



Ben-Gurion University of the Negev
Blaustein Institutes for Desert Research

The Swiss Institute for Dryland Environmental and Energy Research
Alexandre Yersin Department of Solar Energy and Environmental Physics

Title:

Programmable On-Chip DNA Compartments as 'Artificial Cells'

Speaker:

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Abstract:

The assembly of artificial cells capable of executing DNA programs has been an important goal for basic research and technology. We assemble 2D DNA compartments fabricated in silicon as 'artificial cells' capable of metabolism, programmable protein synthesis, and communication. We programmed gene expression cycles in separate compartments, as well as protein synthesis fronts propagating in a coupled 1D system of compartments. Gene expression in the DNA compartments reveals a rich, dynamic system that is controlled by geometry. The organization of matter in the compartment suggests conditions for controlled assembly of biological machines. This puts forth a man-made biological system with programmable information processing from the gene to a 'cell', and up to the 'multicellular' scale.

References:

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- A. Tayar, E. Karzbrun, V. Noireaux, R. H. Bar-Ziv, Propagating gene expression fronts in a one-dimensional coupled system of artificial cells. *Nature Phys.* 11, 1037-1041 (2015).
- E. Karzbrun, A. M. Tayar, V. Noireaux, R. H. Bar-Ziv, Programmable on-chip DNA compartments as artificial cells. *Science* 345, 829-832 (2014).
- D. Bracha, E. Karzbrun, G. Shemer, P. A. Pincus, R. H. Bar-Ziv, Entropy-driven collective interactions in DNA brushes on a biochip. *Proc. Natl. Acad. Sci. U. S. A.* 110, 4534-8 (2013).
- Y. Heyman, A. Buxboim, S. G. Wolf, S. S. Daube, R. H. Bar-Ziv, Cell-free protein synthesis and assembly on a biochip. *Nature Nanotech.* 7, 374-378 (2012).

Tuesday, March 14, 2017, 11:00
Lecture room, Physics Building (ground floor)