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Photoproduction of Amino Acids in Simulated Interstellar Pre-Cometary Conditions

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Amino acids are the essential molecular components of living organisms. The delivery of extraterrestrial organic compounds was likely a source of prebiotic matter on the early Earth. Amino acids from space were certainly delivered to our planet since they are present in several carbonaceous chondrites; these and other organic molecules observed in comets and meteorites could have been formed by UV and cosmic ray irradiation of icy grain mantles in the solar nebula.

Five years after the publication that reported the laboratory synthesis of amino acids by vacuum UV-photoprocessing of circumstellar and interstellar ice analogs (Muñoz Caro et al. 2002, Nature, 416, 403), we re-evaluate those results. We will discuss the influence of several parameters on the amino acid outcome of the experiments, such as: the composition of the starting ice mixture, the temperature of formation, the alternative use of circularly polarized UV light, the use of HCl-hydrolysis as part of the analysis protocol, and the detection technique (gas chromatography vs. liquid chromatography). We will also make a comparison between the amino acid content of the Murchison meteorite and the amino acids generated in our experiments. A possible scenario for the formation of organic grain mantles in the solar nebula, containing prebiotic species, and their incorporation into small solar system bodies, will be presented.