

Abstract Submitted
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Construction of a Unique Laboratory Instrument to Study the Cosmic Origins of Organic Chemistry¹ KENNETH A. MILLER, DANIEL WOLF SAVIN, Columbia University — The cosmic pathway towards life is thought to begin in molecular clouds when atomic carbon is “fixed” into molecules, initiating organic chemistry and the synthesis of complex organic species. Much of our knowledge of this process is through spectroscopic observations and sophisticated astrochemical models to interpret the collected spectra. However, our understanding of the molecular universe is limited by uncertainties in the underlying chemical data in these models. Of particular importance are data for reactions of neutral atomic carbon with molecular ions. To study these chemical reactions we are building a unique instrument which will not suffer from the limitations of previous experimental methods. Starting with a C^- beam, we will use laser photodetachment to generate a C beam. Then the C^- will be removed electrostatically leaving a pure C beam. A molecular ion beam will be merged with the C beam. Since the beams will be co-propagating, we will be able to study reactions down to collision energies of a couple tens of meV (~ 140 K) and possibly lower. Reactions will be studied using an energy analyzer to separate and detect the charged end products, allowing us to determine absolute reaction cross sections.

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