DEPARTMENT OF PHYSICS AND ASTRONOMY

COLLOQUIUM ***IN-PERSON EVENT ONLY***

REVEALING THE COMPOSITION AND HISTORY OF THE SOLAR SYSTEM WITH JWST'S INFRARED EYES

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A number of outstanding questions remain regarding the processes that occurred during the formation and early evolution of the Solar System. Context can be provided from other star and planet forming regions and the evolutionary stages observed from protostars, to disks, to planets. For the solar system, comets provide important constraints to these processes and help us gain insights into the preservation of materials, namely volatiles, during planet formation. The composition of comet nuclei is determined primarily from the remote detection of material found in their atmospheres, with extremely few dedicated missions to flyby, orbit, land on, or collect samples from the coma and the nucleus. Previous ground- and space- based observations, including recent Rosetta results, as well as laboratory measurements of cometary material obtained from Stardust, suggest that comets contain a mixture of the products from both interstellar and nebular chemistries. A major observational challenge in cometary science is to quantify the extent to which chemical compounds can be linked to either reservoir. By understanding the native volatile composition, understanding the physiochemical conditions of the comet upon sublimation, as well as the dust and bulk solid composition, the pristine nature of these objects can be deciphered. JWST's unprecedented sensitivity, spectral coverage, imaging capability, and support for tracking non-sidereal objects makes it an ideal tool for studies of these small bodies. We will present recent results from JWST towards comets C/2022 E3 (ZTF), 22P/Kopff, and C/2017 K2 (Pan-STARRS) and will discuss the volatile, organic, and dust composition as well as new discoveries enabled by this facility for cometary science with applications to planet formation in the Galaxy.

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