

*Posters will be on Display for the Entire Week.
Presenters are Requested to be Present at Their Poster the Last Half-Hour Break of the Evening.*

**POSTER SESSION: SELF-ORGANIZATION AND PREBIOTIC MOLECULAR SYSTEMS
Price Center Ballroom East**

Jayathilaka T. S. Lehman N.

[Self-Assembly of Multiple Small RNA Fragments into an Autocatalytic Prebiotic System](#) [#4011]

This study describes a system that models prebiotic self-assembly of the catalytically active Azoarcus group I intron through the recombination of five shorter inactive RNA oligonucleotides.

Kua J.

[Constructing Free Energy Maps of Oligomerization Reactions in Solution](#) [#4038]

Using first principles computational chemistry, we have constructed free energy maps detailing the thermodynamics and kinetics in systems of molecules with their corresponding oligomers in aqueous solution relevant to prebiotic chemistry.

Todisco M. Fraccia T. P. Smith G. P. Zanchetta G. Clark N. A. Bellini T.

[Non-Enzymatic Ligation of Short RNA Oligomers Enhanced by Supramolecular Self-Assembly and Liquid Crystal Ordering](#) [#4066]

Short RNA molecules self-assembled into liquid crystals show an enhanced non-enzymatic ligation efficiency between their terminals, producing longer polymers ($\sim 6n$) than the ones produced under the same conditions in a disordered solution ($\sim 2n$).

Famiano M. A. Boyd R. N. Kajino T. Onaka T.

[Selection of Amino Acid Chirality via Weak Interactions in External Fields](#) [#4073]

A model has been developed in which the selective destruction of chiral states in high magnetic fields can create enantiomeric excesses of about one part in one million. This selection is implemented through weak interactions on nuclei in amino acids.

Arsene S. Ameta S. Nghe P. Lehman N. Griffiths A. D.

[Networks of RNA Replicators in Origin of Life](#) [#4088]

A diverse library of networks of RNA replicators based on Azoarcus group I intron can be analyzed using a high-throughput experimental set-up in order to study network topologies, node-fitness and robustness in the context of origin of life.

Morrow S. M. Bissette A. J. Kukura P. Fletcher S. P.

[Chirality and Physical Autocatalysis](#) [#4092]

In this work we aim to establish asymmetric variants of physical autocatalytic reactions for the amplification of chirality.

Post E. A. J. Bissette A. J. Fletcher S. P.

[Probing the Mechanism of Self-Reproducing Micelles](#) [#4093]

The work presented here describes a novel physical autocatalytic reaction where new bonds are formed via a copper-catalysed azide-alkyne cycloaddition.

Berg M.F. B. Krismer M. K. Christensen M. C. Hermsen M. H. Vetsigian K. V. Baum D. B.

[Selection for the Spontaneous Appearance of Lifelike Chemistry In Vitro](#) [#4097]

We are using a novel class of experiments, modeled after microbial artificial ecosystem selection experiments to evaluate whether evolvable autocatalytic systems can emerge spontaneously in the laboratory.

Dalai P. Ustiyana P. Sahai N.

[Magnesium Tolerance and Preferential Selectivity of a Lipid in Binary Lipid Systems: An Evolutionary Approach to Modern Membranes](#) [#4104]

We investigated the mechanisms for increased ion tolerance and preferential selectivity of a lipid in a mixed lipid system in the presence of Mg²⁺ as an environmental selection pressure for membrane evolution from fatty acids to phospholipids.

Sahai N. Dalai P. Kaddour H.

[Protocell Self Assembly as Predicted by Mineral Surface Chemistry](#) [#4105]

A structure-activity correlation between mineral surface properties and the enhancement of model protocell formation rates was identified for the first time. Modified DLVO theory for mineral-lipid interactions provides the mechanism.

Hansma H. G.

[Between Mica Sheets: Better than Membranes at the Origin of Life?](#) [#4113]

Organelles without membranes are found in all types of cells. They typically contain RNA and protein and may have preceded membrane-bound structures at the origins of life, where they would have been well sheltered in the spaces between mica sheets.

Bhattacharya A. Devaraj N. K.

[Spontaneous Phospholipid Membrane Formation by Chemoselective Ligation Reactions](#) [#4115]

We describe a simple chemoselective reaction between histidine-functionalized lysolipid and a fatty acyl thioester to generate phospholipid membranes de novo. Such strategies can provide insight into the origin and early evolution of membranes.

Jin L. Szostak J.

[Fe²⁺ in Prebiotic Non-Enzymatic RNA Chemistry and Early Compartmentation](#) [#4165]

We studied Fe(II) catalytic effect on non-enzymatic RNA replication, ligation and hydrolysis along with the effect of pH and cation concentration. Also, these reactions were compatible inside fatty acid protocells with the help of small chelators.

