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Accelerated Self-Replication under Non-Equilibrium, Periodic Energy Delivery[1] RUI ZHANG, MONICA OLVERA DE LA CRUZ, Northwestern University — Self-replication is a remarkable phenomenon in nature that has fascinated scientists for decades. In a self-replicating system, the original units are attracted to a template, which induce their binding. In equilibrium, the energy required to disassemble the newly assembled copy from the mother template is supplied by thermal energy. The possibility of optimizing self-replication is explored by controlling the frequency at which energy is supplied to the system. A model system inspired by a class of light switchable colloids is considered where light is used to control the interactions. Conditions under which self-replication can be significantly more effective under non-equilibrium, cyclic energy delivery than under equilibrium constant energy conditions are identified. Optimal self-replication does not require constant energy expenditure. Instead, the proper timing at which energy is delivered to the system is an essential controllable parameter to induce high replication rates.

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