

Ron Orbach

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Professional Experience

Yale University, New-Haven, USA

2015-Present **Postdoctoral Fellow**
Advisor: Prof. Jonathon Howard
Title: Reassembly of Axonemal Tubulin

Education

The Hebrew University of Jerusalem

2009-2015 **Ph.D.**, Institute of Chemistry, Department of Organic Chemistry.
Advisor: Prof. Itamar Willner
Thesis: "Application of Functional DNA Units in the Development of Amplified Sensors, Logic Gates and Nanostructural Assemblies Exhibiting New Optical Properties"

Tel Aviv University, The George S. Wise Faculty of Life science

2006-2008 **M.Sc. (*summa cum laude*)**, Biotechnology, Department of Molecular Microbiology and Biotechnology.
Advisor: Prof. Ehud Gazit
Thesis: "Self-Assembled Fmoc-Peptides as a Platform for the Formation of Nanostructures and Hydrogels"

2003-2006 **B.Sc. (*magna cum laude*)**, major in Biology.

Open University

1999 - Present Political Science and Economy Student

Courses

2016 Expression, Purification & Analysis of Proteins and Protein Complexes, Cold Spring Harbor Laboratory, NY

Employment

2003-2006 Israel Ministry of Defense

Military Service

1999-2002 Israel Ministry of Defense
2001 Head of Operations Directorate Merit Award

Other activities

2010-2013	Volunteer at "Dr. Baruch Zinger Memorial fund" to help underprivileged high school students prepare for matriculation exam
2007-2008	Student Union Representative
2003- 2013	Member of The Movement for Quality Government in Israel
2003- 2013	Member of Israel Union for Environmental Defense

Languages

Hebrew – Native Language
English – Very Good

Personal Information

Date of Birth: October 17, 1980
Marital Status: Married, 2 children

Fellowships and Awards:

2016	Helmsley Fellowship
2016	Yale Postdoctoral Scholars Travel Fund Award
2016	Human Frontier Science Program (HFSP) Cross-Disciplinary Fellowship
2015	European Molecular Biology Organization (EMBO) Long-Term Fellowship
2013	The Hebrew University of Jerusalem Travel Grant
2013	The Katzir-Katchalsky Student Travel Fellowship

Methods

- **Microscopy** – Scanning Electron Microscopy (SEM), Transmission Electron Microscopy (TEM), Atomic Force Microscopy (AFM), Confocal microscopy, Total Internal Reflection Fluorescence Microscope (TIRFM).
- **Spectroscopy** – Fluorescence spectroscopy, Absorption spectroscopy, Circular dichroism (CD) Fourier-transform Infrared spectroscopy (FTIR).
- **Molecular Biology** – cell culture, protein expression, gel electrophoresis; DNA design
- **Material Science** – rheology

Professional Activities

Ad Hoc Reviewer for *Small, Sensors*

List of Publications

- Lilienthal S, Klein M, **Orbach R**, Remacle F, Willner I, Levine RD (2016) A Continuous Variable Polynomial Function Generator Using a DNAzyme Cascade, *In preparation*.
- Lilienthal S, Shpilt Z, Wang F, **Orbach R**, Willner I (2015) Programmed DNAzyme-Triggered Dissolution of DNA-Based Hydrogels: Means for Controlled Release of Biocatalysts and for the Activation of Enzyme Cascades, *ACS Appl Mater Interfaces*, 7, 8923-8931.

