

Elad Harel

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2011 – present: Assistant Professor

Department of Chemistry

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Education & Research Experience

2008 – 2011: Postdoctoral Fellow

James Franck Institute of the University of Chicago, Illinois.

Research Advisor: Professor Gregory S. Engel

Two-dimensional optical spectroscopy of protein-pigment complexes and semiconductor quantum dots

2003 – 2008: PhD, Chemistry

University of California, Berkeley, California

Research Advisor: Professor Alexander Pines

Thesis - Multidimensional Remote Detection Magnetic Resonance

2006: The Weizmann Institute of Science, Rehovot, Israel

Research Advisor: Professor Lucio Frydman

Single-scan NMR spectroscopy and imaging

1998 – 2003: B.S., Chemical Physics and B.A., Pure Mathematics

University of California, San Diego, California

Research Advisor: Professor Robert E. Continetti

Dissociation dynamics in molecular beams

Honors and Awards

- Institute for Complex Adaptive Matter (ICAM) Postdoctoral Fellowship at the University of Chicago 2009 - 2011
- Best Oral Presentation by a Young Investigator at the 9th International Bologna Conference on Magnetic Resonance Media (MRPM9), Cambridge, MA 2008
- Department of Homeland Security (DHS) Graduate Student Fellowship, UC – Berkeley 2004 - 2007

- Joseph E. Mayer Award for Outstanding Research in Chemistry, UC – San Diego 2003
- Dr. Selmi Silagi Award for Undergraduate Excellence, UC – San Diego 2003
- Howard Hughes Undergraduate Scholar, UC – San Diego 1998 - 2003

Invited Talks

1. **E. Harel**, “Dimension Trading in the Spectroscopic Markets of Spins and Dipoles”, *Special Seminar* Weizmann Institute of Science, February 27 (2011)
2. **E. Harel**, “Dimension Trading in the Spectroscopic Markets of Spins and Dipoles”, *Special Seminar* Tel Aviv University, February 16 (2011)
3. **E. Harel**, “Dimension Trading in the Spectroscopic Markets of Spins and Dipoles”, *Special Seminar* Harvard University, January 24 (2011)
4. **E. Harel**, “Dimension Trading in the Spectroscopic Markets of Spins and Dipoles”, *Special Seminar* Northwestern University, January 20 (2011)
5. **E. Harel**, “Dimension Trading in the Spectroscopic Markets of Spins and Dipoles”, *Special Seminar* University of Wisconsin at Madison, November 29 (2010)
6. **E. Harel**, “Principles of ultrafast multidimensional spectroscopy”, *3rd International Summer School on Control of Quantum Correlations in Tailored Matter*, Ulm, Germany, October 3 – 5 (2010)
7. **E. Harel**, “Applications of Magnetic Resonance to Microfluidics”, Abbott Laboratories, Abbott Park, IL, February 3rd (2009)
8. **E. Harel**, V. Bajaj, M. Smith, A. Pines, “Remotely detected NMR in Microfluidic Devices with High Spatiotemporal Resolution”, *9th International Bologna Conference Magnetic Resonance in Porous Media*, Cambridge, MA, July 15th (2008)
9. **E. Harel**, C. Hilty, E.E. McDonnell, V.V. Telkki, K. Koen, J. Granwehr, S. Garcia, K.L. Pierce, S-I. Han, A. Pines, “Beating the NMR time scale by remote detection flow imaging”, *International Conference on Magnetic Resonance in Microscopy*, Aachen, Germany, September 3rd (2007)

Patents

1. **E. Harel**, G.S. Engel, Single-shot Two-dimensional Optical Spectroscopy, U.S. Provisional Application Nos. 45577 (2010)
2. **E. Harel**, A. Pines, *Ultra-high Time Resolution NMR*, U.S. Provisional Application Nos. 60/969,409 (2007)
3. L. S. Bouchard, D. Budker, **E. Harel**, M. Ledbetter, T. J. Lowery, A. Pines, D. E. Wemmer, S. Xu, *Magnetic Resonance Imaging of Living Systems by Remote Detection* (2007), Patent Application # PCT/US2008/086646

Publications

21. **E. Harel**, Organization of the Bacterial Light-Harvesting Apparatus Revealed by Exciton Transport Optimization. *arXiv.1111.0069* 2011.

