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Chiral sugar and amino acid formation in simulated cometary matter inches closer to explaining the emergence of homochiral life

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Abstract: The original appearance of chiral organic molecules in our universe is an essential component of the asymmetric evolution of life on Earth. Simulated cometary ice experiments have indicated that circularly polarised light could be the initial source of life's handedness following prebiotic astrochemical condensation of primordial gases. With advanced analytical techniques, chiral sugar molecules[1,2] including ribose (**Fig.1**), amino acids[3,4] and their molecular precursors produced within these interstellar achiral ice analogues have been detected and are likely to be abundant in interstellar media. These molecular species are considered key prebiotic intermediates in the first steps towards the formation of biomolecular homochirality.

Moreover, enantiomeric excesses have been produced in the cometary ice simulations either by photolytic degradation of racemates[5] or by photochemical synthesis via transfer of *chiral photons*[6]. The significance of these results will be considered with reference to the Rosetta space probe that successfully deposited the Philae Lander on the nucleus of comet 67P/Churyumov-Gerasimenko in November 2014[7]. The analysis of the formation of enantiomer-enriched amino acid and sugar structures within interstellar ices, both simulated and actual, should serve as a means towards furthering understanding the origin of asymmetric prebiotic molecules.

References:

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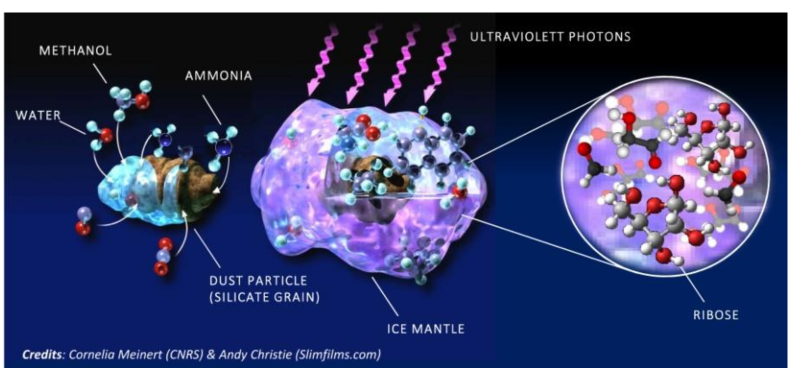

Figure 1 –**Ribose forms in the icy mantles of interstellar dust grains from simple precursor molecules (water, methanol, and ammonia) under high energy radiation.** Ribose sugars make up the backbone of ribonucleic acid (RNA).