- Heleg-Shabtai V, Aizen R, **Orbach R**, Aleman-Garcia MA, Willner I (2015) Gossypol-Crosslinked Boronic Acid-Modified Hydrogels: A Functional Matrix for the Controlled Release of an Anti-Cancer Drug, *Langmuir*, 31, 2237-2242.
- **Orbach R**, Willner B, Willner I (2015) Catalytic Nucleic Acids (DNAzymes) as Functional Units for Logic Gates and Computing Circuits: From Basic Principles to Practical Applications, *Chem Commun*, 51, 4144-4160.
- **Orbach R**, Lilienthal S, Klein M, Remacle F, Levine RD, Willner I (2015) Ternary DNA Computing Using 3×3 Multiplication Matrices, *Chem Sci*, 6, 1288-1292.
- Guo W, Lu CH, **Orbach R**, Wang F, Qi XJ, Ceconello A, Seliktar D, Willner I (2015) pH Stimulated DNA Hydrogels Exhibiting Shape Memory Properties, *Adv Mater*, 27, 73-78.
- Freage L, Wang F, **Orbach R**, Willner I (2014) Multiplexed Analysis of Genes and of Metal Ions Using Enzyme/DNAzyme Amplification Machineries, *Anal Chem*, 86, 11326-11333.
- Guo W, Lu CH, , Qi XJ, **Orbach R**, Fadeev M, Yang HH, Willner I (2014) Switchable Bifunctional Stimuli-Triggered Poly-N-Isopropylacrylamide/DNA Hydrogels, *Angew Chem Int Ed*, 53, 10134-10138.
* Selected by referees as very important paper (VIP)
- **Orbach R**, Wang F, Lioubashevski O, Remacle F, Levine RD, Willner I (2014) A Full-Adder Based on Reconfigurable DNA-hairpin Inputs and DNAzyme Computing Modules, *Chem Sci*, 5, 3381-3387.
* Selected as hot paper; Cover page
- Aleman-Garcia MA, **Orbach R**, Willner I (2014) Ion-Responsive Hemin/G-Quadruplexes for switchable DNAzyme and Enzyme Functions, *Chem Eur J*, 20, 5619-5624.
- Guo W, Qi XJ, **Orbach R**, Lu CH, Mironi-Harpaz I, Seliktar D, Yang HH, Willner I (2014) Reversible Ag⁺-crosslinked DNA Hydrogels, *Chem Commun*, 50, 4065-4068.
- **Orbach R**, Remacle F, Levine RD, Willner I (2014) DNAzyme-Based 2:1 and 4:1 Multiplexers and 1:2 Demultiplexer, *Chem Sci*, 5, 1074-1081.
* Selected as hot paper
- Guo W*, **Orbach R*** (co-first), Mironi-Harpaz I, Seliktar D, Willner I (2013) Fluorescent DNA Hydrogels Composed of Nucleic Acid-Stabilized Silver Nanoclusters, *Small*, 9, 3748-3752.
- **Orbach R**, Guo W, Wang F, Lioubashevski O, Willner I (2013) Self-Assembly of Luminescent Ag Nanocluster-Functionalized Nanowire, *Langmuir*, 29, 13066-13071.
- Wang F, Freage L, **Orbach R**, Willner I (2013) Autonomous Replication of Nucleic Acids by Polymerization/Nicking Enzyme/DNAzyme Cascades for the Amplified Detection of DNA and the Aptamer-Cocaine Complex, *Anal Chem*, 85, 8196-8203.
- Lu CH, Qi XJ, **Orbach R**, Yang HH, Mironi-Harpaz I, Seliktar D, Willner I (2013) Switchable Catalytic Acrylamide Hydrogels Crosslinked by Hemin/G-Quadruplexes, *Nano Lett*, 13, 1298-1302.
- **Orbach R**, Remacle F, Levine RD, Willner I (2012) Logic Reversibility and Thermodynamic Irreversibility Demonstrated by DNAzyme Based Toffoli and Fredkin Logic Gates, *Proc Natl Acad Sci USA*, 109, 21228-21233.
- Wang F*, **Orbach R*** (co-first), Willner I (2012) Detection of Metal Ions (Cu²⁺, Hg²⁺) and of Cocaine Using a Ligation DNAzyme Machinery, *Chem Eur J*, 18, 16030-16036.
- **Orbach R**, Mostinski L, Wang F, Willner I (2012) Nucleic Acid-Driven DNA Machineries

Synthesizing Mg²⁺-Dependent DNAzymes: An Interplay Between DNA Sensing and Logic Gate Operations, *Chem Eur J*, 18, 14689-14694.

