LYDIA LEE SOHN

ADDRESS: Dept. of Mechanical Engineering
5118 Etcheverry Hall
University of California, Berkeley
Berkeley, CA 94720-1740 USA

TELEPHONE: 1-510-612-2236
FAX: 1-510-643-5599
E-MAIL: sohn@me.berkeley.edu
Group Website: http://www.me.berkeley.edu/srl

EDUCATION

1988-1992 Ph.D., Dept. of Physics, Harvard University, Cambridge, MA (M. Tinkham, Ph.D. advisor)
1988-1990 A.M., Dept. of Physics, Harvard University, Cambridge, MA
1984-1988 A.B., Chemistry & Physics (*magna cum laude*), Harvard University, Cambridge, MA

POSITIONS

1992-1993 NSF/NATO Postdoctoral Fellow in the group of Prof. dr. J. E. Mooij, Dept. of Applied Physics, Delft University of Technology, Delft, The Netherlands
1993-1995 AT&T Postdoctoral Research Fellow, Semiconductor Physics Research Dept., AT&T Bell Laboratories, Murray Hill, NJ
1995-2003 Assistant Professor, Dept. of Physics, Princeton University, Princeton, NJ
2003-2005 Assistant Professor, Dept. of Mechanical Engineering, UC Berkeley
2005-present Associate Professor, Dept. of Mechanical Engineering, UC Berkeley
2005-present Faculty Scientist, Physical Biosciences Division, Lawrence Berkeley National Laboratories
2011-present Faculty Assistant to the Vice Chancellor for Research, UC Berkeley

AFFILIATIONS

2003-present Biophysics Graduate Group, UC Berkeley
2003-present Applied Science and Technology, UC Berkeley
2009-present Core Member, UCSF and UC Berkeley Graduate Group in Bioengineering

HONORS AND AWARDS

- Westinghouse Science Talent Search, Honors group (1984)
- Thomas S. Monfried Scholar, New Jersey Harvard Alumni Assoc. (1985)
- Francis Lee Friedman Physics Award, Harvard-Radcliffe Colleges (1987)
- Rowland Foundation Physics Research Award (1986-1988)
- Phi Beta Kappa, Alpha Iota Chapter
- Office of Naval Research Predoctoral Fellowship (1988-1991)
- National Science Foundation-NATO Postdoctoral Fellowship (1992-1993)
- Wu Foundation Award (1996)
- AT&T and Lucent Technologies Foundation Award (1996)
- DuPont Young Professor Award (1996-1999)
- National Science Foundation Faculty Career Early Development Award (1996-2000)
- Army Research Office Young Investigator Award (1997-2000)
- American Physical Society Le Roy Apker Award (2001): awarded to Heather J. Lynch for her Senior Thesis work performed in the Sohn laboratory at Princeton University
- Sigma Pi Sigma, National Physics Honor Society (2004)
- William Pyle Philips Distinguished Visitor, Haverford College (2005)
- Vogel Moral Courage Speaker, Principia College (2006)
- National Academy of Engineering US Frontiers of Engineering Symposium (2007): selected to attend but unable to attend due to family/health reasons
- W. M. Keck Foundation Medical Research Program Award (2010-2013)
- Presidential Chair Fellow, UC Berkeley (2012-2013)

PATENTS

- US Patent No. 7,279,883: "Particle Analyzer and Methods for Use Thereof", issued to O. A. Saleh and L. L. Sohn, October 9, 2007
- US Patent Application 61/544/232: "Compact Portable Single Cell Sorter and Diagnostic Device", K. Balakrishnan, M. Chapman, G. Anwar, and L. L. Sohn, filed September 20, 2012.
- UC Berkeley Technology Disclosure BK-2013-026: "Angled Barrier and Pore Microfluidic Cell Sorter", M. Chambers, A. Kesavaraju, and L. L. Sohn, filed September 9, 2012

