Models of protoplanetary and solar nebula chemistry

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Recent results from the *Atacama Large Millimeter/ submillimeter Array* (*ALMA*) are revolutionising our understanding of the chemical history of planetary systems. The superior sensitivity and resolution of *ALMA* "Early Science" operations has allowed unprecedented access to the molecular structure and chemistry of nearby protoplanetary disks on Solar System size scales. The study of such objects allows us to probe the initial conditions of planetary system formation: the dust, gas, and ice in protoplanetary disks will ultimately end up in planets and planetesimals (e.g., comets) orbiting the young star. Studying the molecular content of disks around young stars which will evolve into stars like the Sun, can give invaluable insight into the initial content and structure of the Solar Nebula - the birth place of the Solar System.

In this talk, I will review the current state of protoplanetary disk chemistry models, motivated by existing observations from near-infrared to millimeter wavelengths, and "hot off the press" results from *ALMA* and *Rosetta*. Each species detected in disks, whether atomic or molecular in nature, gives us unique information on the chemical and physical conditions of the region (or regions) within which it resides. I will describe how models are used to both incentivise and interpret observations, and discuss the different chemical processes which are thought to occur in disks around young Sun-like stars in relation to the observations. I will also discuss the formation and survival of "complex organic molecules" in disks [1,2], those species thought to be the precursors of biologically important molecules, such as amino acids, in the Solar System.

[1] Walsh et al. (2014) *Astron. Astrophys.* **563**, A33. [2] Walsh et al. (2014) *Faraday Discuss.* **168**, 389-421.