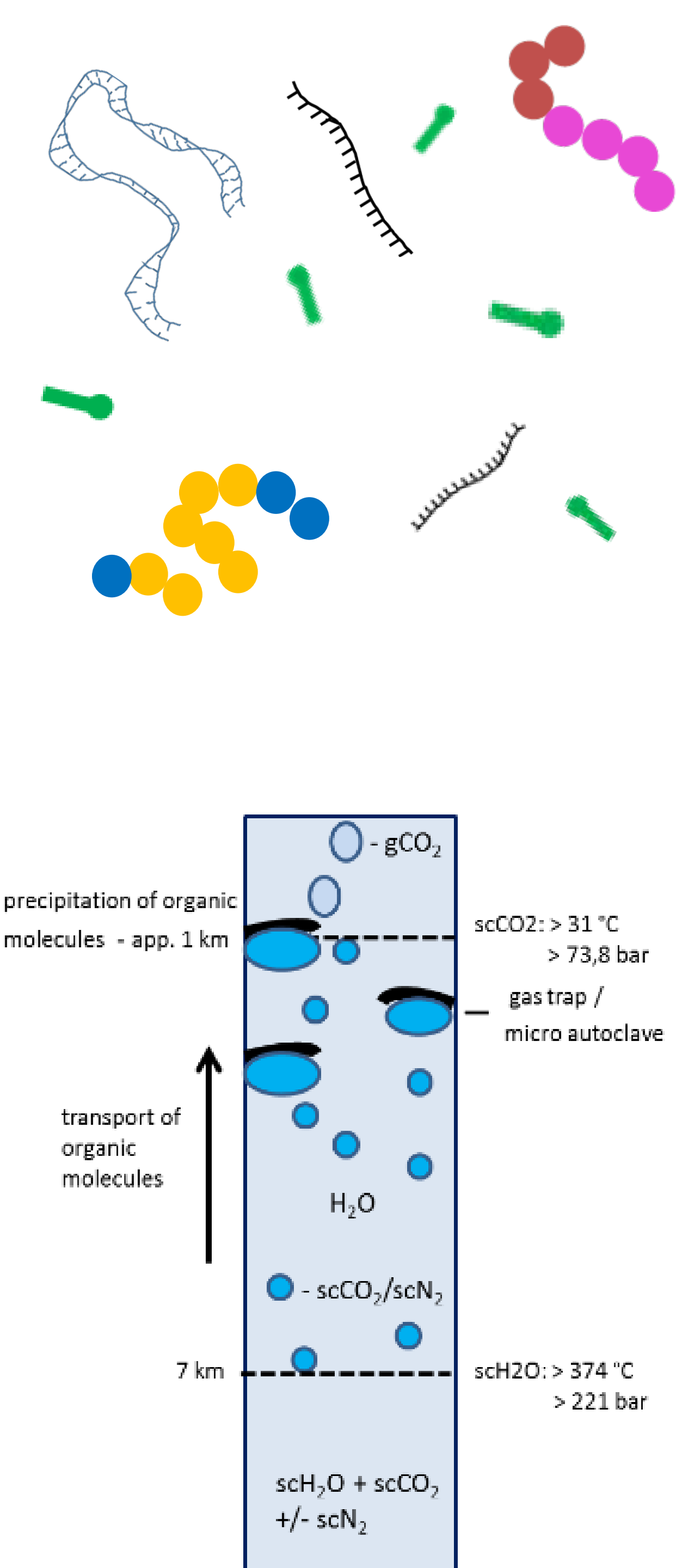


From Molecules to Pre-LUCA World