SERVICE

Department (Princeton University and UC Berkeley)
- Physics Graduate Admissions Committee, Princeton University (2000-2001)
- Chair, Applied Science & Technology Graduate Admissions, UC Berkeley (2005-2006)
- Member, Executive Committee for the Applied Science & Technology Program, UC Berkeley (2004-2006)
- Committee on Seminars, ME Dept., UC Berkeley (2004-2006)
- Committee on Faculty Awards, ME Dept., UC Berkeley (2004-2006)
- Committee on Undergraduate Admissions, ME Dept., UC Berkeley (2004-2008)
- Biophysics Graduate Group Graduate Admissions, UC Berkeley (2004-2007; Chair, 2006-2007)
- Chair, Committee on Faculty and Student Affirmative Action, ME Dept., UC Berkeley (2006-2007)
- Committee on Academic Planning, ME Dept., UC Berkeley (2006-present)
- Committee on Student Prizes, ME Dept., UC Berkeley (2004-2006; 2007-2008)
- Committee on Graduate Study, ME Dept., UC Berkeley (2006-2008)
- Committee on ABET and Undergraduate Study, ME Dept., UC Berkeley (2007-present)
- Committee on Safety, ME Dept., UC Berkeley (2010-present)
- Faculty Search Committee (Biomechanical Engineering), Dept. of Mechanical Engineering (2012-2013)

College of Engineering, UC Berkeley
- SUPERB Committee (2005-2006)
- Faculty Advisory Board, Engineering Research Support Office (2005-2007)
- Commencement Student Relations Committee (2007)
- Faculty Search Committee, Dept. of Civil Engineering (2007-2008)
- Task Force Member, Biology in the College of Engineering (2007-2008)
- Task Force Member, Nanoscience & Nanotechnology in the College of Engineering (2007-2008)
- Founding Faculty Director Search Committee, Fung Institute for Engineering Leadership, (2010-2011)
- Faculty Advisory Committee, Biomolecular Nanotechnology Center (2010-present)

University, UC Berkeley
- Nanoelectronics Search Committee & Affirmative Action Officer, Berkeley Nanosciences & Nanoengineering Institute (2005-2006)
- Faculty Advisory Board, Nanoscale Science & Engineering Graduate Group (2005-2007)
- Dean Search Committee, College of Natural Resources (2007-2008)
- Member, Research Compliance Advisory Committee (2011-present)
- Chair, Committee on Laboratory and Environmental Biosafety (Institutional Biosafety Committee) (2011 present)
- Search Committee for Assistant Biosafety Office, Environmental, Health, & Safety (2012)

PROFESSIONAL ACTIVITIES

- Co-Director, *NATO Advanced Study Institute: Mesoscopic Electron Transport*, Curaçao, The Netherlands Antilles, June 24-July 5, 1996
- Member, Advanced Research & Experiments in Sensing II, Office of the Undersecretary of Defense for Acquisition & National Academy of Sciences and Engineering (2000-2001)
- Member, National Research Council committee to review the Federal National Nanotechnology

Initiative (2001-2002)
- Public Member, NJ Domestic Security Preparedness Task Force (2001-2003)
- Member, Biophysical Society Minority Affairs Committee (2002-2007)
- Scientific Advisory Board, NSF ScienCentral "Public Understanding of Research" (2003-2006)
- Faculty Advisor: Pi Tau Sigma, Mechanical Engineering Honor Society, UC Berkeley (2004-2006)
- Member, Advisory Board, Boulder School of Condensed Matter Physics and Materials Physics (2004 present)
- Chair in Micro/NanoBiotechnology, IEEE Engineering in Medicine & Biology Society Annual Meeting (2004)
- Editorial Board: *American Journal of Nanomedicine* (2005-2007)
- Mentor to College Preparatory High School students interested in science and engineering (2006-present)
- Panelist, Global Technology Leader Conference (2009)
- Editorial Board: *Journal of Physical Chemistry and Biophysics* (2011-present)
- Chair of Advanced Technology for Stem Cell Research Session, 4th Annual Congress of Regenerative Medicine & Stem Cell, Bejing, China (November 2011)—declined due to family reasons
- Consumer Advisory Panel, King Arthur Flour (April, 2012)
- Consultant, Ono Pharmaceutical (June 2012-present)
- Co-Chair, "Biological Devices/ Biosensors and Molecular Diagnostics" at the 6th International Conference on Bioengineering and Nanotechnology, UC Berkeley (June 2012)
- Panel member for numerous NIH and DoD workshops regarding integrating nanotechnology and physics with molecular biology (2000-present); panel reviewer for numerous NSF evaluation committees in the areas of Physics, Biophysics, Bioinformatics, and Computer Science
- Reviewer for numerous NIH study sections and special emphasis sections focused on medical instrumentation and systems development, training grants, and Innovative Molecular Analysis Technologies (IMAT)
- Referee for Nature, Science, National Research Council, Applied Physics Letters, Langmuir Letters, NanoLetters, Lab Chip, and Journal of Optical Society of America

