Peter Smith – Curriculum Vitae

petercbsmith@asu.edu | petercbsmith.github.io

Education

Arizona State University - Ph.D., Astrophysics 2026 (expected)

University of Texas at Austin - B.S., Astronomy; B.S., Physics 2020

GPA: 3.68

Special Departmental Honors

Positions

Graduate Research Associate – Arizona State University 2020-present

Spectroscopy of transiting exoplanets, including atmospheric modeling and retrieval, planning observations, and handling of spectroscopic data products - Advisor: Prof. Michael Line

Astronomy education research, including curriculum development and testing - Advisor: Prof. Molly Simon

Undergraduate Researcher - University of Texas at Austin 2018-2020

Atmospheric modeling of rocky exoplanets and simulating observations with the James Webb Space Telescope – Advisor: Prof. Caroline Morley

Research Interests

Exoplanet atmospheres, atmospheric modeling, Bayesian statistics, high resolution spectroscopy, high performance computing

Publications

[18] Seidel, J.; Parmentier, V.; Prinoth, B.; et al (including **Smith**). Submitted. *Hot giant exoplanets have magnetic fields between Jupiter and Saturn.* Nature

[17] Sanchez, J.; **Smith, P**.; Kanumalla, K.; et al. (in review). *A Stellar Magnesium to Silicon ratio in the atmosphere of an exoplanet.* Nature Communications.

[16] Panwar, V.; Brogi, M.; Kanumalla, K; et al (including **Smith**). 2025. *The Roasting Marshmallows Program with IGRINS on Gemini South III: Seeing deeper into the metal depleted atmosphere of a gas-giant on the cusp of the hot to ultra-hot Jupiter transition.* MNRAS.

[15] Choi, Y.; Jeong, U.; Lee, J.; et al (including **Smith**). 2025. *An Early Look at the Performance of IGRINS-2 at Gemini-North with Application to the ultrahot Jupiter, WASP-33 b.* AJ.

[14] Savel, A.; Bedell, M; Kempton, E.; et al (including **Smith**). 2025. *Peering into the Black Box: Forward Modeling of the Uncertainty Budget of High-resolution Spectroscopy of Exoplanet Atmospheres.* A&A

[13] Bartelt, D.; Weiner Mansfield, M.; Line, M.; et al (including **Smith**). 2025. *A Measurement of the Water Abundance in the Atmosphere of the Hot Jupiter WASP-43b with High-resolution Cross-correlation Spectroscopy.* AJ.

[12] Pelletier, S.; Benneke, B.; Chachan, Y.; et al (including **Smith**). 2025. *CRIRES+ and ESPRESSO Reveal an Atmosphere Enriched in Volatiles Relative to Refractories on the Ultrahot Jupiter WASP-121b.* AJ

[11] **Smith, P**.; Sanchez, J.; Line, M.; et al. 2024. *The Roasting Marshmallows Program with IGRINS on Gemini South. II. WASP-121 b has super-stellar C/O and refractory-to-volatile ratios.* AJ.

[10] Kanumalla, K.; Line, M.; Weiner Mansfield, M.; et al (including **Smith**). 2024. *IGRINS Observations of WASP-127 b: H2O, CO, and Super-solar Atmospheric Metallicity in the Inflated Sub-Saturn.* AJ.

[9] Deibert, E.; Langeveld, A.; Young, M.; et al (including **Smith**). 2024. *High-resolution Dayside Spectroscopy of WASP-189 b: Detection of Iron during the GHOST/Gemini South System Verification Run.* PASP.

[8] Wardenier, J.; Parmentier, V.; Line, M.; et al (including **Smith**). 2024. *Phase-resolving the Absorption Signatures of Water and Carbon Monoxide in the Atmosphere of the Ultra-hot Jupiter WASP-121b with GEMINI-S/IGRINS.* PASP.

[7] Weiner Mansfield, M.; Line, M.; Wardenier, J.; et al (including **Smith**). 2024. *The Metallicity and Carbon-to-oxygen Ratio of the Ultrahot Jupiter WASP-76b from Gemini-S/IGRINS.* AJ.

[6] Noguer, F.; Corley, S.; Pearson, K.; et al (including **Smith**). 2024. *Enhancing Exoplanet Ephemerides by Leveraging Professional and Citizen Science Data: A Test Case with WASP-77 A b*. 2024. PASP.

