SUGARS AS THE SOURCE OF ENERGIZED CARBON FOR ABIGENESIS. A. L. Weber, SETI Institute, NASA Ames Research Center, Mail Stop 239-4, Moffett Field, CA, 94035-1000, Arthur.L.Weber@nasa.gov

Abstract: As shown in Figure 1, abiogenesis has several requirements: (A) a source of organic substrates and chemical energy that drives the synthesis of (B) useful small molecules (ammonia, monomers, metabolites, energy molecules), and (C) a second synthetic process that yields large replicating and catalytic polymers that control (D) the growth and maintenance of a primitive protocell. Furthermore, the required chemical energy must be sustained and effectively coupled to individual reactions to drive biosynthesis at a rate that counters chemical degradation. Energy coupling would have been especially difficult during the origin of life before the development of powerful enzyme catalysts with 3-D active sites. To solve this energy coupling problem we have investigated abiogenesis using sugar substrates whose energized carbon groups drive spontaneous synthetic self-transformation reactions that yield: biometabolites, catalytic molecules, energy-rich thioesters, amino acids, plausible alternative nucleobases and cell-like microstructures [1-8]. Recently, we demonstrated that sugars drive the synthesis of ammonia from nitrite [9]. The ability of sugars to drive ammonia synthesis provides a way to generate ammonia at microscopic sites of sugar-based origins processes, thereby eliminating the need for a planet-wide source of photochemically unstable ammonia.

Figure 1. Major Synthetic Processes of Abiogenesis.