

Juli Peretó

Professor of Biochemistry and Molecular Biology (University of Valencia) and Principal Investigator at the Institute of Integrative Systems Biology I2SysBio (University of Valencia-CSIC). Co-founder and co-director of I2SysBio, he teaches courses on metabolism from an evolutionary perspective to biotechnologists, and his research interests include the early evolution of life. As a popular science communicator, he explores the relationship between human evolution and cooking.

The imperfect road to metabolism: from protometabolism to LUCA

How did prebiotic chemistry transform into the metabolic networks of primitive life? Metabolic evolution was probably initially driven by chemical contingency and catalytic imperfection. Systems chemistry experiments indicate that prebiotic reactions naturally converge into protometabolic networks of limited complexity. The first generalist catalysts are thought to have co-opted non-enzymatic reactions. At the other extreme, LUCA is the deepest node we can reconstruct from information in current genomes. The available data suggest that it was endowed with a complex genetic and metabolic machinery. To venture beyond the phylogenetic threshold of LUCA, linking ancestral gene clusters to generative reaction rules offers a powerful methodology for exploring the primordial metabolic space. Catalytic imperfection was not an evolutionary anomaly or a defect, but the primary starting point for metabolic innovation.