

Department of Physics and Astronomy Colloquium Series

Tuesday, September 23rd, 2025, 2:30pm in PSE 317

Speaker: Sarah Nickerson

Institution: Bay Area Environmental Research Institute

Title: The Mid-infrared Secrets of Massive Star Forming Regions

Abstract:

Protostars spend their earliest stages embedded in dust clouds that block most radiation, but are bright in the mid-infrared (MIR). As they heat their natal clouds they release molecules from the icy grain mantels. These hot, dense regions of molecular gas bear the kinematic, structural, and chemical stamp of their protostars. The MIR has the capacity to access the inner $\sim 1\text{--}10$ au of disks around both low- and high-mass protostars, including the planet-forming zone in protoplanetary disks. While high mass protostars will not form planets themselves, they are the most powerful probes of the molecular chemistry in star forming regions.

I will present results from MIR molecular spectroscopy of massive star forming regions taken with the Stratospheric Observatory For Infrared Astronomy (SOFIA). SOFIA was a Boeing 747 modified to accommodate a telescope and flew at 45,000 ft, above most of Earth's infrared-blocking atmosphere. With the EXES instrument aboard SOFIA we completed the first high resolution MIR survey towards the enigmatic source Orion IRc2 within our closest massive star forming region. Towards the massive binary protostellar system NGC 7538 IRS 1, we discovered methanol for the first time in the MIR, a key precursor to prebiotic molecules. I will also share a preview of the SpaceMol Database that we are building at NASA Ames, the first of its kind to catalogue observed molecular transitions in space.