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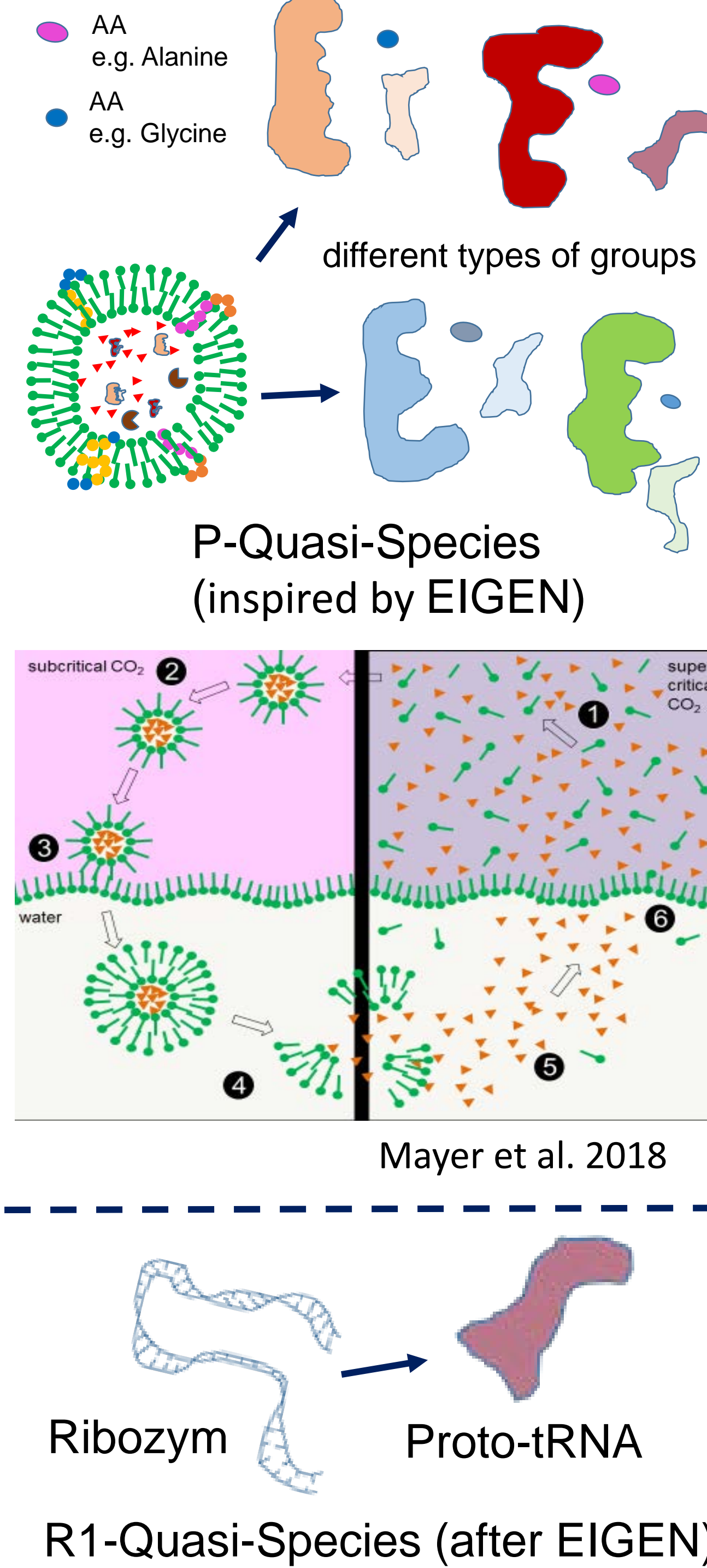
Phase I

