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**“Physical Aspects of the Origin of Life Problem”**

Abstract:  
In the fascinating puzzle of the origin of life, two main phenomena distinguish biology from non-equilibrium thermodynamic processes: the presence of a code and the ability of machines to self-reproduce.

- In the RNA world of the early soup we are studying how a *genetic code* could originate, building an *RNA ribozyme* that can charge an amino acid without enzymes, a primitive tRNA. We also show that the initial code could have started with four amino acids only: valine (GUC), alanine (GCC), glycine (GGC), aspartate (GAC).

- Encapsulation of cells in a membrane is another step in this puzzle. Building an *artificial cell* based on gene expression inside vesicles reveal the physical constraints to overcome: energy exchange, osmotic pressure, sources and sinks for protein production. This cell can sustain protein production for about one week. Self-reproduction will be the next step.