NEW FRONTIERS IN COSMIC CARBON CHEMISTRY

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The last four years have seen a massive explosion in the spectroscopic detection and characterization of large carbon-containing molecules in the interstellar medium, including the first detections of individual polycyclic aromatic hydrocarbon (PAH) molecules. The detections of PAHs and other carbon rings in the cold, dark starless cloud TMC-1 by the GOTHAM and QUIJOTE projects has opened new frontiers for the exploration of this massive reservoir of as much as 25% of interstellar carbon. In this talk, I will highlight the GOTHAM collaboration's pioneering work in laboratory (rotational) spectroscopy, radio-astronomical observational spectroscopy, astrochemical modeling, and machine learning all working together to unravel the chemistry and physics underlying these new discoveries.