

**Wednesday, July 19, 2017**  
**CHEMICAL EVOLUTION TOWARDS THE TRANSITION OF LIFE**  
**8:30 a.m. Price Center Theatre**

**Chairs: Ramanarayanan Krishnamurthy**  
**Yitzhak Tor**

- 8:30 a.m. Deamer D. W. \* Damer B. F. Van Kranendonk M. J. Djokic T.  
[An Origin of Life in Cycling Hot Spring Pools: Emerging Evidence from Chemistry, Geology and Computational Studies](#) [#4130]  
 New evidence for an origin of life in a hot spring setting on land is supported by three studies: chemical (polymerization in wet-dry cycles), geological (stromatolites in a 3.48 Ga geothermal field) and computational (verifying the kinetic trap).
- 8:50 a.m. Parker E. T. \* Forsythe J. G. Fernandez F. M.  
[An Evaluation of the Prebiotic Plausibility of Depsipeptide Synthesis Under Possible Primitive Conditions](#) [#4163]  
 This research evaluates the primordial plausibility of generating depsipeptides (containing mixed amide/ester linkages) from prebiotic simulation experiments, as literature reports surmise depsipeptides may enable primitive polypeptide synthesis.
- 9:10 a.m. Camprubi E. \* Lane N.  
[Alkaline Hydrothermal Vents as Electrochemical Reactors Driving an Auto-Trophic Origin of Life](#) [#4168]  
 We report the reduction of CO<sub>2</sub> to formaldehyde under simulated alkaline hydrothermal conditions. Formaldehyde is transformed into relevant sugars via the formose reaction. Acetyl phosphate can also be synthesised and phosphorylates organic molecules.
- 9:30 a.m. Furukawa Y. \* Takeuchi Y. Kobayashi T. Sekine T. Kakegawa T.  
[Amino Acid Formation by Asteroid Impacts on Ammonia-Free Oceans](#) [#4075]  
 Impacts of asteroids have potential to have provided inorganic reductants to the prebiotic Earth. This study shows the results of experiments simulating post-impact reactions and shows the formation of amino acids with N<sub>2</sub> as the nitrogen source.
- 9:50 a.m. Becker S. \* Carell T.  
[Parallel Prebiotic Origin of Canonical and Non-Canonical Purine Nucleosides](#) [#4118]  
 RNA of all living organisms is highly modified. It is unclear if these non-canonical bases are ancestors of an early Earth or biological inventions. We investigated a prebiotic pathway that leads to canonical and non-canonical purine nucleosides.
- 10:10 a.m. Ashkenasy G. \* Chotera A.  
[Chemical Evolution Routes to Functional Peptide-Nucleic Acid Chimeras](#) [#4120]  
 We discuss a prebiotic system relevant for the pre-LUCA transition from RNA or peptides alone into today's DNA-RNA-proteins triad, highlighting structure and function synergies along a putative trajectory producing DNA-peptide conjugate assemblies.
- 10:30 a.m. *Coffee Break*
- 11:00 a.m. Petrov A. S. \* Gavette J. V. Krishnamurthy R. Hud N. V.  
[Exploring the Stability of DNA/RNA Chimeras by MD simulations: Could Early Life have Utilized Mixed DNA/RNA Duplexes?](#) [#4198]  
 We report an MD study of a DNA to RNA transition by two pathways that are different by the order of purine and pyrimidine mutations. The results reveal substantial differences in the structure and energetics of these transitions.

- 11:20 a.m. Bhowmik S. \* Stoop M. Krishnamurthy R.  
[\*Heterogeneity to Homogeneity: Synthesis, Base Pairing, and Ligation Studies of 4',3'-XyluloNA/RNA and TNA/RNA Chimeric Sequences\*](#) [#4219]  
Based on the reality of “prebiotic clutter,” we herein present an alternate model for pre-RNA to RNA transition, which starts, not with homogeneous-backbone system, but rather with mixtures of heterogeneous-backbone of chimeric “pre-RNA/RNA.”
- 11:40 a.m. Liu Y. \* Shu W. Y. Yu Y. F. Ji Z. L. Zhao Y. F.  
[\*Ser-His Dipeptide : A Potential Candidate of the Prototype for Serine Protease\*](#) [#4026]  
Ser-His is a magical dipeptide with protease activity. It is obtained easily in prebiotic conditions, could hydrolyze all 20 amino acids with different efficiencies and substrate proteins broad spectrum. It maybe a potential candidate of the serine protease prototype.
- 12:00 p.m. Mariani A. \* Sutherland J. D.  
[\*Non-Enzymatic RNA Backbone Proofreading by Energy-Dissipative Recycling\*](#) [#4054]  
Degradation and repair of non-natural backbone linkages as a plausible scenario for the prebiotic evolution of RNA on the early Earth.
- 12:20 p.m. Pressman A. D. \* Moretti J. E. Campbell G. W. Muller U. F. Chen I. A.  
[\*Estimating Ribozyme Kinetics from Analysis of In Vitro Selection\*](#) [#4147]  
Accurately mapping the pathways of potential evolution in an RNA world would require better methods for approximating ribozyme activity. We demonstrate a mathematical process for high-throughput estimation of activity across a ribozyme landscape.
- 12:40 p.m. *Session Adjourns*