From Molecules to Pre-LUCA World

Ulrich Schreiber (1), Christian Mayer (2),
1) Department of Geology, University of Duisburg-Essen
2) Institute of Physical Chemistry, CENIDE University of Duisburg-Essen

Phase I
Formation and Accumulation

- Separation of scCO₂ bubbles from hydrothermal water
- Collection of organic molecules
- Reaction to peptides and nucleotides in scCO₂
- Enrichment of molecules in micro-autoclaves after change from scCO₂ to gCO₂
- pH 3.3 to 6 depending on mixture of scCO₂ and scN₂ and phase transitions

Phase II
Selection

- Cyclic vesicle formation and selection of peptides
- Development of ribozymes

Phase III
Random combination

- Contact between peptide world and RNA world
- Semi-specific linking from aminoacid to a cognate proto-RNA
- Random combination to peptide
- Supply of a template
- Storage of information in an emerging RNA

Phase IV
Long lasting combination check

- Numerous combinations of aminoacids with probably most common species glycine and alanine
- Some combinations are stored in emerging RNA
- Two resulting synthetases from Phase IV with specific linking of glycine and alanine
- Information about sequences are stored in proto-RNA which is linked with uncharged tRNAs

Phase V
Principles of life

- Replication of synthetases S1, S2 from Proto-RNA, parallel to Phase III with new random sequences. Herewith a development to synthetases S3, S4, S5, S6 ... is possible.

Phase VI
Pre-LUCA World

- Loading of all necessarry molecules in excess during vesicle formation process
- Reproduction of all main compounds
- Physical sharing
- Continued reproduction in both vesicles

Documents from fluid inclusions
Partly experimentally proven

- The RNA phosphodiester bond is most stable at pH 4.5 at 90°C. Hydrolysis of the nucleoside 5’-phosphate at 90°C as a function of pH.

