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A Hot Spring Origin of Life and Early Adaptive Pathway from Woese Progenotes to Marine Stromatolites

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Introduction: Laboratory and volcanic field synthesis of polymers through prebiotically plausible wet-dry cycling [1] combined with the earliest evidence of life on land discovered in 3.48Ga strata of fresh water hot springs in Western Australia [2] suggests an alternative hypothesis [3] to a deep sea origin of life. This hypothesis proposes a complete pathway (figure 1) through: the synthesis of key organic compounds in the solar accretion disk; accumulation and concentration of compounds in pools on land; synthesis and cycling of membraneous protocells encapsulating random sets of polymers; repeated selection of evolving aggregates of protocells yielding a Woese progenote [4]; subsequent distribution of progenotes to varying environments leading to the emergence of living microbial communities; and finally, to global colonization by robust communities of stromatolites so prevalent in the earliest rock record. Malcolm Walter, Martin Van Kranendonk and Tara Djokic of the Australian Centre for Astrobiology, University of New South Wales are acknowledged for their input into this model and visualization.

References:

[1] De Guzman V et al. (2014) *Journal of Molecular Evolution* 78:251-261. [2] Djokic T et al. (2017). *Nature Comunications* (in press). [3] Damer BF (2016) *Life* 6:2, 21. [4] Woese C and Fox G (1977) *Proceedings of the National Academy of Sciences* 74:5088–5090.

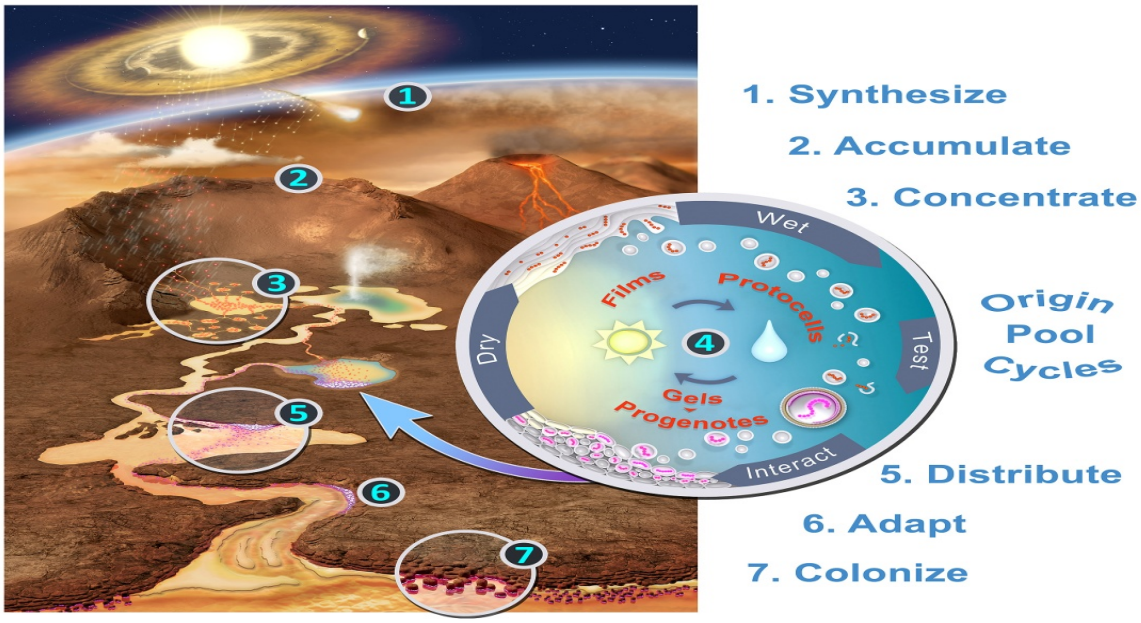

Figure 1 – Visual depiction of a model for a hot spring origin of life in seven stages: 1. synthesis of organic compounds during solar system accretion; 2. accumulation of compounds on land; 3. concentration and chemical reactions; 4. generation and cycling of protocells through three phases; 5. progenote emergence and distribution; 6. transition to cellular life and saline adaptation; and 7. microbial colonization of continental interiors and margins.