Skylar Grayson

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Research Interests

Extragalactic astronomy, computational astrophysics, galaxy evolution, active galactic nuclei, feedback processes, Sunyaev-Zel'dovich effect, X-ray astronomy, astronomy education, course-based undergraduate research experiences, online education

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Education

Arizona State University Aug. 2021 - Aug. 2026
Tempe, AZ
Doctor of Philosophy in Astrophysics
Average unweighted GPA: 4.0/4.0
Dissertation: *Galaxies, Black Holes, and Students: Exploring Feedback from the Circumgalactic Medium to Online Courses*

Whitman College Aug. 2017 - May 2021
Walla Walla, WA
Bachelor of Arts in Physics-Astronomy, Minors in Mathematics and French
Average unweighted GPA: 3.966/4.0
Thesis: *Exploring Bottlenecks in Asymmetric Dark Matter Bound State Formation*

Universite de Nantes/IES Abroad Jan. 2020 - May 2020
Nantes, France
Average unweighted GPA: 4.0/4.0

Academic Appointments

Postdoctoral Fellow Sep. 2026-
University of Waterloo/Waterloo Centre for Astrophysics

Outreach Coordinator Sep. 2026-
University of Waterloo/Waterloo Centre for Astrophysics

Fellowships, Awards, and Honors

National Science Foundation Graduate Research Fellowship 2023-2026
Outstanding Graduate-College of Liberal Arts and Sciences, ASU 2026
ASU College Leaders Award 2024
Karen Valentine Science Communication Award ($2,000) 2023
ASU President's Professor Award for Innovation - Online Undergraduate Research Scholars Program 2023
Graduated summa cum laude, Whitman College 2021
Inducted into Phi Beta Kappa National Honor Society 2020
Academic Distinction every semester of undergraduate studies 2017-2021
Bates Foundation Music Scholarship ($4,000) 2018-2021
Walter Brattain Merit Scholarship ($16,000) 2017-2021
Bend Chamber of Commerce Woman of the Year-Young Hero Award ($2,000) 2017

Published Papers

Grayson, S, Scannapieco, E, Grete, P, Boettcher, E, Brüggen, M, Hodges-Kluck, E, ZuHone, J, & Fujita, Y. Supersonic Motion in the Driving Region of M82. *ApJ*, 1007:65

Grayson, S, Scannapieco, E, Dave, R, Babul, A., & Hough, R.T. 2026. Introducing RAFIKI: Refining AGN Feedback in Kinetic Implementations. *ApJ*, 999: 9

Grayson, S, Scannapieco, E, Comparat, J, ZuHone, JA, Zhang, Y, Shreeram, S, Bruggen, M, & Bulbul, E. 2025. The hot circumgalactic medium in stacked X-rays: observations vs simulations. *ApJ*, 994: 89

Grayson, S, Simon, MN, Buxner, S, Wenger, M & Impey, C. 2025. Motivation, Demographics and Engagement During COVID-19 in an Astrobiology MOOC. *PRPER*, 21, 010109

Grayson, S, Scannapieco, E, & Dave, R. 2023. Distinguishing AGN Feedback Models with the Thermal Sunyaev-Zel'dovich Effect. *ApJ*, 957:17

Truong, N & **Grayson, S** et al. 2025. Comparing XRISM cluster velocity dispersions with predictions from cosmological simulations: are feedback models too ejective? *ApJ Letters*, 993, L11

Wenger, M, **Grayson, S**, Buxner, S, Impey, C, Formanek, M, & Simon, MN. Characterising the motivations of learners in a massive open online course on astronomy. *International Journal of Science Education, accepted*

Kobayashi, S. et al. (incl. **Grayson, S.**) The First View of an Ultraluminous X-ray Pulsar with XRISM: Phase-Resolved High-Resolution Spectroscopy of the Fe K-shell Band of M82 X-2 *ApJ*, 1005:90

Boettcher, E et al. (incl. **Grayson, S**). 2026. A fast starburst wind consumes most of the energy from supernovae. *Nature*, 651:8107

Kramer, DM et al. (incl. **Grayson, S**). Cross-correlating the patchy screening and kinetic Sunyaev-Zel'dovich effects as a new probe of reionization. *ApJ*, 994:82

Lewis, BL et al. (incl. **Grayson, S**). 2025. Improving Undergraduate Astronomy Students' Skills with Research Literature via Accessible Summaries: An Exploratory Case Study with Astrobites-based Reading Assignments. *PRPER*, 21, 010124

Hewitt, HB, Simon, MN, Mead, C, **Grayson, S**, Beall, GL, Zellem, RT, Tock, K, & Pearson, KA. 2023. Development and Assessment of a Course-Based Undergraduate Research Experience (CURE) for Online Astronomy Majors. *PRPER*, 19, 020156

