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Pub - Public document; No restrictions on access; may be given freely to any interested party or published openly on the web, provided the author and source are mentioned and the content is not altered.
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Abstract

In the frame of the 36 Month Meeting of the project CADMAD that will place at the Weizmann Institute in Rehovot, Israel, on April 1st, 2014, Dr. Tuval Ben-Yehezkel of WEIZMANN will give a seminar for the members of the CADMAD consortium, and the scientific community of the Faculty of Mathematics and Computer Science at the Weizmann Institute of Science.
Topic: **Cell free gene synthesis using programmable micro-fluidics**.

Abstract of the Lecture

Cell free gene synthesis using programmable micro-fluidics

Our ability to build on basic science insights from an engineering perspective and translate them into useful bioengineering projects is still prohibited by our inability to streamline the physical generation of novel, designer DNA molecule blueprints.
Instead, bioengineering and synthetic biology are still prohibited by their reliance on a plethora of ad hoc, manual labor intensive methods for making DNA blueprints de novo.
Here we describe a programmable, bench-top electro wetting on dielectric (EWOD) micro-fluidic device and novel accompanying molecular biology methodologies that together enable for the first time micro-fluidic, cell-free, rapid construction and cloning of synthetic genes. Specifically, we developed and applied micro-fluidic methods for (1) DNA assembly (programmable order polymerization, POP) to assemble synthetic constructs, (2) in vitro single molecule amplification to clone them and (3) combinatorial DNA library construction, all employed on chip. We demonstrate the utility of this technology and methods for the study of protein translation by rapidly generating and cloning a synthetic fluorescent 5'UTR reporter library using the device.
The development of non-specialist, fully programmable, desktop micro-fluidic DNA synthesis and cloning machines may accelerate our ability to write DNA and engineer biology to the same extent that NGS machines have accelerated our ability to read DNA and study how it encodes biology. The potential impact of developing such a machine exceeds the fields of bioengineering and synthetic biology, potentially empowering non-synthetic biology labs from any biological field with the powerful tools of synthetic biology.