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Homochirality through Photon-induced Dissipative Structuring of Life´s Fundamental Molecules

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Resumen de la plática

We have proposed that the origin of the fundamental molecules of life and their proliferation over the surface of Earth are examples of photochemical microscopic dissipative structuring and dissipative proliferation respectively, under the non-equilibrium conditions arising from the imposition of UVC and UVB wavelengths of the Archean solar spectrum. In this talk we describe the physics of photochemical dissipative structuring and delineate the microscopic (quantum mechanical) mechanisms involved. We show how these mechanisms lead to carbon based molecules with conical intersections which endow them with the property of broad wavelength absorption and high dissipative efficacy in this region of the Archean spectrum. One of a number of such UVC pigments (today known as the fundamental molecules of life) are the nucleic acids which are chiral molecules. UVC photon-induced denaturing of these molecules [1] together with the preferential handedness of circularly polarized light in the afternoon at the ocean surface when temperatures are most conducive to denaturing, leads rapidly to homochirality [2].

References:

[1] Michaelian, K. and Santillán Padilla, N. UVC photon-induced denaturing of DNA: A possible dissipative route to Archean enzyme-less replication, Heliyon 5, e01902 (2019).

[2] Michaelian, K., Homochirality through Photon-Induced Denaturing of RNA/DNA at the Origin of Life, Life 8, 21, (2018).