SACRAMENTO STATE

Department of Physics and Astronomy

SPRING 2026 Colloquium Series

“Stellar Winds and Supernovae in Gasoline Simulations of Giant Molecular Clouds”

Alex Giovannini

Sac State Astronomy Minor Independent Research Talk

Massive stars inject energy and momentum into giant molecular clouds (GMCs) long before they explode as Type II supernovae. It is still unclear how much of the cloud disruption we should attribute to those pre-supernova stellar winds versus the supernova itself. In this project, completed over two semesters with Dr. Pettitt, I used the Gasoline2 smoothed-particle hydrodynamics code to couple OB-star stellar winds, continuous energy injection during the massive-star phase, with existing Type II supernova feedback. I implemented metallicity-dependent wind energy injection using a prescription parameterized by a collaborator in Dr. Pettitt’s research group and tested it in a sweep of ten simulations spanning different compositions. I also ran an approximately 300 pc GMC with supernova and wind feedback independently toggled on and off to isolate their effects on star formation. In my talk I will show star formation histories, density–temperature phase diagrams, and 3D visualizations of the evolving gas so faculty and students can see, concretely, how winds and supernovae differ in these simulations.

***Tuesday, May 12, 2026**

4:00 – 5:20PM

MND1015

Open & Free to all students, faculty and public