MAR15-2015-021051

Abstract for an Invited Paper
for the MAR15 Meeting of
the American Physical Society

**Simple self-replicators: growth via self-assembly and fissioning via bursting bubbles**

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We explore the principles of and experimentally demonstrate an autonomous and natural scheme for molecular self-replication. The talk will discuss a design for a simple DNA self-replicator that in principle exhibits exponential population growth, is limited by resource consumption, and has the potential to exhibit complicated population dynamics such as competition between species for a common food source. The replicating species are DNA nanotubes made from single-stranded tiles. Our proposed model for self-replication is designed around two basic principles that are ubiquitous on the Earth, and indeed on any oceanic world with crashing waves: growth via molecular self-assembly and fragmentation via violent hydrodynamic flows in bursting bubbles. The talk will focus on recent work to carefully characterise and understand both of these principles. In particular, on the nucleation and growth properties of various kinds, or species, of single-stranded tile nanotubes, and on the capability of bursting bubbles to break these micron-length structures. The proposed experimental system is conceptually very simple, completely autonomous, has the potential for information-based evolution, exploits energy from the environment to release replicated structures, and uses physically plausible mechanisms that could be implicated in the origin of life.

The is joint work with collaborators Erik Winfree, Bernard Yurke, Joy Hui and Rizal Hariadi.