

# GRAYSON C. PETTER

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Observational astrophysicist studying accreting supermassive black holes and the connections to their host halos and galaxies. Interested in revealing black hole-galaxy coevolution through statistical studies of active galactic nuclei found in wide-area surveys. Currently focused on studying how different classes of AGN populate the large-scale structure of the universe, or how they occupy their host dark matter halos.

## EDUCATION

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Physics and Astronomy Ph.D. Candidate	Sept 2019 – May 2024
Thesis: The Large-scale Environments of Active Galactic Nuclei	
Department of Physics & Astronomy, Dartmouth College	Advisor: Professor Ryan Hickox
Bachelor of Science in Physics, Bachelor of Science in Astronomy	
Department of Physics, University of Kansas	Aug 2015 – May 2019

## PUBLICATIONS

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### First Author:

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1. (**Mature Manuscript**) “Environments of Luminous Low-frequency Radio Galaxies Since Cosmic Noon: Jet-mode feedback dominant at  $z < 1$ ”, **Grayson C. Petter**, Ryan C. Hickox, Leah K. Morabito, David M. Alexander, 2024, *The Astrophysical Journal*, Manuscript copy
  2. “Host Dark Matter Halos of WISE-selected Obscured and Unobscured Quasars: Evidence for Evolution”, **Grayson C. Petter**, Ryan C. Hickox, David M. Alexander, Adam D. Myers, James E. Geach, Kelly E. Whalen, and Carolina P. Andonie, 2023, *The Astrophysical Journal*, doi:10.3847/1538-4357/acb7ef
  3. “Host Dark Matter Halos of SDSS Red and Blue Quasars: No Significant Difference in Large-scale Environment”, **Grayson C. Petter**, Ryan C. Hickox, David M. Alexander, James E. Geach, Adam D. Myers, David J. Rosario, Victoria A. Fawcett, Lizelke Klindt, and Kelly E. Whalen, 2022, *The Astrophysical Journal*, doi:10.3847/1538-4357/ac4d31
  4. “Deviations from the Infrared-radio Correlation in Massive, Ultracompact Starburst Galaxies”, **Grayson C. Petter**, Amanda A. Kepley, Ryan C. Hickox, Gregory H. Rudnick, Christy A. Tremonti, Aleksandar M. Diamond-Stanic, James E. Geach, Alison L. Coil, Paul H. Sell, John Moustakas, David S. N. Rupke, Serena Perrotta, Kelly E. Whalen and Julie D. Davis, 2020, *The Astrophysical Journal*, doi:10.3847/1538-4357/abb19d

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### Co-author:

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- “X-ray and multi-wavelength analysis of candidate AGNs in dwarf galaxies in the Boötes field”, Purohit, Rujuta et al., 2023, *The Astrophysical Journal*, submitted
  - “Obscuration beyond the nucleus: infrared quasars can be buried in extreme compact starbursts”, Andonie, Carolina et al., 2023, *Monthly Notices of the Royal Astronomical Society*, doi:10.1093/mnrasl/slad144
  - “Extending the Dynamic Range of Galaxy Outflow Scaling Relations: Massive Compact Galaxies with Extreme Outflows”, Julie D. Davis et al., 2023, *The Astrophysical Journal*, doi:10.3847/1538-4357/acbbbf
  - “The Ionization and Dynamics of the Makani Galactic Wind”, David S.N. Rupke et al., 2023, *The Astrophysical Journal*, doi:10.3847/1538-4357/acbfaf
  - “A panchromatic view of infrared quasars: excess star formation and radio emission in the most heavily obscured systems”, Carolina P. Andonie et al., 2022, *Monthly Notices of the Royal Astronomical Society*, doi:10.1093/mnras/stac2800

