

Life and the Universe: From Astrochemistry to Astrobiology

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Great strides have been made in our understanding of interstellar material thanks to advances in infrared astronomy and laboratory astrophysics. Ionized polycyclic aromatic hydrocarbons (PAHs), shockingly large molecules by earlier astrochemical standards, are widespread and very abundant throughout much of the cosmos. In cold molecular clouds, the birthplace of planets and stars, interstellar atoms and molecules freeze onto extremely cold dust and ice particles forming mixed molecular ices dominated by simple species such as water, methanol, ammonia, and carbon monoxide. Within these clouds, and especially in the vicinity of star and planet forming regions, these ices and PAHs are processed by ultraviolet light and cosmic rays forming hundreds of far more complex species, some of biogenic interest. Eventually, these are delivered to primordial planets by comets and meteorites. As these materials are the building blocks of comets and related to carbonaceous micrometeorites, they are likely to be important sources of complex organic materials delivered to habitable planets (including the primordial Earth) and their composition may be related to the origin of life. This talk will focus on the chemical evolution of these cosmic materials and their relevance to astrobiology.