



Emergence of Life

Exploring mechanisms with cross-disciplinary experiments

Do you want to find out how life could have originated on early Earth? With this SFB, we bring together both young and experienced researchers to form a cross-disciplinary network for experimentally Origins of Life research in Munich. We will integrate the initial boundary conditions of early Earth from astronomy, geology, and chemistry for innovative lab experiments. Projects are jointly designed and led by two PIs with complementary expertise, supervising two PhD students. The students are connected through a graduate research and training network designed to make the students and PIs familiar with the often complex and multi-faceted details of the Origin of Life question. This effort includes a student-driven exhibition at the Deutsches Museum in Munich.

The experiments range from the origin of molecules, including their long-term survival in rocks or meteorites and volcanic scenarios of molecular synthesis, to the autonomous polymerization and replication of oligonucleotides, the origin of the genetic code, the role of freeze-thaw cycles, mechanisms to amplify chirality, connections to existing metabolic networks and the non-equilibrium chemical physics to form, divide and control protocells.

Our long-term aim is to reconstruct life-like molecular systems in geologically plausible conditions.

Early Synthesis

- P01** Probing RNA-stability, formation and catalysis in simulated prebiotic environments on the early Earth and in Space
- P02** Profiling of meteoritic organic matter and the role of metalorganic compounds
- P03** Prebiotic synthesis in volcanic discharges: porous ash in volcanic gas atmospheres
- P04** Chemical evolution of biomolecules under volcanic hydrothermal conditions
- P05** Evolutionary optimization of experimental synthetic networks

Replication + Translation

- P06** Bridging the gap between chain formation and genetic copying of RNA
- P07** Foams as catalytic environments for prebiotic reactions
- P08** Thermally driven emergence of functional RNA motifs
- P09** Volcanic matrices to host autonomous DNA replication
- P10** Oligonucleotide assemblies as binding and reaction centers
- P11** Understanding the genetic code from affinities and reactivities to transfer RNA motifs

Early Metabolism + Cells

- P12** Probing mechanisms of chirality amplifications by experiments and multi-scale modeling
- P13** Tracing primordial metabolism reflected by microorganisms under hydrothermal conditions
- P14** Freeze-thaw driven proliferation of RNA protocells
- P15** Nonequilibrium dynamics of nucleic acid-lipid mixtures
- P16** Self-replicating microcompartments as a model for protocells

Collaborating PIs



We are interested in highly motivated and hard working PhD students which are interested in the interdisciplinary interactions of this emerging field. We offer monthly teaching, talks, discussions and exchange with the 32 PhD students of this SFB/TRR.

We are interested in students from diverse backgrounds, matching the projects and one of the two project supervisors - which will also evaluate the criteria for the eligibility to graduate.

To apply for positions, contact the two PIs of a project directly with the subject line "PhD Emergence of Life" and supplement your application with a CV, publications, motivation letter and references to contact. Project titles are listed on the left. You can find the websites and emails of PIs on our preliminary site www.emergence-of-life.de.

Please do not apply for more than two projects and prioritize your choice. For help at choosing the project, inquire with the PIs or with dieter.braun@lmu.de.

Astronomy Biology Geoscience Physics Chemistry Theory