

# The Chemist's Interactions

Seminars @ the Chemistry Department

Friday, 25<sup>TH</sup> September 2020

LIVE  
STREAM  
h 16:00

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## The Molecular Universe

Over the last 20 years, we have discovered that we live in a molecular Universe: A Universe with a rich and varied organic inventory; A Universe where molecules are abundant and widespread; A Universe where molecules play a central role in key processes that dominate the structure and evolution of galaxies. A Universe where molecules provide convenient thermometers and barometers to probe local physical conditions. A Universe where the prebiotic origin of life may well have its roots in the chemistry in space. Understanding the origin and evolution of interstellar molecules is therefore key to understanding the Universe around us and our place in it and has therefore become a fundamental goal of modern astrophysics.

Observations have demonstrated that the molecular universe is filled with large and complex species, including Polycyclic Aromatic Hydrocarbons (PAHs), fullerenes (C<sub>60</sub>) and clusters of such molecules. Observed spectral variations reflect compositional changes in the family of molecules present in space, driven by e.g., UV photolysis. Extensive experimental and theoretical studies have elucidated the intrinsic infrared properties of large PAH molecules and their dependence on the molecular characteristics. In addition, experimental studies and astronomical modeling have revealed the importance of top-down chemistry whereby large molecules are broken down to smaller species and isomerized to cages and fullerenes. Finally, carbonaceous meteorites contain a diverse array of organic species including PAHs. This organic inventory betrays an interstellar heritage affected by aqueous alteration on the parent body. Our progress in understanding the Molecular Universe is greatly aided by close collaborations between astronomers, molecular physicists, astrochemists, spectroscopists, and physical chemists who work together in loosely organized networks. In this talk, I will sketch the progress that we have made over the last 20 years and outline some of the challenges that are facing us.



The Virtual Seminar Series will be broadcast with the Zoom software.

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