20. **E. Harel**, P. D. Long, G. S. Engel, Single-shot ultrabroadband two-dimensional electronic spectroscopy of the light-harvesting complex LH2. *Opt Lett* **36**, 1665 (May 1, 2011).
19. **E. Harel**, A. F. Fidler, G. S. Engel, Single-Shot Gradient-Assisted Photon Echo Electronic Spectroscopy. *J Phys Chem A* **115**, 3787 (Apr 28, 2011).
18. G. Panitchayangkoon, D. Hayes, K. A. Fransted, J. R. Caram, **E. Harel**, J. Z. Wen, . . . G. S. Engel, Long-lived quantum coherence in photosynthetic complexes at physiological temperature. *P Natl Acad Sci USA* **107**, 12766 (Jul 20, 2010).
17. **E. Harel**, A. F. Fidler, G. S. Engel, Real-time mapping of electronic structure with single-shot two-dimensional electronic spectroscopy. *P Natl Acad Sci USA* **107**, 16444 (Sep 21, 2010).
16. **E. Harel**, Lab-on-a-chip detection by magnetic resonance methods. *Prog Nucl Mag Res Sp* **57**, 293 (Oct, 2010).
15. A. F. Fidler, **E. Harel**, G. S. Engel, Dissecting Hidden Couplings Using Fifth-Order Three-Dimensional Electronic Spectroscopy. *J Phys Chem Lett* **1**, 2876 (Oct 7, 2010).
14. V. S. Bajaj, J. Paulsen, **E. Harel**, A. Pines, Zooming In on Microscopic Flow by Remotely Detected MRI. *Science* **330**, 1078 (Nov 19, 2010).
13. **E. Harel**, Magnetic resonance detection: spectroscopy and imaging of lab-on-a-chip. *Lab Chip* **9**, 17 (2009).
12. S. J. Xu, **E. Harel**, D. J. Michalak, C. W. Crawford, D. Budker, A. Pines, Flow in Porous Metallic Materials: A Magnetic Resonance Imaging Study. *J Magn Reson Imaging* **28**, 1299 (Nov, 2008).
11. **E. Harel**, L. Schroder, S. J. Xu, Novel Detection Schemes of Nuclear Magnetic Resonance and Magnetic Resonance Imaging: Applications from Analytical Chemistry to Molecular Sensors. *Annu Rev Anal Chem* **1**, 133 (2008).
10. **E. Harel**, A. Pines, Spectrally resolved flow imaging of fluids inside a microfluidic chip with ultrahigh time resolution. *J Magn Reson* **193**, 199 (Aug, 2008).
9. V. V. Telkki, C. Hilty, S. Garcia, **E. Harel**, A. Pines, Quantifying the diffusion of a fluid through membranes by double phase encoded remote detection magnetic resonance imaging. *J Phys Chem B* **111**, 13929 (Dec 20, 2007).
8. **E. Harel**, C. Hilty, K. Koen, E. E. McDonnell, A. Pines, Time-of-flight flow imaging of two-component flow inside a microfluidic chip. *Phys Rev Lett* **98**, (Jan 5, 2007).
7. J. Granwehr, **E. Harel**, C. Hilty, S. Garcia, L. Chavez, A. Pines, . . . Y. Q. Song, Dispersion measurements using time-of-flight remote detection MRI. *Magn Reson Imaging* **25**, 449 (May, 2007).
6. **E. Harel**, J. Granwehr, J. A. Seeley, A. Pines, Multiphase imaging of gas flow in a nanoporous material using remote-detection NMR. *Nat Mater* **5**, 321 (Apr, 2006).
5. **E. Harel**, H. Cho, A general numerical analysis of time-domain NQR experiments. *J Magn Reson* **183**, 308 (Dec, 2006).

4. V. G. Stavros, **E. Harel**, S. R. Leone, The influence of intense control laser pulses on homodyne-detected rotational wave packet dynamics in O-2 by degenerate four-wave mixing. *J Chem Phys* **122**, (Feb 8, 2005).
3. **E. Harel**, S. E. Meltzer, A. A. G. Requicha, M. E. Thompson, B. E. Koel, Fabrication of polystyrene latex nanostructures by nanomanipulation and thermal processing. *Nano Lett* **5**, 2624 (Dec, 2005).
2. J. Granwehr, **E. Harel**, S. Han, S. Garcia, A. Pines, P. N. Sen, Y. Q. Song, Time-of-flight flow imaging using NMR remote detection. *Phys Rev Lett* **95**, (Aug 12, 2005).
1. S. A. Maier, P. G. Kik, H. A. Atwater, S. Meltzer, **E. Harel**, B. E. Koel, A. A. G. Requicha, Local detection of electromagnetic energy transport below the diffraction limit in metal nanoparticle plasmon waveguides. *Nat Mater* **2**, 229 (Apr, 2003).

Forthcoming Publications

1. **E. Harel**, G. S. Engel, Quantum Coherence Spectroscopy Reveals Complex Dynamics in Bacterial Light Harvesting Complex 2 (LH2). In Press *P Natl Acad Sci USA* **2011**
2. A. F. Fidler, **E. Harel**, P. D. Long, G. S. Engel, Two-dimensional Spectroscopy Can Distinguish Between Homogenous and Inhomogeneous Dephasing of Zero-Quantum Coherence. In Press, *Phys Chem Lett* **2011**
3. **E. Harel**, S. M. Rupich, R. D. Schaller, D. V. Talapin, and G. S. Engel, Revealing the hidden electronic structure of semiconductor nanocrystals with nearly-degenerate states. submitted *Phys Rev Lett* (June, **2011**)