FUNDING

Awarded

•**NATO Advanced Study Institute 951289:** *Special Program on Nanoscale Science—Mesoscopic Electron Transport*, $110K, 1996. Sohn (PI)

•**Office of Navel Research N00014-96-1-0724:** *Mesoscopic Electron Transport: Advanced Study Institute*, $5K, 1996. Sohn (PI)

•**NSF DMR-9624536**: *CAREER— Probing Mesoscopic Phenomena in Novel Materials*, $300K, 9/15/96 - 8/31/00. Sohn (PI)

•**Army Research Office DAAG55-97-1-0401:** *Young Investigator Award—Spin-Polarized Transport in Semiconductor-Based Mesoscopic Devices*, $150K, 9/27/97 – 9/21/00. Sohn (PI)

•**DuPont Young Professor Award:** *A Microscale Electronic Sensor for Material Identification*, $75K, 1997 - 2000. Sohn (PI)

•**Office of Navel Research (DURIP):** *The Fabrication and Exploration of Quasi-3 Dimensional Mesoscopic Devices,* $160K, 3/1/97 – 2/28/98. Sohn (PI)

•**Army Research Office (DURIP):** *Electronic Biosensors*, $50K, 2000 – 2001. Sohn (PI)

•**Army Research Office/DARPA DAAD19-00-1-0065:** *Electronic Biosensing for Microfluidic Devices,* $825K, 05/1/00 – 04/30/03. Sohn (PI)

•**NSF BES-0074780**: *POWRE: Electronic Biosensors—An Integration of Nanotechnology with Molecular Biology*, $75K, 8/1/00 – 7/31/01. Sohn (PI)

•**Fluidigm Corporation:** Measurement of Nanoscale Particles, $23K, 2001. Sohn (PI)

•**NSF EIA-0103215**: *Nano Initiative: The Single-Molecule DNA Transistor*, $100K, 9/15/01 – 8/31/02. Sohn (PI)

•**NSF EIA-0121405**: *Collaborative Proposal-ITR/SY: Molecular Computation with Automated Microfluidic*

Sensors (MCAMS), $1.15M, 9/30/01 – 9/29/06. Sohn (co-PI)