Formation and Accumulation



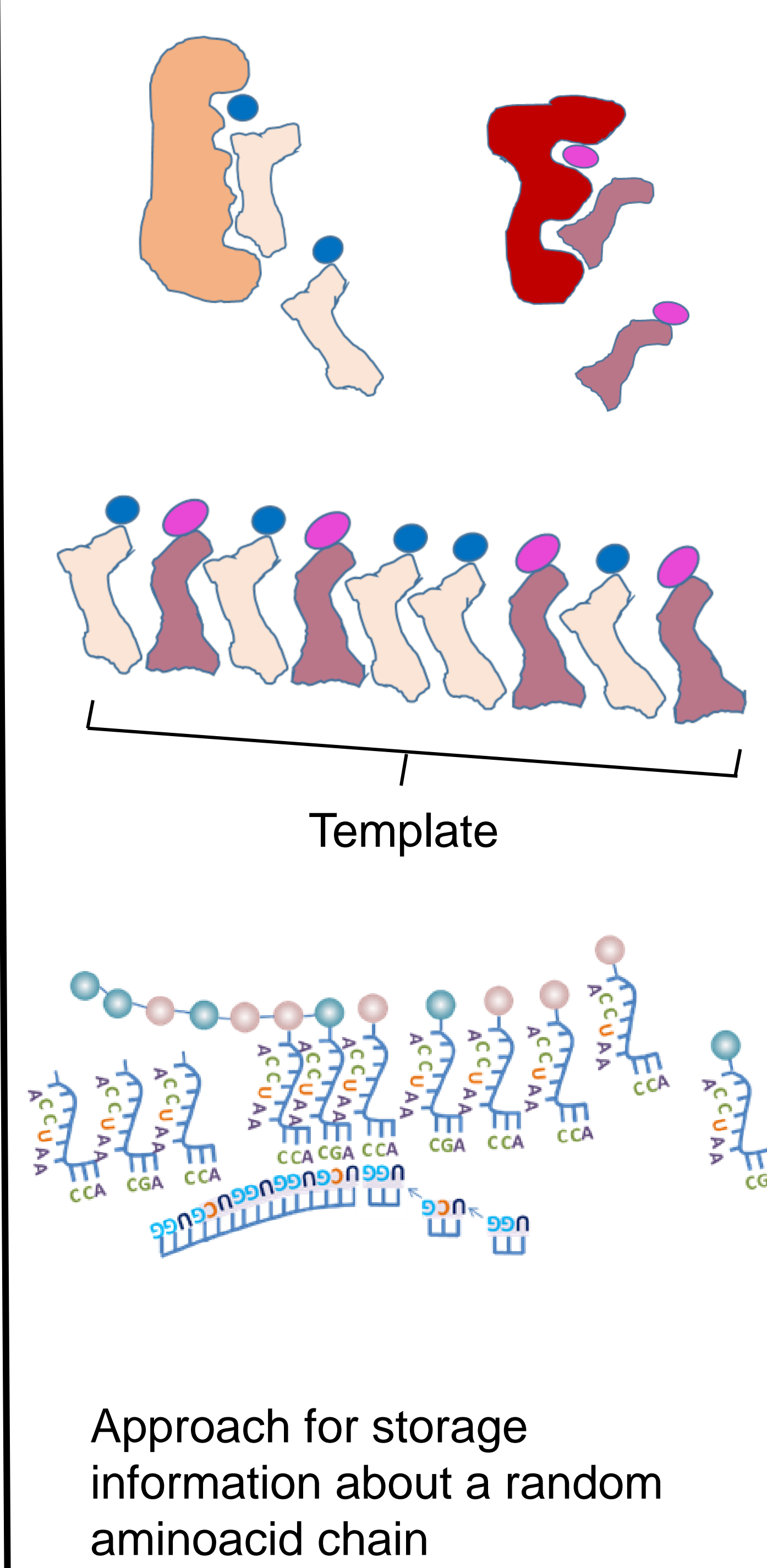
Phase II

Selection



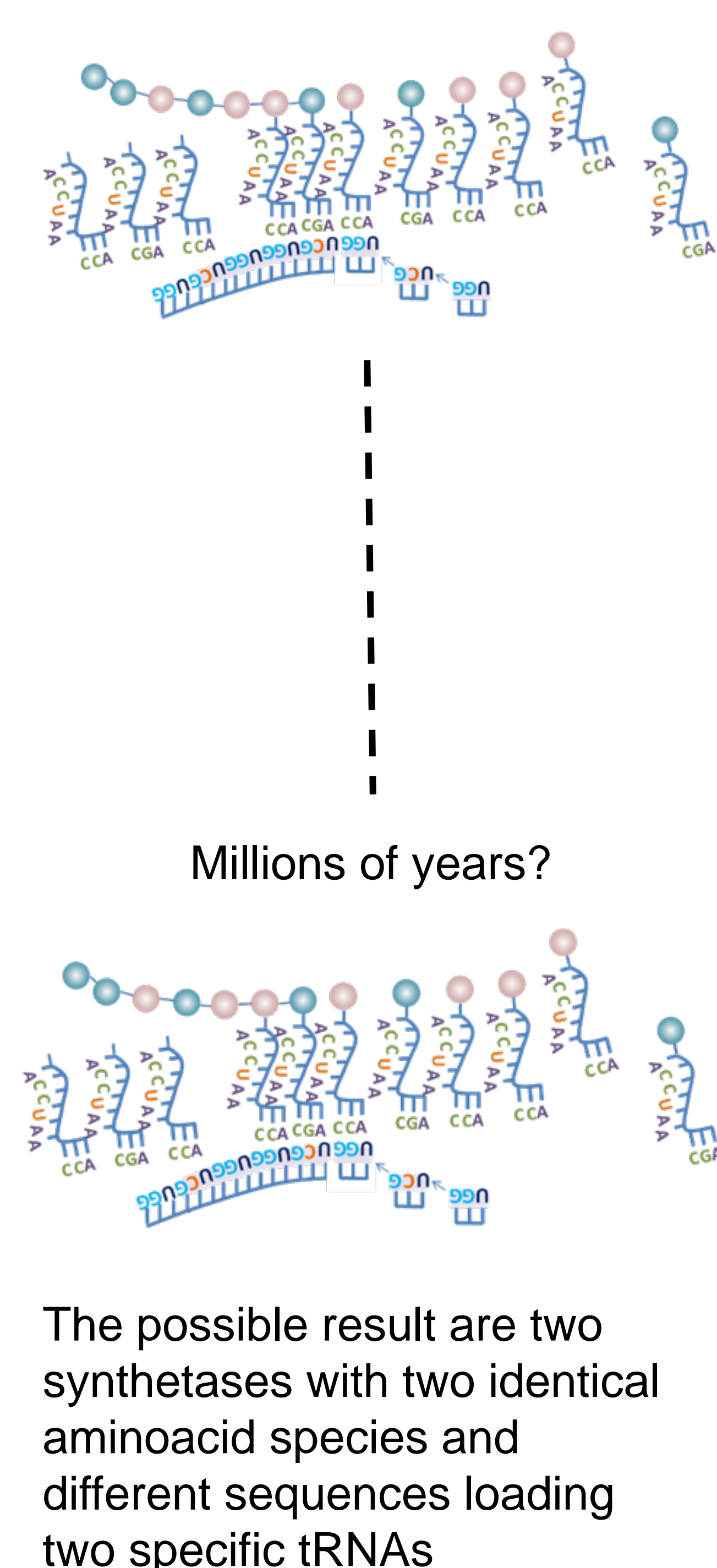
Phase III

Random combination



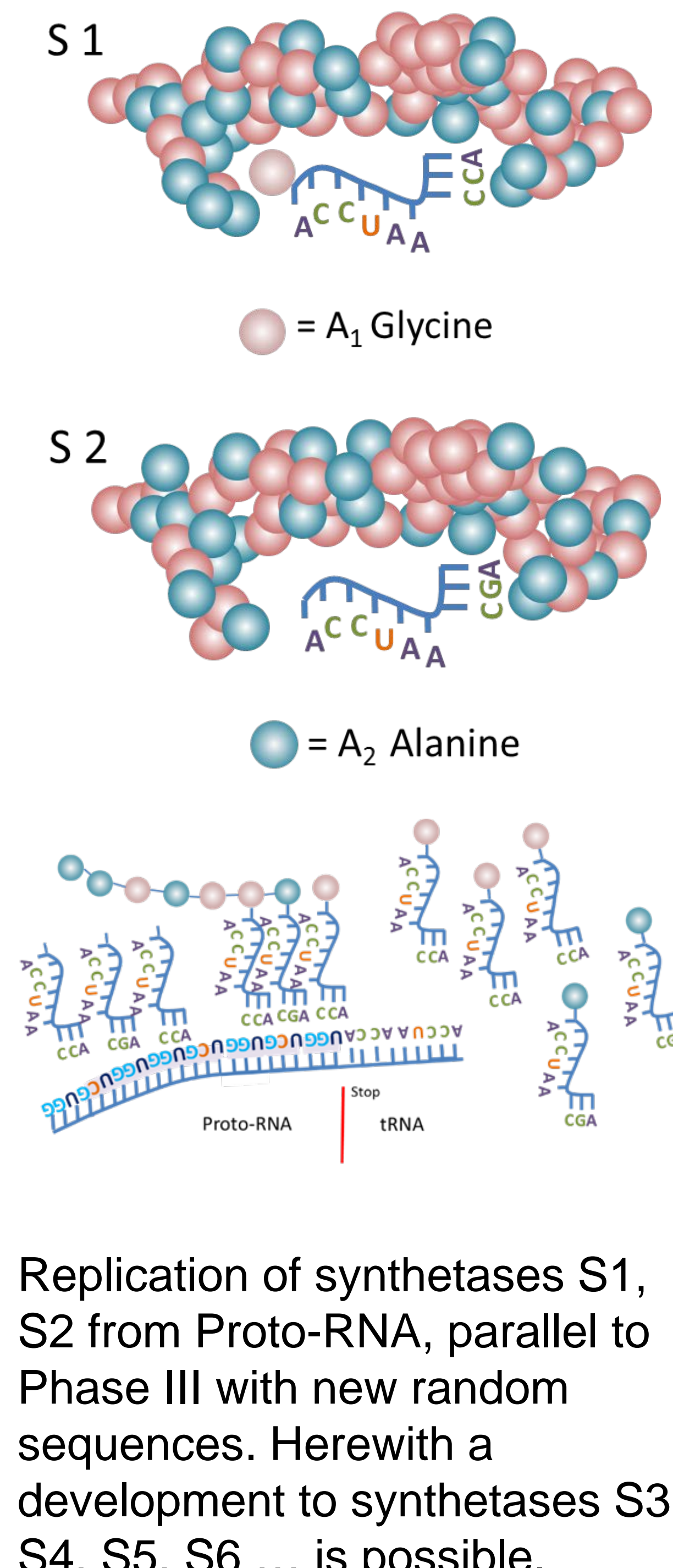
Phase IV

Long lasting combination check



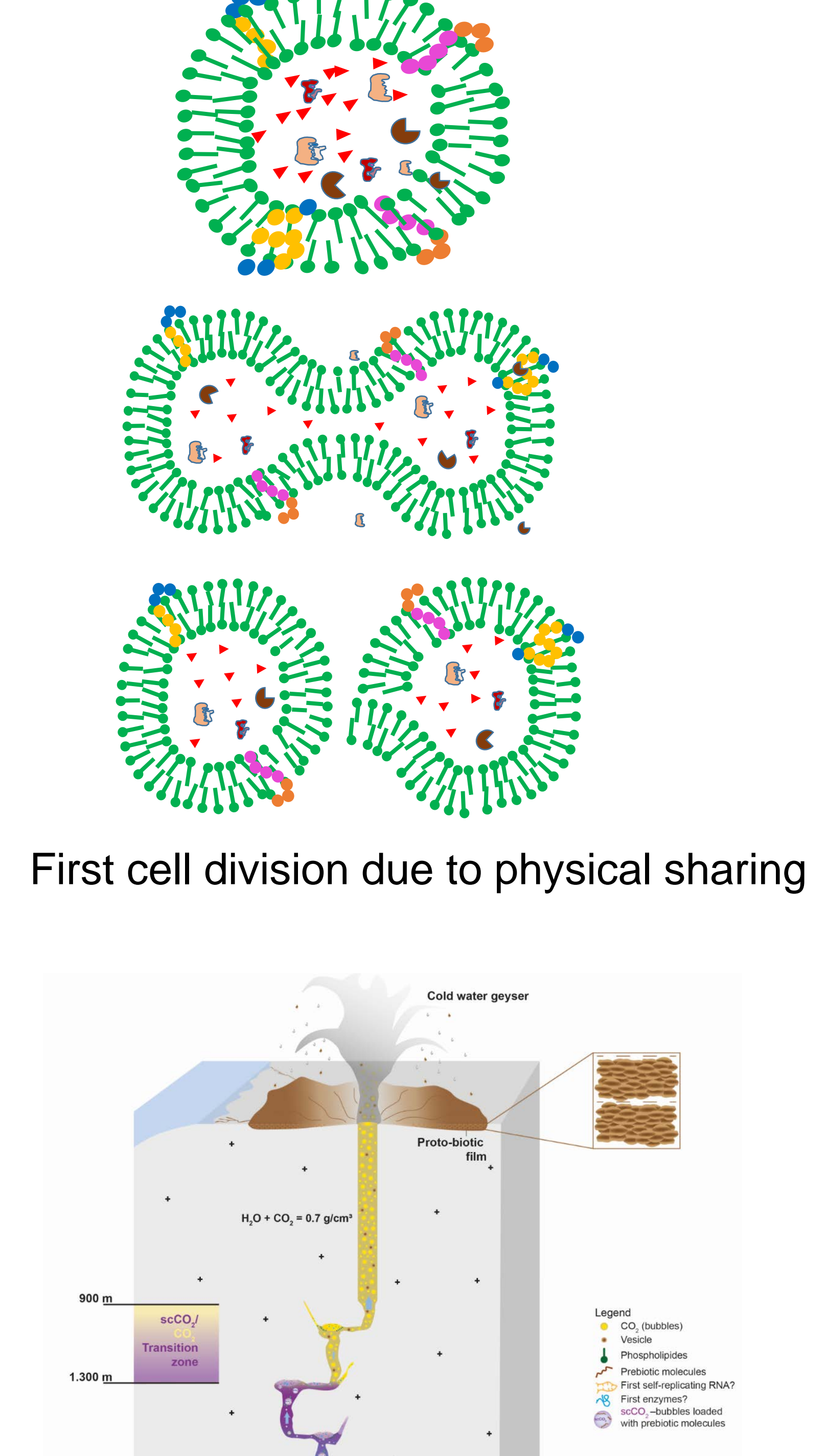
Phase V

Principles of life



Phase VI

Pre-LUCA World

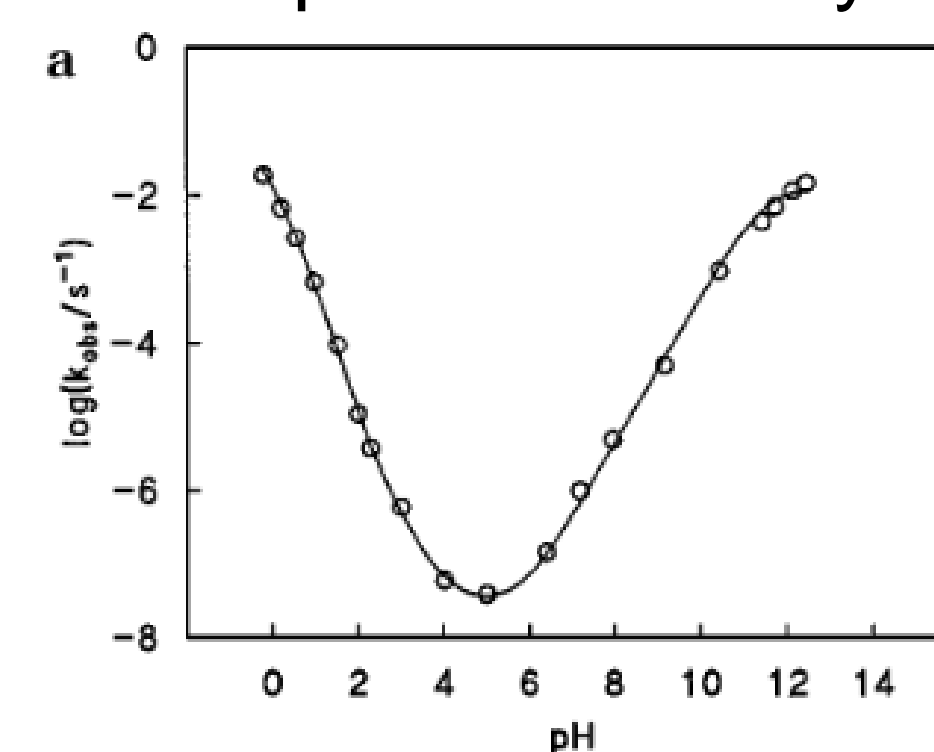


Documents from fluid inclusions

- 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

Partly experimentally proven

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



The RNA phosphodiester bond is most stable at pH 4-5 at 90°C. Hydrolysis of the inucleoside 3',5'-UpU at 90°C as a function of pH.
Oivanen et al. (1998)

-- Hypothetical assumption to show a possible solution for the chicken/egg dilemma --

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

- 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

Process from Phase II

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

Schreiber U., Locker-Grütjen O., Mayer C. (2012). Hypothesis: Origin of Life in Deep-Reaching Tectonic Faults. Prebiotic Chemistry. Origins of Life and Evolution of Biospheres 42(1), 47 – 54.

Mayer, C.; Schreiber, U.; Dávila, M.J.; Schmitz, O.J.; Bronja, A.; Meyer, M.; Klein, J.; Meckelmann, S.W. Molecular Evolution in a Peptide-vesicle System Eigen M., Schuster P. (1979). The Hypercycle – A Principle of Natural Self-Organization. Springer, Berlin 1979.

Oivanen, M., Kuusela, S., Lönnberg, H. (1998). Chem. Rev., 98, 961-990



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