[5] **Smith, P**.; Line, M., Bean, J. et al. 2024. *A Combined Ground-based and JWST Atmospheric Retrieval Analysis: Both IGRINS and NIRSpec Agree that the Atmosphere of WASP-77A b is Metal-poor*. AJ

[4] August, P.; Bean, J.; Zhang, M.; et al (including **Smith**). 2023. *Confirmation of Subsolar Metallicity for WASP-77Ab from JWST Thermal Emission Spectroscopy*. ApJL

[3] Brogi, M.; Emeka-Okafor, V.; Line, M.; et al (including **Smith**). 2023. *The Roasting Marshmallows Program with IGRINS on Gemini South I: Composition and Climate of the Ultrahot Jupiter WASP-18 b*. AJ.

[2] Weiner Mansfield, M.; Wiser, L.; Stevenson, K.; et al(including **Smith**). 2022. *Confirmation of Water Absorption in the Thermal Emission Spectrum of the Hot Jupiter WASP-77Ab with HST/WFC3*. AJ.

[1] Line, M.; Brogi, M.; Bean, J.; et al (including **Smith**). 2021. *A solar C/O and sub-solar metallicity in a hot Jupiter atmosphere.* Nature.

Awards, Grants, and Scholarships

2SLGBTQIA+ Leadership Graduate Award ($350)

Graduate Completion Fellowship ($26,000)

NASA ExoPAG Exoplanet Explorer

College of Liberal Arts and Sciences Student Leader

NASA FINESST ($150,000)

Graduate Excellence Award ($100)

John W. Cox Endowment for the Advanced Studies in Astronomy

Observing Programs

500+ hours, including 75 hours as PI

[40] **PI** – *Singing in the (iron) rain: Interrogating the Hypothesis of Fe Condensation on an Ultra Hot Jupiter*, Gemini South, 8 hours

[39] **PI** – *Desert Oasis: Confirming the Detection of Water in a Neptune Desert Planet*, Gemini South, 8 hours

[38] **PI** – *A Definitive C/O Ratio Determination of a Sub-Jovian Exoplanet*, Gemini South, 4 hours

[37] **PI** – *Confirmation of a Carbon Isotopologue in the Atmosphere of a Transiting Hot Jupiter*, Gemini South, 16 hours

[36] **PI** – *The first definitive C/O ratio determination for a sub-Jovian exoplanet*, Gemini South, 5 hours

[35] **PI** – *From the Ashes: Investigating the Survival of the Lowest Mass Planet Orbiting an Evolved Star*, Gemini North, 8 hours

[34] **PI** – *A Ridge Too Far: Unveiling the Mysterious Origins of Intermediate-sized Planet on the Neptune Ridge*, Gemini North, 20 hours

[33] **Co-PI**, Special call for July 2025, Magellan, 1 night

[32] Co-I – Setting the stage for sub-Neptune formation by observing the primary atmosphere of their youngest progenitor, Gemini North, 9 hours

[31] Co-I – *Completing the Picture: Dayside Spectroscopy of an Ultra-Hot Jupiter Atmosphere*, Gemini South, 5 hours

[30] Co-I - *The wind rises*, Gemini South, 27 hours

[29] Co-I - *Revealing the Composition of the Canonical Hot Jupiter HD209458b*, Gemini South, 4 hours

[28] Co-I – *Flavorous Exoplanets: using multiple molecules to probe the 3D structure of an ultra-hot Jupiter*, Gemini South, 12 hours

[27] Co-I – *Exploring Synergies between Ground Based High Resolution Spectroscopy and JWST Observations of an Ultra-hot Exoplanet*, Gemini South, 3 hours

[26] Co-I – *The Elemental Abundance Inventory of a Rare Jovian Mass Planet around and M-dwarf,* Gemini South, 7 hours

[25] Co-I – *Guilt by Dissociation: Searching for Thermochemical Gradients in an Ultra-Hot Jupiter*, Gemini South, 13 hours

[24] Co-I – *Unveiling the 3D structure of the ultra-hot Jupiter WASP-121 using multiple molecules*, Gemini South, 8 hours

[23] Co-I – *Dude, where's my methane?: Searching for the atmospheric imprints of chemical disequilibrium in a warm sub-Neptune*, Gemini South, 10 hours

[22] Co-I – *Assessing the influence of metallicity in shaping the inflated radius of a sub-Saturn WASP-193 b*, Gemini South, 9 hours

[21] Co-I – *Dude, who puffed my marshmallow?: Understanding the conditions that give rise to the inflated atmosphere of WASP-127b*, Gemini South, 5 hours

[20] Co-I – *Probing the atmospheres of the sub-Neptunes in the TOI-270 system*, Gemini South, 20 hours

[19] Co-I – *An updated look at a keystone planet: Obtaining a precise metallicity measurement of the hot Jupiter WASP-43b*, Gemini South, 5 hours