Submitted Papers

Grayson, S & Lewis, B. et al. Connecting course concepts to current research with Astrobites accessible summaries. *AEJ, submitted*

Hewitt, HB et al. (incl. **Grayson, S**). Investigating Scalable Research Elements in Undergraduate Astronomy Courses. *PRPER, submitted*

Invited Talks

Modelling the Hot CGM: Implications for Sub-grid AGN Feedback Implementations. The Milky Way Halo Research Group at STScI, February 2026

Simulating the Impact of AGN Feedback on X-ray and tSZ Observations. Fall Seminar Series:
Five College Astronomy Department Astronomy Seminar (*virtual*), October 2025
Canadian Institute for Theoretical Astrophysics cosmolunch, October 2025
Canadian Institute for Theoretical Astrophysics Rando Astro Seminar, October 2025
University of Wisconsin-Madison Science Seminar (*virtual*), September 2025
Duke University Cosmology Seminar, September 2025
Arizona State University STARs Research Group, August 2025

Advocating for Astronomy in the Face of Budget Cuts, Rutgers Summer Transient Soiree (*virtual*), July 2025

Constraining Feedback in Cosmological Simulations with CGM Modelling, Rutgers Astronomy Journal Club (*virtual*), March 2025

AGN Feedback Implementation in Cosmological Simulations, Theoretical Astrophysics and Cosmology Seminar, University of Arizona, January 2024

Invited Public Talks

How Big is the Universe? Arizona Science Center Nebula Nights, May 2026

The Great Debate: Expanding Our Understanding of the Universe. Astronomy on Tap: Valley of the Sun, November 2025

Conference Presentations

Grayson, S., *Introducing RAFIKI: Varying AGN Feedback Parameters in the SIMBA Simulation), SIMBA/KIARA Team Meeting (Talk), June 2026*

***Grayson, S.**, Constraining Models of AGN Feedback Using X-ray and tSZ Observations of the Circumgalactic Medium, AAS (Dissertation Talk), January 2026*

***Grayson, S.**, Constraining Models of AGN Feedback Using X-ray and tSZ Observations of the Circumgalactic Medium, Texas Symposium for Relativistic Astrophysics (Talk), December 2025*

***Grayson, S.** (on behalf of Truong, N.), Constraining ICM Physics: XRISM observations of PV-phase Clusters vs Cosmological Simulations, XRISM International Conference (Talk), October 2025*

***Grayson, S.**, Scannapieco, E., Boettcher, E., ZuHone, J., Bruggen, M., Grete, P., Hodges-Kluck, E. Comparing XRISM Observations to Models of the Hot Wind Fluid in M82, XRISM International Conference (Poster & Flash Talk), October 2025*

***Grayson, S.** Simulating AGN Feedback, SESE Research Symposium 2025 (Talk), August 2025*

***Grayson, S.**, Truong, N. XRISM Collaboration EGD Cross-target clusters project: Comparing XRISM observations with cosmological simulations, XRISM Science Team Meeting #8 (Talk), July 2025*

***Grayson, S.** and Scannapieco, E. Spectral Modelling of Hot Wind Outflows in M82,*

XRISM Science Team Meeting #7 (Poster & Flash Talk), February 2025

***Grayson, S.**, Scannapieco, E., and Dave, R. Distinguishing AGN Feedback Models via the Thermal Sunyaev Zel'dovich Effect in SIMBA, AAS (Poster), January 2024*

***Grayson, S.**, Ojeda, A., Buxner, S., Wenger, M., Simon, M., and Impey, C. Understanding the Motivations of Learners in Three Astronomy Massive Open Online Courses, AAS (Talk), January 2024*

***Grayson, S.**, Hewitt, H. B., Simon, M. N., Mead, C., Beall, G. L., Zellem, R. T., Tock, K., and Pearson, K. A. Qualitatively Assessing An Online Research Course for Astronomy Majors, SHAW-IAU (Poster), November 2023*

***Grayson, S.**, Scannapieco, E., and Dave, R.Characterizing AGN Feedback Processes at z∼1 with SIMBA, SIMBA Collaboration Meeting (Talk), May 2023*

***Grayson, S.**, Scannapieco, E., and Dave, R.Modeling the Thermal Sunyaev-Zel'dovich Effect Using SIMBA, Oases in the Cosmic Desert (Poster), February 2023*

***Grayson, S.** and Gresham, M. Exploring Bottlenecks in Asymmetric Dark Matter Bound State Formation, Whitman College Undergraduate Research Conference (Poster and Talk), March 2021*

Workshops

Unveiling a Universe of Black Holes: The next Generation of AGN Surveys
MIAPbP March 2025
Talk: Constraining AGN Feedback Models Using CGM Observations

New Cross-Correlation Perspectives on Cosmic Baryons
Aspen Center for Physics August 2026
Co-Discussion Leader: Cross-correlation observations and analysis, including but not limited to CMB, FRBs, LIM, and X-rays.