- **Orbach R**, Mironi-Harpaz I, Adler-Abramovich, L, Mossou E, Mitchell E, Forsyth VT, Gazit E, Seliktar D (2012) The rheological and structural properties of Fmoc-peptide based hydrogels: The effect of aromatic molecular architecture on self-assembly and physical characteristics, *Langmuir*, 28, 2015–2022.
- Shimron S, Wang F, **Orbach R**, Willner I (2012) Amplified Detection of DNA through the Enzyme-Free Autonomous Assembly of Hemin/G-Quadruplex DNAzyme Nanowires, *Anal Chem*, 84, 1042-1048.
- Wang F, Elbaz E, **Orbach R**, Magen N, Willner I (2011) Amplified Analysis of DNA by the Autonomous Assembly of Polymers Consisting of DNAzyme Wires, *J Am Chem Soc*, 133, 17149–17151.
- Wilner O, **Orbach R**, Henning A, Teller C, Yehezkeli O, Mertig M, Harries D, Willner I (2011) Self-Assembly of DNA Nanotubes with Controllable Diameters, *Nature Commun*, 2:540 DOI: 10.1038/ncomms1535.
- Balogh D, Tel-Vered R, Riskin M, **Orbach R** and Willner I (2011) Electrified Au Nanoparticle Sponges with Controlled Hydrophilic/Hydrophobic Properties, *ACS Nano*, 5, 299-306.
- Frisman I, **Orbach R**, Seliktar D, Bianco-Peled, H (2010) Structural investigation of PEG-fibrinogen conjugates, *J Mater Sci Mater Med*, 21, 73-80.
- Elbaz J, Wang ZG, **Orbach R**, Willner I (2009) pH-stimulated Concurrent Mechanical Activation of Two DNA “Tweezers” – A “SET-RESET” Logic Gate System, *Nano Lett*, 9, 4510–4514.
- Amdursky N*, **Orbach R*** (co-first), Gazit E, Huppert D (2009) Probing the inner cavities of hydrogels by proton diffusion, *J Phys Chem C*, 113, 19500–19505.
- **Orbach R**, Adler-Abramovich L, Zigerson S, Mironi-Harpaz I, Seliktar D, Gazit E (2009) Self-Assembled Fmoc-Compounds as a Platform for The Formation of Nanostructures and Hydrogels, *Biomacromolecules*, 10, 2646-2651.

Oral Presentations

- **Orbach R**, Remacle F, Levine RD, Willner I. “The Construction of Molecular Computing Systems Using Catalytic DNA Molecules”, *The 5th National Graduate Student Symposium in Organic Chemistry, Tel-Aviv University, Israel*, October 2013.
- **Orbach R**, Willner I. “DNA Computing with DNAzymes”, *Max-Planck Institute for Chemical Energy Conversion, Germany*, February 2013.
- **Orbach R**, Willner I. “DNA Computing with DNAzymes”, *The 6th Annual Schulich Graduate Mini Symposium on Chemistry, Technion – Israel Institute of Technology, Israel*, January 2013.

Posters

- **Orbach R**, Wang F, Remacle F, Levine RD and Willner I, Self-Assembled DNA-Based Nanostructures for Logic Gates and Biosensors Applications, *Self-Assembly & Supramolecular Chemistry Gordon Research Conference, Les Diablerets, Switzerland*, May 5th-10th, 2013.
- **Orbach R**, Wang F, Remacle F, Levine RD and Willner I, Self-Assembled DNA-Based Nanostructures for Logic Gates and Biosensors Applications, *The Hebrew University of Jerusalem*

Annual Nanoscience and Nanotechnology Conference, Dead Sea, Israel, April 3rd-4th, 2013.

- **Orbach R**, Wang F and Willner I, DNA Building Blocks for The Rational Design of Biosensors and Logic Gates, *From Molecules to Materials: Advances and Challenges*, Weizmann Institute of Science, Israel, July 15th-16th, 2012.
- **Orbach R**, Wang F and Willner I, DNA Building Blocks for The Rational Design of Biosensors and Logic Gates, *The Hebrew University of Jerusalem Annual Nanoscience and Nanotechnology Conference*, Hagoshrim, Israel, June 24th-25th, 2012.
- **Orbach R**, Mahler A and Gazit E, Self-Assembled Fmoc-Compounds as a Platform for The Formation of Nanostructures and Hydrogels, *RBNI Winter School*, Dead Sea, Israel February 10th-15th, 2008.
- **Orbach R**, Mahler A and Gazit E, Self-Assembled Peptide-Based Hydrogel as Biocompatible Agent for Drug Delivery, Tissue Engineering and Regeneration, *The 5th Federation of Israel Societies for Experimental Biology Congress*, Eilat, Israel, January 28th-31st, 2008.
- **Orbach R**, Mahler A and Gazit E, Self-Assembled Peptide-based Hydrogel as Biocompatible Agent for Drug Delivery, Tissue Engineering and Regeneration, *The Tel-Aviv University 4th Nanoscience and Nanotechnology Workshop*, Hagoshrim, Israel, September 23rd-25th, 2007.
- **Orbach R**, Mahler A and Gazit E, Self-Assembled Peptide-based Hydrogel as Biocompatible Agent for Drug Delivery, Tissue Engineering and Regeneration, *The 15th Annual meeting of the Laura Sdhwarz-Kipp Institute of Biotechnology*, Hagoshrim, Israel, May 12th-14th, 2007.