

SPECIAL CHEMICAL PHYSICS AND PIZZA SEMINAR SERIES**

“Astrochemistry: Heavenly Atoms and Molecules”

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Abstract

We visit two extraordinary astrochemical detective stories. The first is about the "most brilliant Ph.D. thesis ever written in astronomy," published in 1925 by Cecilia Payne. She demonstrated that the seemingly wild variations observed in stellar absorption lines was due to variations in excitation or ionization of the atoms, and arose from differences in temperature rather than, as previously assumed, variations in abundances of the chemical elements. She also showed that many elements occur in the Sun in about the same relative amounts as on Earth, but that helium and hydrogen were far more abundant. All this she accomplished in less than two years as a graduate student, before the advent of quantum mechanics. The second story is an ongoing saga, unraveling the chemical mechanisms that produce a rich variety of molecular species in the interstellar medium of our galaxy and others, observed over the past 40 years by radioastronomy. These molecules include H₂, OH, H₂O, NH₃ and a few other small inorganic species, but most are organic molecules, many with sizable carbon chains containing double or triple bonds. This appears paradoxical, in view of the low cosmic abundance of carbon. William Klemperer has proposed a kinetic scheme that invokes sequences of exoergic, bimolecular ion-molecule reactions. In particular, his scheme indicates that the seemingly paradoxical proliferation of organic molecules in the heavens arises from the mutual distaste of the simplest inorganic species, He⁺ and H₂.

Wednesday, November 17, 2010

11:30 a.m. IQSE 578

Mitchell Physics Building

Texas A&M University

Department of Physics

(Pizza, salad, and soda to be served at 12:30 p.m. outside IQSE 578)

** Grad students and postdocs are invited to participate in the “Entanglement Club” for further discussions on various aspects of entanglement, pertaining to quantum optics as well as quantum computing, to be held on Thursday, November 18, 10 AM – 12 noon, in IQSE 578.