## Boston University College of Arts & Sciences Institute of Astrophysical Research BOSTON UNIVERSITY

2024-2025 SPACE PHYSICS SEMINAR SERIES

## White Dwarf Astrophysics as a Physics Laboratory in the Gaia Era

Due to their compactness and strong gravitational fields, white dwarf stars probe a wide array of interesting physical conditions and processes. The precision astrometry of the Gaia space mission has introduced a fascinating variety of puzzles in understanding the physics at play in white dwarfs, from their peaceful cooling over long timescales to violent explosions as thermonuclear supernovae. The data that is becoming available on large samples of white dwarfs makes it possible to use population studies of these stars as a physics laboratory to gain understanding of the dense plasma physics at play in white dwarf interiors. Highlights include diffusion and sedimentation in stronglycoupled plasma, phase transitions in cooling white dwarfs, and enigmatic hypervelocity runaway stars from supernovae in white dwarf binaries. I will review recent progress on white dwarf modeling efforts to understand the physics at play in massive white dwarfs undergoing crystallization that rearranges their interior composition and liberates surprisingly large amounts of energy. I will also discuss some ongoing theoretical modeling investigations motivated by puzzles in white dwarf astrometric data, along with some of their implications for supernovae, nucleosynthesis, and runaway stars.

**Evan Bauer** 

## Monday, September 30th

2:30-4:00 p.m. 725 Commonwealth Ave | Room 502 Harvard Center for Astrophysics