Research Experience

Characterizing AGN Feedback using Cosmological Simulations *June 2021 - Present*
Arizona State University
Mentored by Dr. Evan Scannapieco

- *Developed an end-to-end pipeline to generate SZ and X-ray mock-observations from SIMBA and EAGLE simulations, enabling direct comparisons with ACT and SRG/eROSITA datasets*
- *Designed and ran a new suite of simulations (RAFIKI) varying the energetic efficiencies of different modes of AGN feedback to test against upcoming multi-wavelength surveys*
- *Currently developing an open access code that generates RAFIKI predictions for a range of current and upcoming observatories*

Generating Model Comparisons for Novel High-Resolution X-ray Spectroscopic Observations *June 2024 - Present*
Arizona State University
Mentored by Dr. Evan Scannapieco

- *Used zoom simulations of cluster environments to determine how XRISM observations of the temperatures and velocities in the intracluster medium compares to cutting edge observations*
- *Generating mock spectra of a hot wind outflow to test theories of starbursts against XRISM observations of M82*

Utilizing Astrobites in the Classroom *May 2025- Present*
Arizona State University

- *Analyzing 10 years of readership surveys to understand the Astrobite audience and role Astrobites plays in the education landscape*
- *Developed and analyzed the use of curricular materials that aid in incorporating Astrobite posts in undergraduate classrooms*

Understanding Motivations of MOOC Learners *May 2023 - Present*
Arizona State University
Mentored by Dr. Molly Simon and Dr. Sanlyn Buxner

- *Surveyed students in three astronomy Massive Open Online Courses (MOOCs), characterizing motivations, demographics, and participation levels*
- *Looked at the impact of the COVID-19 pandemic on the MOOC landscape*

Assessing Online Research Experiences for Undergraduates *October 2021 - Present*
Arizona State University
Mentored by Dr. Molly Simon

- *Conducted and analyzed interviews of students to determine the outcomes of online research experiences*
- *Research will be continued with studies currently in progress to assess the effect of different levels of research incorporation in the classroom on student outcomes*

Asymmetric Dark Matter *June 2020 - May 2021*
Whitman College
Mentored by Dr. Moira Gresham

- *Studied potential bottleneck scenarios in bound states of asymmetric dark matter*
- *Used Mathematica to determine conditions in our parameter space where energy conservation and cosmological requirements were met*
- *Calculated cross-sections and reaction rates for the formation of 2-body bound states to identify potential bottlenecks in forming larger bound states*
- *Research was worked into a Senior Honors Thesis along with a review of the implications of an asymmetric dark matter model*

Simulations of Physical Vapor Deposition *May 2019 - August 2019*
Sandia National Laboratories
Mentored by Dr. Remi Dingreville

- *Ran 10,000+ simulations of physical vapor deposition*
- *Studied the impact of a range of variables on a resulting surface roughness*
- *Wrote final report and gave a presentation on method/results*

Late Stage Pharmaceuticals *May 2018 - August 2018*
Lonza Bend

- *Assisted with client projects including running HPLC, dissolution, and purity tests*
- *Developed a research project determining the robustness of a Pion Rainbow dissolution test by testing the impact of a wide range of variables*

- *Wrote final report and gave a presentation on method/results*

Teaching Experience

Co-Instructor, Astronomy 4+1 Master's Capstone Course *August 2024 - May 2025*
Arizona State University

- *Designed a research project and wrote a syllabus for a student to complete a Master's capstone course*
- *Led weekly meetings to guide and assist student in the data analysis and writing process*

Sundial Academic Facilitator *August 2024*
Arizona State University

- *Developed curriculum and taught a nine day science camp for incoming undergraduates identified to be in 'at risk' populations*
- *Worked with 30 students to develop foundation mathematical and conceptual skills for physics, astronomy, and geology degrees*

Lecture Teaching Assistant *August 2022 - May 2023*
Arizona State University

- *Part-time TA for introductory astronomy lecture for non-majors*
- *Answered questions during lecture, held office hours and was available for questions via email*
- *Graded weekly assignments*

Lab Teaching Assistant *August 2021 - May 2022*
Arizona State University

- *TA for introductory astronomy labs for non-majors*
- *Worked with 60+ students in three lab sections per semester*
- *Created and presented 30 minutes presentations covering the lab material and concepts each week, guided students through the lab, held office hours and was available for questions via email, and graded all lab work*

