Catherine Petretti

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RESEARCH INTERESTS

- Cosmic inflation theory for various inflationary models
- Forecast analysis for upcoming CMB missions to probe inflation
- The search for primordial gravitational waves in the CMB

EDUCATION

Harvard University — Cambridge, MA
Ph.D. Student, Astronomy — Aug 2022 – Present
Mentors: Dr. Xingang Chen

Villanova University — Villanova, PA
B.S. Astronomy & Astrophysics — Aug 2018 – May 2022
Minors: Physics, Mathematics, Classics
Summa Cum Laude – GPA: 3.97/4.0

HONORS AND AWARDS

Graduate Prize Fellowship, Harvard University	2022
Phi Beta Kappa Honor Society, Villanova University	2022
Jason A. Cardelli Memorial Award, Villanova University	2022
Edward F. Jenkins OSA Medallion, Villanova University	2022
Sigma Pi Sigma Physics Honor Society, Villanova University	2022
NEROC Symposium Award, Haystack Observatory	2022
Edward F. Jenkins, OSA Scholarship, Villanova University	2021
Barry Goldwater Scholarship	2021
National Hispanic Scholarship	2020
NSF REU, Haystack Observatory	2020
Undergraduate Research Fellowship, Villanova University	2019
Match Research Program, Villanova University	2019

RESEARCH EXPERIENCE

Searching for Inflation with LiteBIRD — 2023 –
Advisor: Dr. Xingang Chen, Harvard University
Executed a forecast analysis of upcoming CMB measurements from LiteBIRD to detect and distinguish between models of cosmic inflation.

Next Generation VLA Stellar Imaging — 2021, 2023
Advisors: Dr. Kazunori Akiyama & Dr. Lynn D. Matthews,
Haystack Observatory
Generated synthetic observations of evolved stellar photospheres for the Next Generation VLA. Assessed performance for different revisions of the array configuration and different imaging methods.

Determining the Orbital Period of GRO J1655-040 2019 – 2023
Advisor: Dr. Joey Neilsen, Villanova University
Performed a lightcurve analysis from infrared data of the black hole X-ray binary GRO J1655–40 to determine the orbital period and search for a period derivative.

Analyzing Short-Term Variability in Cygnus X-1 2021
Advisor: Dr. Edward Guinan, Villanova University
Performed a lightcurve analysis from TESS data of the black hole X-ray binary Cygnus X-1 to analyze non-periodic brightness variations.

Observing Black Holes with the EHT 2020
Advisors: Dr. Vincent Fish & Dr. Kazunori Akiyama,
Haystack Observatory
Generated synthetic observations of the supermassive black hole M87* to demonstrate imaging benefits of adding space telescopes to the Event Horizon Telescope (EHT) array.

PUBLICATIONS

Petretti, C., Neilsen, J., & Homan, J., 2023 "Determining the Orbital Period and Wind Geometry in GRO J1655–40", ApJ, 957, 1, doi:10.3847/1538-4357/acf837

Petretti, C., & Guinan, E., 2021 "Analysis of High-Precision TESS Photometry of the Black-Hole X-Ray Binary Cygnus X-1: Evidence of Intrinsic Variability of the Luminous Blue Supergiant Component", RNAAS, 5, 11 (2021), doi:10.3847/2515-5172/ac3830

Petretti, C., Akiyama, K., & Matthews L. D., 2021 "Next Generation Very Large Array: Evaluation of the Revision D Array Configuration for Stellar Imaging", ngVLA Memo No. 95, arXiv:2110.01625

PRESENTATIONS

Unlocking the Hidden Potential of the CMB: A Forecast Analysis for LiteBIRD Measurements to Distinguish between Inflationary Models Jun 2023
Tri-Institute Summer School on Elementary Particles. Perimeter Institute for Theoretical Physics. Poster.

Next Generation Very Large Array: Evaluation of the Revision D Array Configuration for Stellar Imaging Jun 2022
AAS 240th Meeting. Pascadena, CA. Poster.

Next Generation Very Large Array: Evaluation of the Revision D Array Configuration for Stellar Imaging Mar 2022
6th Annual NEROC Symposium. Haystack Observatory. Talk.

Next Generation Very Large Array: Evaluation of the Revision D Array Configuration for Stellar Imaging Nov 2021
Student Research Symposium. Villanova University. Poster

Mapping a Black Hole Wind: Determining the Orbital Period and Wind Geometry in GRO J1655–40 Apr 2021
President's Advisory Council Meeting. Villanova University. Invited Talk.

Simulating Observations of M87 with the Event Horizon Telescope and Space VLBI Jan 2021
APS Conference for Undergraduate Women in Physics. Virtual. Talk.

Simulating Observations of M87 with the Event Horizon Telescope and Space VLBI Jan 2021
AAS 237th Meeting. Virtual. Talk.

Simulating Observations of M87 with the Event Horizon Telescope and Space VLBI Aug 2020
REU/UROP Research Symposium. Haystack Observatory. Talk.

Mapping a Black Hole Wind: Determining the Orbital Period and Wind Geometry in GRO J1655–40 Sep 2019
Student Research Symposium. Villanova University. Poster.

TEACHING EXPERIENCE

Teaching Assistant, Villanova University — Spring 2022
MSE 2151: Astronomy Lab - Stars

Teaching Assistant, Villanova University — Spring 2021
AST 2133-2134: Observational Lab II

Teaching Assistant, Villanova University — Fall 2020
AST 2133: Observational Lab I

Teaching Assistant, Villanova University — Fall 2019
PHY 1101: General Physics Lab

LEADERSHIP AND OUTREACH

Student Editorial Board, *Veritas: Villanova Undergraduate Research Journal* — 2021 – 2022

Secretary, Villanova Astronomical Society — 2020 – 2021

Public Observatory Attendant, Villanova University — 2018 – 2019