

Chemistry in Protoplanetary disks

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In my seminar, I will introduce you to astrochemistry, a field in which researchers simulate chemical processes in space using various methods. My focus will be on protoplanetary disks, which are flat clouds of gas and dust that co-rotate around newborn stars. These disks form when molecular clouds contract under the pull of their own gravity to form new stars. These disks exist for a couple of million years and are the places where new planets are born.

I will mention and describe a few key chemical processes, such as UV photoionization and dissociation,

X-ray and cosmic-ray chemistry, gas kinetic reactions, ice adsorption and desorption, and surface chemical processes. I will demonstrate how rate networks that simulate these processes are embedded into complex astrophysical simulations, which are then used to analyze and interpret modern astronomical observations, such as spectra from the James Webb Space Telescope. I will also discuss astrochemical models of the upper atmospheres of planets, where collisions between molecules become rare and the energy distribution of molecules becomes non-Maxwellian.