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An Automated Microfluidic Chemostat for a Self-Replicating System of DNA Constructs ANDREW BERGMAN, Department of Physics, New York University, XIAOJIN HE, Department of Chemical Engineering, The Hong Kong University of Science and Technology, CORINNA MAASS, Department of Physics, New York University, RUOJIE SHA, Department of Chemistry, New York University, YONGLI MI, Department of Chemical Engineering, The Hong Kong University of Science and Technology, NADRIAN SEEMAN, Department of Chemistry, New York University, PAUL CHAIKIN, Department of Physics, New York University — We have modified a bacterial microchemostat[1] for use in studying and optimizing a self-replicating system based on DNA constructs. The self-replication process we employ requires cycling temperature and UV light exposure. The base units of our system are DNA constructs that can recognize their complements using DNA "sticky ends" and can be covalently linked to one another through the use of a UV-crosslinkable nucleobase substitute. "Seed particles" of varying length are made by attaching two or more of these constructs and are added to and processed in this microfluidic system, which allows for temperature control, UV illumination and microscopic observation of fluorescence and FRET. Automation provides for a well-regulated and high-throughput testing and optimization of conditions. [1] F. K. Balagadde *et al.*, Science **309**, 137 (2005).

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