- **DARPA BioComp:** *Molecular Computation with Automated Microfluidic Sensors*, $850K, 2001-2004. Sohn (co-PI)
- **Office of Naval Research:** *Measuring the Electron Transport of Single Molecules***,** $450K, 2001-2004. Sohn (PI)
- **NSF EIA-0205098**: *QuBIC: NSF Information Technology Research/QuBIC Principal Investigators' Meeting Conference*, $25.5K, 1/15/02 – 12/31/02. Sohn (PI)
- **DOE DE-FG02-02ER15355:** *Probing Interactions at the Nanoscale: Sensing Protein Molecules and Protein Networks In Vivo Using On-Chip Electronic Nanosensors*, $850K, 10/1/02– 8/24/05. Sohn (PI)
- **Army Research Office:** *A Microfluidics Approach to Investigate Axon Guidance*, $50K, 4/1/06 – 12/31/06. Sohn (PI)
- **DARPA NBCH1060008:** *On-Chip NMR*, $150K, 5/8/06 – 5/7/07. Sohn (PI)
- **NIH/NIEHS 2 P42 ES004705-19:** *Toxic Substances in the Environment*, $15.7M, 6/19/06-5/30/2009. Sohn (co-PI)
- **NIH/NINDS 5R21NS058600-02**: *A Controllable Microfludic Gradient Device for Studying Neuronal Polarization*, $275K (direct), 3/15/07- 2/28/10. Sohn (PI)
- **NSF CBET-0651799:** *NanoCytometry: A Point-of-Care Technology for Monitoring Chronic Leukemia Patients*, $210K (direct), 6/1/07 - 5/31/10. Sohn (PI)
- **CITRIS:** *Improving Point-of-Care Diagnostics for Disease Surveillance in the Developing World*, $75K, 6/1/08 – 5/31/09. Sohn (PI)
- **Michael J. Fox Foundation for Parkinson's Research:** *A Pore-Based Method to Sort and Characterize Human Embryonic Stem-Cell Derived Dopaminergic Neurons*, $75K, 12/17/08-12/16/09. Sohn (PI)
- **W.M. Keck Foundation Medical Research Program:** *Applying Embryonic Signal Integration for Adult Limb and Organ Regeneration*, $1M, 1/15/10-1/14/14. Sohn (PI)
- **Siebel Stem-Cell Institute:** *PALM-Mediated Tracking of Stem-Cell Surface Proteins*, $48K,10/1/09-12/31/11. Sohn (PI)
- **DoD Breast Cancer Research Program:** *Using 3-D Super-Resolution Microscopy to Probe Breast Cancer Stem Cells and Their Microenvironment*, $375K (direct), 2/14/11– 2/13/13. Sohn (PI)
- **Siemens Center of Knowledge Interchange (Healthcare Division):** *Direct Detection Diagnostics*, $105K, 6/15/11-3/31/11. Sohn (PI)
- **NIH/NCI 1R21CA156139-01:** *Rapid Label-Free Detection of Acute Promyelocytic Leukemia*, $275K (direct), 8/31/2011 – 7/30/2013. Sohn (PI)
- **Siemens Center of Knowledge Interchange (Healthcare Division):** *Direct Detection Diagnostics Phase II*, $935K, 4/1/2012 – 3/31/2014. Sohn (PI)

SELECTED TALKS AND PRESENTATIONS

Invited talks (Colloquia, Seminars, Plenary)

1. Condensed Matter Seminar, Physics Dept., Harvard University, "Searching for Cancer Cells One-by-One," Cambridge, MA, October 1999.
2. Dept. of Electrical Engineering and Computer Science, Stanford University, "Capacitance Cytometry: Measuring Single Cells One-by-One," Palo Alto, CA, April 2000.
3. XX Congress for the Int'l. Soc. for Analytical Cytology, "A Micro-Electronic Flow Cytometer," Montpellier, France, May 2000.
4. Defense Science Research Council, "Capacitance Cytometry: Measuring Single Cells One-by-One," San Diego, CA, July 2000.
5. Colloquium, Dept. of Physics, Princeton University, "(Electrically) Shocking Observations about DNA," Princeton, NJ, October 2000.
6. Dept. of Electrical Engineering and Computer Science, Massachusetts Institute of Technology, "(Electrically) Shocking Observations about DNA," Cambridge, MA, February 2001.

