

# CSU PHYSICS COLLOQUIUM

## “Transforming our understanding of galaxy formation with the power of JWST and ALMA ”

**Dr. Katherine Suess**

**Stanford University**

Monday, November 13th at 4:00 PM

### **Abstract**

Galaxies are one of the fundamental building blocks of our universe, yet despite a century of study we still don't understand how these vast cosmic ecosystems formed. The key challenge is that we want to measure physical properties like stellar mass, but all we observe is light. Making the translation from light to physical properties requires pairing complex stellar population models with rich multi-wavelength datasets. In this talk, I'll tell three stories of recent observations with JWST and ALMA that have forced us to rewrite these models and rethink our theories of galaxy formation. (1) I'll discuss the new picture of massive galaxy evolution emerging from the first year of JWST observations: when these monster galaxies form, their sizes and structures, and how they shut down star formation. (2) We used ALMA to reveal huge reservoirs of cold gas in galaxies that aren't forming new stars, implying that qualitatively new mechanisms are needed to explain why massive galaxies shut down their star formation. (3) Our first spatially-resolved infrared look at distant galaxies suggests that our previous understanding of galaxy assembly was biased. Interpreting these observations requires a radical re-envisioning of our most basic measurement techniques. I'll discuss my ongoing work to develop a multi-wavelength, spatially-resolved understanding of distant galaxies by combining these cutting-edge observations with Bayesian analysis and modern machine learning techniques. I'll conclude with a forward look at how leveraging the joint power of JWST, ALMA, and upcoming observatories like Roman will answer our biggest outstanding questions about galaxy formation and usher in a new era of discoveries.

### **Biography**

Katherine (Wren) Suess grew up in Raleigh, North Carolina, and received her bachelor's degree from the University of Colorado, Boulder. She completed her PhD at the University of California, Berkeley under the mentorship of Professor Mariska Kriek. After graduating in 2021, Wren spent two years as a joint Stanford – Santa Cruz Cosmology Fellow and a UC Santa Cruz Chancellor's Fellow before starting a Hubble Fellowship at Stanford University in fall 2023. Beginning in fall 2024, Wren will be an assistant professor at the University of Colorado, Boulder. In addition to her work studying the formation and evolution of galaxies, Wren is one of the lead coordinators of the “Respect is Part of Research” peer-led workshop program.