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Metabolically Coupled Replicator Systems: Overview of an RNA-world model concept of prebiotic evolution on mineral surfaces

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Metabolically Coupled Replicator Systems (MCRS) are a family of models implementing a simple, physico-chemically and ecologically feasible scenario for the first steps of chemical evolution towards life. Evolution in an abiotically produced RNA-population sets in as soon as any one of the RNA molecules become autocatalytic by engaging in template directed self-replication from activated monomers, and starts increasing exponentially. Competition for the finite external supply of monomers ignites selection favouring RNA molecules with catalytic activity helping self-replication by any possible means. One way of providing such autocatalytic help is to become a replicase ribozyme. An additional way is through increasing monomer supply by contributing to monomer synthesis from external resources, i.e., by evolving metabolic enzyme activity. Retroevolution may build up an increasingly autotrophic, cooperating community of metabolic ribozymes running an increasingly complicated and ever more efficient metabolism.