Physics Fellow *January 2019 - May 2021*
Whitman College

- *TA for introductory physics courses and 300-level Particle Physics course*
- *Met weekly with students to work on group homework assignments*
- *Helped students develop good homework and collaboration strategies*

Peer Tutor *August 2018-May 2021*
Whitman College

- *Met weekly with students in physics, astronomy, and mathematics courses*
- *Helped with homework, developing good study habits, and tailoring practices to specific classes*
- *Included professional development work, meetings with professors, and providing reports on sessions*

Mentorship Experience

Maliyah Adams, 4+1 Undergraduate/Masters *2023-2025*

- *Developed and taught a Master's Capstone course guiding the student in modifying code written for SIMBA to produce mock tSZ effect observations from the EAGLE simulation*

Dustin Hubbartt, Online Undergraduate *2024*

- *Trained the student in qualitative research methods including conducting interviews with students from a range of classes and analyzing how student outcomes are connected to the level of research incorporation in the curriculum*

Angel Ojeda, Undergraduate *2023-2024*

- *Trained the student in quantitative research methods to analyze responses from online MOOC surveys and write code to compare demographics between different courses*

Science Communication

Social Media

- *Platforms on TikTok (320,000+ followers), Instagram (50,000+ followers), Threads (230,000+ followers), Bluesky (7,000+ followers), and YouTube (20,000+ followers)*
- *An emphasis on sharing science in an accessible, honest and relatable way. Content focused around current science news, fun facts, and my experience as a scientist*

Selected Appearances

- *Guest on Lab Coat Optional Podcast*
- *Invited speaker at the Oxnard Summer School Space Camp: Spoke to over 200 K-8 students over three days about space and a career in science*
- *Reporting on the Europa Clipper launch for Arizona State University: Included visit to the spacecraft in the JPL clean room and travel to the launch*
- *NASA Social for Artemis 1: One of 100 influencers accepted to attend the launch of Artemis 1 and spend the weekend touring Kennedy Space Center and talking to NASA administration and astronauts*
- *Youth STEM Matters Magazine: Interviewed by a group of young women around the world about my experience as a woman in STEM, career paths in science, and my research*

Astrobites Author: January 2024-Present

- *Served on the DEI Committee and Co-Chaired the Education Committee beginning August 2024*
- *Published Articles can be found here*

Extracurricular Activities and Outreach

Astronomy on Tap: Valley of the Sun Organizing Committee: Tempe, AZ, 2025-2026

- *Helped launch a new chapter and ran the social media and communications for Astronomy on Tap: Valley of the Sun*
- *Organized monthly events sharing science with the public at a local brewery*

SESE Inclusive Community Committee: Arizona State University *2024-2025*

- *Served as Graduate Student representative to help build a more inclusive department*

SESE Graduate Council: Arizona State University *2023-2025*

- *Served as Vice President and President on the council, acting as a liason between students and faculty, planning events, and working to improve the graduate student experience*
- *Advocated for changes to the TA process and offer letter systems*
- *Organized community building events, student surveys, and career panels*

SESE TA Training Committee: Arizona State University *2024-Present*

- *Worked with faculty and other graduate students to design and present a three-hour orientation on Teaching Assistant duties for incoming graduate students in the School of Earth and Space Exploration*
- *Led the training during two years of new student orientation*
- *Created and organized an online page of resources for TAs*

GSPA Grant Reviewer: Arizona State University *2023-2025*

- *Reviewed research grants from fellow graduate students at Arizona State University*
- *Provided feedback and rated $\sim$ 5 grants a month*

Local Organizing Committee Member: XRISM Science Meeting #7 (ASU) Feb. 2025

Letters to a Pre-Scientist *2023-2024*

- *Exchanged letters with an eighth grader over the course of an academic school year*
- *Wrote to share my experience as a STEM professional and to broaden interest in STEM careers*

SESE Open House Committee Member: Arizona State University *2022-2023*

- *Member of the committee for the School of Earth and Space Exploration's Open House, held once a semester*
- *Assisted in outreach and planning*

Local Organizing Committee Member: Oases in the Cosmic Desert Meeting (ASU) Feb. 2023

Relevant Coursework

Physics: Classical Mechanics, Thermal Physics, Acoustics, Particle Physics, Quantum Mechanics, Electricity and Magnetism, General Relativity

Astronomy: Stellar Astrophysics, Cosmology, Galactic Astronomy, Observational Astronomy, Interstellar Medium, Radiative Transfer, Astro-Statistics

Mathematics: Calculus, Differential Equations, Linear Algebra, Statistics

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Skills

Programming Languages: Python, Wolfram, C, R

Operating Systems: Windows, Mac OS, Linux

Software: LaTeX, SPSS, Mathematica, ParaView

Soft Skills: Communication, Leadership, Problem Solving, Teaching/Tutoring

Languages: French-Proficient