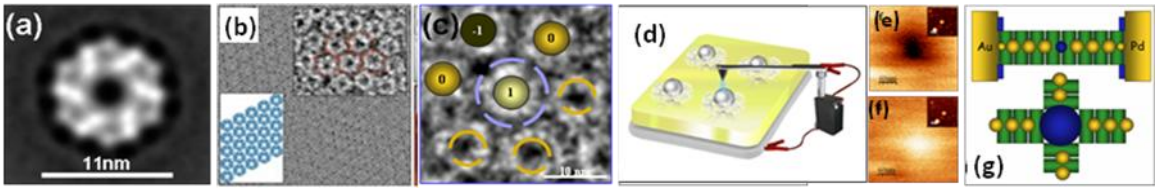
*Invited Speaker*

# Bio-Templated Systems for Nanoelectronics

*Danny Porath*

*Physical Chemistry Department, The Hebrew University of Jerusalem, Israel and Center for Nanoscience and Nanotechnology of the Hebrew University*

porath@chem.ch.huji.ac.il




***SP1 protein as a basis for nanoelectronic applications: (a) TEM of a single SP1 protein. (b) a large packed ordered array of SP1 molecules. Lower inset: a scheme of the array, upper inset: enlargement of part of the array, where the hexagonal packing is marked. (c) Overlaid scheme of the suggested memory array. (d) Scheme of the suggested omplementation, where the writing is by charging individual particles with AFM and reading by EFM. (e-f) Two charged states of the hybrid and topography (inset). (g) Scheme of chain structures.***

In our research we use bio-templated systems to realize one-dimensional conducting nanowires and nanodevices for scientific investigation of electrical charge transport in these systems, for nanoelectronics and for nanotechnology applications. One example is dsDNA and its synthetic derivatives. Within this frame we measured electrical charge transport in dsDNA, measured the energy level spectrum of dsDNA, showed polarizability of DNA derivatives and more. I will briefly review this activity. Another example for bio-templated systems is the SP1 protein hybridized with various nanoparticles to form memory units and protein-particles conducting chains. We demonstrate The construction of various building blocks, acquiring specific attachment to gold or Si surfaces, array formation and finally charging and logic operations in hybrid SP1-nanoparticle systems. I will review this activity in more details. The research is conducted by my group in close collaboration with several groups from complementary fields.

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[3] *"Long Monomolecular G4-DNA Nanowires",* Alexander Kotlyar, Nataly Borovok, Tatiana Molotsky, Hezy Cohen, Errez Shapir and **Danny Porath**, Advanced Materials **17**, 1901 (2005).

[4] *"Polarizability of G4-DNA Observed by Electrostatic Force Microscopy Measurements"*, Hezy Cohen Hezy Cohen et al., Nano Letters **7(4)**, 981 (2007).

[5] "*High-Resolution STM Imaging of Novel Poly(G)-Poly(C)DNA Molecules",* Errez Shapir, Hezy Cohen, Natalia Borovok, Alexander B. Kotlyar and **Danny Porath**, J. Phys. Chem. **B 110**, 4430 (2006).

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[7] *"SP1 Protein Based Nanostructures and Arrays",* Izhar Medalsy et. al**.,** Nano Letters **8**, 473 (2008).

[8] *"Float And Compress: A Honeycomb Like Array Of A Highly Stable Protein Scaffold"*, Arnon Heyman et al., Langmuir 25, 5226 (2009).

[9] *"Protein Scaffold Engineering Towards Tunable Surface Attachment"*, Arnon Heyman et al., Angewandte Chemie Int. Ed., **48,** 9290 (2009).

[10] "*Logic implementations using a single nanoparticle-protein hybrid*", Izhar Medalsy et. al**., Nature Nanotechnology**, **In Press**.