[18] Co-I – *Getting the Full Picture: Building a 3D map of ultra-hot Jupiter day sides through post eclipse observations*, Gemini South, 14 hours

[17] Co-I – *The final puzzle piece: Completing the picture of the most-studied JWST hot Jupiter exoplanet with Gemini-S/IGRINS*, Gemini South, 11 hours

[16] Co-I – *What is the Abundance Inventory of the Warmest Sub-Neptune?*, Gemini South, 6 hours

[15] Co-I, *Roasting Marshmallows: Disentangling Composition & Climate in Hot Jupiter Atmospheres through High-Resolution Thermal Emission Cross-Correlation Spectroscopy* , Gemini South, 131 hours

[14] Co-I, *Quantifying the Thermal Inversion in Exoplanet Atmospheres*, Gemini North, 20 hours

[13] Co-I – *Detecting Magnetic Drag in an Ultra Hot Jupiter Atmosphere*, Gemini North, 8 hours

[12] Co-I – *Lorentz vs. Navier-Stokes: the answer is blowing in the wind*, Gemini North, 25 hours

[11] Co-I – *Settling the debate on the molecular makeup of two classic exoplanets*, Gemini North, 16 hours

[10] Co-I – *Tracing the Exact History of Hot Jupiters via Atmospheric Analysis for the Hotter Planets*, Gemini North, 9 hours

[9] Co-I – *Dude, where's my methane?: Searching for the atmospheric imprints of chemical disequilibrium in a warm sub-Neptune*, Gemini North, 4 hours

[8] Co-I – *Unraveling the Formation History of a Saturn-Mass Exoplanet*, Gemini North, 3 hours

[7] Co-I – *Constraints for the Hot Jupiters Formation Scenario with a Precise Atmospheric Analysis for a Extremely Hot Planet*, Gemini North, 4 hours

[6] Co-I - *Surveying the desert from the ridge: constraining hot Neptune evolution with WASP-166b*, Very Large Telescope, 12 hours

[5] Co-I - *A Desert Island: Probing the Origins of the Desert with Atmospheric Transmission of a Hot Neptune*, Very Large Telescope, 6 hours

[4] Co-I – *A High-Performance Analysis Framework for JWST Exoplanet Observations*, James Webb Space Telescope, archival

[3] Co-I – *Revealing the impact of telluric variability on high-resolution spectroscopy with IGRINS*, Harlan J Smith Telescope, 4 nights (September 25)

[2] Co-I – *Revealing the impact of telluric variability on high-resolution spectroscopy with IGRINS*, Harlan J Smith Telescope, 4 nights (March 25)

[1] Co-I – Emission Spectroscopy of a Ultra Hot Jupiter WASP-33b, Harlan J Smith Telescope, 7 nights

Observing and Telescope Operation Experience

MIKE on Clay Telescope at Magellan Observatory, 1 night (remote)

IGRINS on Harlan J. Smith Telescope at McDonald Observatory, 4 nights

PISCES on Multiple Mirror Telescope at Whipple Observatory, 3 nights

iSHELL on IRTF at Mauna Kea Observatory, 1 night (remote)

16 inch on PMA building at University of Texas, 10+ nights (outreach)

8 inch Dobsonians at various locations, 10+ nights (outreach)

Mentorship Experience

Graduate Students

Jorge Sanchez	2021-present
Krishna Kanumalla	2023-present

Heather Hewitt Fasani 2022

Undergraduate Students

Devon Strader, NASA Space Grant Recipient 2024-present

Roman Goralski 2024-2025

Kiera Charley, NASA Space Grant Recipient, now a graduate student at University of Hertfordshire 2024-2025

Jackson Headon, NASA Space Grant Recipient 2024-2025

Joshua Gonzalez 2024

Colin Boecker-Grieme, through Sundial 2023

Kimberly Merriam, through Sundial 2023

Megan Miller, through Sundial 2022

Gabriela Roig, through Sundial 2021

Teaching Experience

Academic Facilitator, Sundial Early Start 2021-2024

Guest Lecturer, SES 598 *An Overview of Planetary Atmospheres* 2025

Guess Lecturer, AST 394 *Astrophysics Research Seminar* 2025

Guest Lecturer, SES 598 *Exoplanets* 2024

Guest Lecturer, SES 598 *An introduction to Astro-Statistics* 2024

Guest Lecturer, SES 126 *Exploration of the Universe* 2024

Service and outreach

Volunteer for Astronomy on Tap, Valley of the Sun 2025

Reviewer for The Astronomical Journal 2024-present

Reviewer for Astronomy and Astrophysics 2024-present

Coordinator, SESE Queer and Trans Coffee Hour 2023-present

Vice President, SESE Graduate Council 2024-2025

Graduate Advocate, SESE Graduate Council 2023-2024

Science Panelist, Phoenix Fan Fusion 2023-present

Judge, Arizona Science & Engineering Fair 2022-present

Stars and Exoplanets Research Group Outreach Coordinator (tabling and demos for ASU Open Door and Earth and Space Exploration Day) 2021-present

