DEPARTMENT OF PHYSICS AND ASTRONOMY
COLLOQUIUM IN-PERSON ONLY EVENT

Precursor Prebiotic Chemistry at the Earliest Stage of Sun-like Star Formation

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Before low-mass (M ≤ few solar masses) stars like our Sun are born, they are conceived inside cold (~10 K) and dense (> 10^4 cm^-3) cocoons of gas and dust known as starless or dynamically evolved prestellar cores. These objects are budding chemical laboratories that set the initial conditions important for understanding the later stages in their evolution, i.e., protostars, protoplanetary disks, and comets. In this talk, I will discuss what we know about the increasing chemical complexity found in this early stage, specifically those interstellar molecules that are precursors to more biologically relevant species such as amino acids, DNA, and RNA. Observational results from my large (> 60 object) surveys with single-dish submillimeter radio observing facilities (including the ARO 12m, Yebes 40m, and IRAM 30m), reveal that gas-phase precursor prebiotic chemistry in starless and prestellar cores is more widespread than previously thought. And, early results from my new observing programs with the 100m Green Bank Telescope (GBT) and Atacama Large Millimeter/submillimeter Array (ALMA) probe deeper, at finer kinematic and spatial scales, in order to map for the first time the precise locations of these precursor prebiotic species in and around prestellar cores. These programs, along with complementary ice measurements from JWST, ongoing chemical modeling efforts and laboratory studies, are necessary for us to trace how this chemistry, which is important for life on Earth, might be incorporated into the next stages of star and planet formation.

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