Kühnlein A. Mast C. B. Benk A. Spatz J. P. Braun D.

[Driving Early Biochemical Reactions by the Thermal Accumulation of ATP over ADP/AMP?](#) [#4142]

We propose a system which uses the prebiotically realistic thermal trap to locally shift the equilibrium of ADP and ATP towards an ATP bias and thereby allows biochemical reactions to take off.

Evans A. C. Kading J.

[Continuous Processing Approaches for Prebiotic Syntheses of 2-Amino-Oxazole and Subsequent Ribo/Arabino Furanosyl Amino-Oxazolines](#) [#4124]

Under mild continuous processing prebiotic conditions, the precursors to nucleic acids can be formed. Glycolaldehyde and cyanamide efficiently form 2-amino-oxazole, which can then be reacted in flow series to form furanosyl amino-oxazolines.

Ito S. Haruna T. Sakurazawa S.

[Formation of Outer Shells from Proteinoid Microspheres](#) [#4174]

Proteinoid microspheres form outer shells with thermal gradient. We conducted experiments to verify this mechanism. We found that formation of outer shells was caused by dissolution of microspheres and the flow promotes the formation of outer shells.

Fialho D. M. Cafferty B. J. Clarke K. C. Khanam J. Moore M. K. Watkins K. A. Schuster G. B. Krishnamurthy R. Hud N. V.

[Glycosylation of Noncanonical Nucleobases in Water: Implications for the Evolution of Early Genetic Polymers](#) [#4193]

Unlike the canonical nucleobases, 2,4,6-triaminopyrimidine can react with sugars (including ribose) in water to form glycosides. These monomeric glycosides have the propensity to self-assemble in water.

Leman L. J. Masaki Y. Ura Y. Beierle J. M. Ghadiri M. R.

[*Dynamic Chemical Assembly of Peptide Nucleic Acids*](#) [#4111]

We report on the development of dynamic, sequence-adaptive peptide nucleic acids that efficiently assemble in aqueous solution via reversible covalent reactions from simple peptides and nucleobase units.

Guillemin J. C. Tarasevych A. V. Vives T. Snytnikov V. N.

[*A Path to Homochirality on the Primitive Earth: High Temperature Sublimation of Enantioenriched \$\alpha\$ -Alkylated- \$\alpha\$ -Amino Acids*](#) [#4138]

The high temperature sublimation of alpha-alkylated-alpha-amino acids containing one enantioenriched derivative leads to enantioenrichments of all components with the same handedness.

Bartlett S. J. Witkowski O. Giovannelli D.

[*Cognition and Learning: A Primary Determinant and Seed of Life*](#) [#4140]

We propose a new line of inquiry for origin of life research: the emergence of learning in prebiotically relevant systems. Understanding the origin of learning would provide key insights in the search for the origin of life on Earth and elsewhere.

Karunakaran S. C. Cafferty B. J. Hud N. V. Schuster G. B.

[*Influence of Nucleic Acid Intercalators on Model Proto-Nucleotide Supramolecular Assemblies*](#) [#4160]

We are investigating the potential for known nucleic acids intercalators, as model midwife molecules, to alter the supramolecular structures formed by self-assembling model proto-nucleobases.

Yu S. S. Solano M. D. Blanchard M. K. Soper-Hopper M. T. Krishnamurty R. Fernandez F. M.

Hud N. V. Schork F. J. Grover M. A.

[*Growth of Proto-Peptides by Continuous Feeding of Monomers*](#) [#4161]

The formation of peptides on the early Earth is a long-standing problem in prebiotic chemistry. An environmental cycle is presented to elongate peptides produced via the ester-amide exchange reaction, by periodically feeding with monomers.

Glass K. Oye M. Deamer D. Vercoutere W.

[*Assessment of Secondary Structure in Nucleic Acid Produced in Simulated Prebiotic Conditions*](#) [#4211]

The earliest forms of life would likely have a protocellular form, with a membrane encapsulating some form of linear charged polymer that would have enzymatic as well as genetic properties. Our experiments mimic these conditions.

Colomer I. Fletcher S. P.

[*Physical Autocatalysis Triggered by a Transition Metal-Catalyzed Reaction*](#) [#4145]

We highlight here the importance of merging transition metal-catalyzed reactions and new modes of autoinduction or physical autocatalysis, using simple non-activated molecules, such as alkenes.

Ameta S. Arsene S. Nghe P. Lehman N. Griffiths A. D.

[*Autocatalytic sets of RNA Replicators in Origin of Life*](#) [#4143]

Autocatalytic sets based on Azoarcus' group I intron ribozyme can form networks of replicators. Using a high-throughput experimental set-up, we have analyzed a diverse library of RNA networks to study network topologies, node-fitness and robustness.