Founding member, UT Physics, Math, and Astronomy Board for Student Advocacy 2019-2020

Member, Sigma Pi Sigma Physics Honor Society (tutoring/homework help) 2019-2020

President, secretary; UT Astronomy Students Association (organizing outreach, student resources) 2018-2020

Contributed and Invited Talks

Drops of (hot) Jupiter: The impacts of metal rain on exoplanet climates, Annual SESE Symposium, 2025

Alien Worlds and Our Place in the Universe, 51st Asilomar Microcomputer Workshop, 2025 (invited)

Lies, damned lies, and statistics of exoplanet atmospheres, 51st Asilomar Microcomputer Workshop, 2025

Stronger Together: Expanding Exoplanet Atmospheric Inference Capabilities by Combining Ground-based and JWST Spectroscopy, ExoExplorer Science Series, 2025

The Roasting Marshmallows Program with IGRINS on Gemini South II: WASP-121 b has super-stellar C/O and Refractory-to-volatile ratios, American Astronomical Society Winter Meeting, 2025

Stronger Together: Enhancing Atmospheric Inference capabilities by combining ground-based and JWST spectra, Two HoRSEs, 2024

Alien Worlds: Then and Now, ASU astronomy club, 2024 (invited)

A Combined Ground-based and JWST Atmospheric Retrieval Analysis: Both IGRINS and JWST Agree the Atmosphere of WASP-77A b is Metal-poor, MPIA/APEx Exocoffee, 2024 (invited)

Stronger Together: Enhancing Atmospheric Inference Capabilities by Combining Ground-based and JWST Spectroscopy, GMT Annual Community Meeting, 2023

Stronger Together: Enhancing Atmospheric Inference Capabilities by Combining Ground-based and JWST Spectroscopy, ELT Science in Light of JWST, 2023

Alien Worlds Through Time, Sundial No Jargon Conference, 2023

S'More Roasting Marshmallows: The Atmosphere of WASP-121 b is 13CO-enriched, Penn State CEHW Seminar, 2023 (invited)

S'More Roasting Marshmallows: The Atmosphere of WASP-121 b is ^{13}CO-enriched, American Astronomical Society Winter Meeting, 2023

The Need for Fast, 3D Models at High Spectral Resolution, Other Worlds Laboratory Summer Program, 2022

A Combined High- and Low- Resolution Retrievals of a Hot Jupiter using IGRINS/Gemini South and WFC3/HST, Leibnitz Institute for Astrophysics Thinkshop: High resolution spectroscopy of exoplanet atmospheres and biosignatures, 2022

A Whole New World: Opportunities and Challenges for the Next Era of Exoplanet Science, Oxford SPIMAX Astronomy Seminar, 2022 (invited)

A combined High- and Low-Resolution Retrieval of a Hot Jupiter using IGRINS/Gemini South and WFC3/HST, American Astronomical Society Winter Meeting, 2022 (cancelled due to COVID-19)

A new model for culturally responsive citizen science-based curriculum, American Astronomical Society Winter Meeting, 2022 (cancelled due to COVID-19)

A combined High- and Low-Resolution Retrieval of a Hot Jupiter using IGRINS/Gemini South and WFC3/HST, CHAMPS Exoplanet Early Career Seminar, 2022

Detection of a Carbon Isotope in a Hot Jupiter Using High Resolution Cross Correlation Spectroscopy, Emerging Researchers in Exoplanet Science Symposium, 2021

Understanding the Atmospheres of Alien Worlds, Sundial No Jargon Conference, 2021

High Resolution Cross Correlation Spectroscopy Observations of a Hot Jupiter with IGRINS on Gemini South, Space Telescope Science Institute Spring Symposium, 2021

Predictions for Secondary Eclipse Observations of TESS Discoveries with JWST, American Astronomical Society Winter Meeting, 2021

Predictions for Secondary Eclipse Observations of TESS Discoveries with JWST, University of Texas Astronomy Department Undergraduate Research Seminar, 2020

Detecting and Characterizing Exoplanets, Astronomy Students Association Undergraduate Research Month, 2019 (invited)