Self-Replication, Exponential Growth and Evolutionary Selection of Artificial Systems

(Keynote Talk #6)

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We want to make a "non-biological" system that mimics some basic functions of life. The idea is to design particles with specific reversible and irreversible interactions, introduce seed motifs, and cycle the system in such a way that a copy is made. Repeating the cycle would double the number of offspring in each generation leading to exponential growth. Using the chemistry of DNA either on colloids or on DNA constructs makes the specific recognition part easy. Using DNA BTX tiles some of us have replicated a seed to the third generation [1]. In more recently work with DNA origamis we achieve exponential growth and an elementary form of evolution. This system needs no external intervention other than cycling temperature and light, mimicking daily cycles on earth. The process should be adaptable to assemble and replicate micro-nano constructs and devices.

References:

[1] T. Wang et al., Nature **478**, 227, (2011)