



**Western University**  
**Department of Physics and Astronomy**

## **PHYSICS & ASTRONOMY COLLOQUIUM**

**Date:** Thursday, 16<sup>th</sup> November 2017  
**Time:** 1:30 p.m.  
**Location:** Physics & Astronomy Seminar Room 100

### **Dr. Edwin (Ted) Bergin**

Department of Astronomy  
University of Michigan

### ***“Connecting protoplanetary disk and exoplanet atmospheric composition”***

#### **ABSTRACT**

In planetary atmospheres equilibrium chemistry will redistribute elements into specific carriers depending on local conditions. Therefore to draw a link between planet formation and end-state composition, we need to measure absolute abundances and trace the bulk carriers of key elements, particularly carbon and oxygen. In this talk I will discuss methods to determine bulk abundances, relative to hydrogen, within protoplanetary disks to provide grounding data on the disposition of elemental C and O during the phase of giant planet formation. Based on surveys of emission lines with ALMA (CO) and Herschel (H<sub>2</sub>O), one intriguing result is that the main volatile carriers of C and O appear to be missing in gas-rich disk systems. The implication is that either nearly all Myr-old disks are effectively gas-poor (dissipating) or that chemical abundances are lower than expected. We will show that in at least one system resolved ALMA observations of optically thin CO isotopologues and unresolved Herschel observations of water vapor suggest the chemical abundances are reduced in emissive layers. We will present models that support the hypothesis that the missing gas-phase volatiles are present as ices locked within growing dust particles in the disk midplane. In all, we are on the cusp of greater understanding regarding the chemical content of planet-forming disks with important implications for the baseline level of chemical enrichment within giant planet atmospheres.

***COFFEE + light snacks will be available in the Atrium, 2nd floor, at 1:15 p.m.***