- “The Space Density of Intermediate Redshift, Extremely Compact, Massive Starburst Galaxies”, Kelly E. Whalen et al., 2022, *The Astronomical Journal*, doi:10.3847/1538-3881/ac958f
- “TESS Hunt for Young and Maturing Exoplanets (THYME). VII. Membership, Rotation, and Lithium in the Young Cluster Group-X and a New Young Exoplanet”, Elisabeth R. Newton et al., 2022, *The Astrophysical Journal*, doi:10.3847/1538-3881/ac8154
- “Physical Properties of Massive Compact Starburst Galaxies with Extreme Outflows”, Serena Perrotta et al., 2021, *The Astrophysical Journal*, doi:10.3847/1538-3881/ac8154
- “Compact Starburst Galaxies with Fast Outflows: Central Escape Velocities and Stellar Mass Surface Densities from Multiband Hubble Space Telescope Imaging”, Aleksandar M. Diamond-Stanic et al., 2021, *The Astrophysical Journal*, doi:10.3847/1538-4357/abe935
- “The GOGREEN and GCLASS surveys: first data release”, Michael L. Balogh et al., 2021, *Monthly Notices of the Royal Astronomical Society*, doi:10.1093/mnras/staa3008

## PRESENTATIONS

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### Talks:

- “Physical Models for the Clustering of Obscured and Unobscured Quasars”; What drives the growth of black holes?, Sept 26-29 2022, Reykjavik, Iceland.
- “Host Dark Matter Halos of Obscured and Unobscured Quasars”; Panchromatic view of the life-cycle of AGN, Sept 14-16 2022, Madrid, Spain.
- “Host Halos/Galaxies of Obscured and Unobscured Quasars”; New England Regional Quasar and AGN Meeting, May 26 2022, Storrs, Connecticut.

### Posters:

- “Unveiling Star Formation and its Demise in Ultra-compact Post-merger Galaxies using Jansky VLA Continuum Measurements”; American Astronomical Society Meeting 233, Jan 6-10 2019, Seattle, Washington.

## OBSERVING EXPERIENCE

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### Principal Investigator:

- SALT 2022-2 RSS Spectroscopy: Characterizing Heavily Obscured Quasars Missed by X-ray Surveys.
- SALT 2023-1 RSS Spectroscopy: Characterizing Heavily Obscured Quasars Missed by X-ray Surveys.

### Co-investigator

- VLA 2018A: Probing Dust-Obscured Star Formation in Massive Ultra-compact Galaxies.

## MENTORING/TEACHING EXPERIENCE

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- Co-advisor to Ms. Rujuta Purohit, an undergraduate studying with Prof. Ryan Hickox at Dartmouth College who has submitted her first lead-author paper and is preparing her second.
- Served as a graduate teaching assistant for an undergraduate foreign study program in astronomy in Cape Town, South Africa, culminating in a research project involving hands-on observations on a 1-meter telescope at the South African Astronomical Observatory.
- Served as a graduate teaching assistant at Dartmouth College for eight terms of introductory physics and astronomy courses.

- Served as an undergraduate teaching assistant at the University of Kansas for six semesters of introductory physics courses.

## AWARDS

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- Selamawit Tsehay Teaching Award, 2023, Dartmouth College

## PAST RESEARCH APPOINTMENTS

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- NSF REU at the National Radio Astronomy Observatory, Advisor: Dr. Amanda Kepley

## SOFTWARE PACKAGES

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- HaloModelPy - An efficient python package to model galaxy auto/cross-correlation functions, and cross-power spectra with lensing signals in a halo model framework.
- Corrfunc Helper - A wrapper for the Corrfunc package to simplify computation of correlation functions. Pass galaxy and random catalogs and compute angular/spatial, auto/cross correlations, and perform bootstrap resampling all in one line.

## COMPUTING SKILLS

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- Python - functional and object-oriented, writing vectorized numpy code for speed
- Markov chain Monte Carlo methods
- SQL/ADQL queries
- Operations on HEALPix maps, multi-order coverage maps, MANGLE maps, and MASTER power spectrum estimation
- Usage of Code for Anisotropies in the Cosmic Microwave Background (CAMB), Fourier methods (FFTLog)
- Modeling galaxy spectral energy distributions with CIGALE
- Maintaining projects on GitHub

## REFERENCES

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*Professor Ryan Hickox*  
*Professor and Department Chair*  
*Department of Physics and Astronomy,*  
*Dartmouth College*  
*Ryan.C.Hickox@dartmouth.edu*  
*Relation: Advisor*

*Professor David Alexander*  
*Professor and Director of CEA*  
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*Professor Adam Myers*  
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