenge to show how to make an at-home device to safely view the solareclipse which took place in June 2020.

### **[1] Outer Space Institute Space Security Workshop**

*May 2021*

Transdisciplinary roundtable discussion covering topics like kinetic ASAT testing, missile defense testing, and militarization of cis-lunar space, with (undisclosed) experts in space security.

## **ACADEMIC PRESENTATIONS/CONFERENCES**

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### **Princeton Undergraduate Astronomy Club Talk**

*Dec 2022*

"Dancing stars wave hello: White dwarf binaries as gravitational wave sources"

### **[2] 239th American Astronomical Society Meeting (canceled)**

*Jan 2022*

Poster: "Applying the metallicity-dependent binary fraction to double white dwarf formation: Implications for LISA"

### **[1] AMOS Surveillance Technologies Conference 2021**

*Sep 2021*

Poster: "Investigating the risks of debris-generating ASAT Tests in the presence of megaconstellations" – invited for publication in JAS

### **[3] Institute for Research on Exoplanets**

*Aug 2021*

"2D modelling of atmospheric recycling in planetary envelopes"

- [2] **Flatiron Institute’s Center for Computational Astrophysics: Gravitational Wave Astronomy Group** *Aug 2021*  
 “Impacts of the Metallicity-Dependent Binary Fraction on the Galactic DWD Population”
- [6] **UBC Compact Objects Journal Club** *April 2021*  
 “Transients from ONe White-Dwarf - Neutron-Star/Black Hole Mergers”
- [4] **LIGO Scientific Collaboration January 2021 DetChar F2F meeting** *Jan 2021*  
 “Results of Gravity Spy Safety Investigation”
- [4] **UBC-TRIUMF-SFU Cosmology Meeting** *Dec 2020*  
 “Characterization and Mitigation Of Transient Noise in LIGO Data”
- [4] **UBC LIGO Group** *Fall 2020*  
 · “Characterized and Mitigated Transient Noise in aLIGO Data”  
 · “Characterization And Mitigation Of Advanced LIGO Transient Noise from O3”  
 · “Investigation and Mitigation of Glitches in Gravitational Wave Data”
- [4] **LIGO DetChar Telecons**  
 · “Investigating Safety of Gravity Spy Classifications for Injected CBC Signals”  
 · “Glitch Samples Used for Population Studies: Follow-up and Recommendations”  
 · “Follow-up on Glitch Samples Used For Population Studies”
- [5] **University of Toronto Summer Undergraduate Research Program** *Summer 2020*  
 · “Metallicity Dependence of Double White Dwarf Gravitational Wave Signals”  
 · “Metallicity-dependent gravitational wave signals from white dwarf binary star populations”
- [6] **UBC Department of Physics and Astronomy Final Presentations** *Aug 2019*  
 “Using Gaia DR2 to Search for High-Mass White Dwarfs in Open Star Clusters”

## WORKSHOPS AND PROFESSIONAL DEVELOPMENT

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- [3] **AstroComm 2021 Workshop** *June 2021*  
 Run by the Centre for Research in Astrophysics of Quebec (CRAQ).
- Best of Banff: Science Communications Program**  
 Through a collaboration of Telus Spark, NSERC, Genome and the Banff Centre.
- Various: internship professional developments seminars** *2020-2021*  
 Internships at iREx, LIGO and CITA included workshops in resume/CV writing, public speaking, academic presentations, scientific writing, and EDI.
- [7] **Intercultural Communication Workshop** *Nov 2019*  
 Run by UBC’s International Student Initiative

## NON-ACADEMIC EXPERIENCE

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### [7] UBC International Student Initiative

*Sep 2019 - July 2022*

*Student Ambassador - Campus Tours Program*

- Deliver virtual/in-person tours of UBC campus, interacting with diverse groups from all over the world.
- Participate in continuous professional development and outreach programs opportunities, such as workshops, social media takeovers and high school recruitment events.

### UBC Residence Life

*Sep 2018 - April 2019*

*Residence Advisor*

- Aimed to foster strong communities by supporting students through their transition to university.
- Enforce standards and safety within residence, run programs, and refer students to resources.

### Solfeo Music Academy/Independent

*Oct 2013 - Jan 2017*

*Piano Teacher*

- Taught more than 20 students ranging in age from three years old to adult. Taught both from home and in the studio. Created lesson plans, teaching solo/group lessons and helping run recitals.

### Beneath One Sky, UBC

*Sep 2017 - April 2020*

*Volunteer/Club Member*

- Advocated and raised awareness for those in poverty in our community through events like Poverty Action Conference 2020/21.
- Handed out food and clothing, and volunteering at soup kitchens throughout the year.

## NON-ACADEMIC INVOLVEMENTS AND OUTREACH

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### [7] Your Degree at UBC: Vancouver Campus Student Panelist

*Oct 2021*

This Q&A panel was a recruitment event for high school students where I got to speak about the UBC Vancouver Campus experience.

### [7] UBC Social Media Takeovers

*March 2021*

Did an Instagram takeover of the @youbcpic account to discuss tips for self care and staying motivated while remote learning. Condensed this into a TikTok version for the @youbcpic TikTok account.

### [7] Student Ambassador Research Panelist

*Jan 2021*

A component of ongoing training, the team held a panel discussing the research that various teammembers have taken part in during their degree.

### [7] Your Degree at UBC: Science Panelist

*Nov 2020*

As part of this high school student recruitment event, got to talk about my experience as a student in UBC's Faculty of Science.

## RELEVANT SKILLS

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### Programming Languages

Python, Fortran, MATLAB, Linux

### Software & Tools

Latex, Git, MS Office

### Laboratory

Data fitting and graphing, oscilloscopes, multimeters, function generators, optical and acoustic experiments, laser systems