7. National Research Council, "(Electrically) Shocking Observations about DNA," Washington, D.C., February 2001.
8. Materials Science and Engineering Dept., Cornell University, "(Electrically) Shocking Observations about DNA," Ithaca, NY, April 2001.
9. Condensed Matter Seminar, Physics Dept., California Institute of Technology, "(Electrically) Shocking Observations about DNA," Pasadena, CA, May 2001.
10. American Chemical Society Prospectives: Biological Applications of Nanotechnology, "Nanoelectronic Sensing: From Single Cells to Single Molecules," Berkeley, CA, June 2001.
11. International Conference on Electronic Interactions in DNA, ""(Electrically) Shocking Observations about DNA," University of California, Los Angeles, September 2001.
12. Molecular Biology Department, Princeton University, "Molecular Sensing Using an Artificial Lateral Nanopore," Princeton, NJ, October 2001.
13. National Science Foundation, "Molecular Sensing Using an Artificial Lateral Nanopore," Washington, D.C., December 2001.
14. Stanford Genome Science Technology Center, "Nanoelectronic Sensing: From Single Cells to Single Molecules," Palo Alto, CA, February 2002.
15. Dept. of Hematology and Oncology, Harvard Medical School, "Nanoelectronic Sensing: From Single Cells to Single Molecules," Beth Israel Deaconess Hospital, Boston, MA, March 2002.
16. Physics Dept., Columbia University, "Molecular Sensing Using an Artificial Lateral Nanopore," New York, NY, April 2002.
17. American Vacuum Society, "Molecular Sensing Using an Artificial Lateral Nanopore," Monterey, CA, May 2002.
18. Dept. of Bioengineering, Duke University, "Molecular Sensing Using an On-Chip Artificial Pore," Durham, NC, January 2003.
19. Dept. of Materials Science and Engineering, UC Santa Barbara, "Molecular Sensing Using an On-Chip Artificial Pore," Santa Barbara, February 2003.
20. Dept. of Bioengineering, University of Pennsylvania, "Molecular Sensing Using an On-Chip Artificial Pore," Durham, NC, March 2003.
21. Bauer Center for Genomics, Harvard University, "Peering in the Life of a Cell: Developing Electronic Techniques to Identify Proteins *In Vivo*, Cambridge, MA, April 2003.
22. Dept. of Mechanical Engineering, UC Berkeley, "Molecular Sensing Using an On-Chip Artificial Pore," Berkeley, CA, April 2003.
23. Sandia National Laboratories, "Molecular Sensing Using an On-Chip Artificial Pore," Albuquerque, NM, April 2003.
24. American Chemical Society, Annual Meeting, "Molecular Sensing Using an On-Chip Artificial Pore," New York, NY, September 2003.
25. Plenary Talk, Fundamenteel Onderzoek der Materiel, "Molecular Sensing Using an Artificial Lateral Nanopore," Amsterdam, The Netherlands, September 2003.
26. Dept. of Mechanical Engineering, Northwestern University, Dept. of Materials Science and Engineering, "Molecular Sensing Using an On-Chip Artificial Pore," Evanston, IL, February 2004.
27. NIEHS Nanotechnologies Workshop: Technologies for Improved Risk Stratification and Disease Prevention, "Electronic Sensing: From Single Cells to Single Molecules," Research Triangle Park, NC, March 2004.
28. IBM Almaden, "Molecular Sensing Using an On-Chip Artificial Pore," San Jose, CA, April 2004.
29. Dept. of Materials Science and Engineering, "Molecular Sensing Using an On-Chip Artificial Pore," Palo Alto, CA, September 2004.
30. Plenary Talk, Sigma Pi Sigma National Physics Honor Society Congress Meeting, "Research Ethics in the Physics Community: The Sad Case of Hendrik Schön, Albuquerque, NM, October 2004.
31. ASME Nanotechnology: Miniaturization in Biomedicine, "Molecular Sensing Using an Artificial Nanopore," Irvine, CA, April 2005.
32. Gordon Research Conference on Analytical Chemistry, "Molecular Sensing Using an Artificial Lateral Pore," Roscoff Biological Station, France, June 2005.
33. Prostate Cancer Advocates Group, UC San Francisco, "NanoCytometry: A New Method to Separate Cancer Cells at the Nanoscale," San Francisco, CA, June 2005.

34. William Pyle Philips Distinguished Visitor, Haverford College, "Molecular Sensing Using an On-Chip Artificial Pore," Haverford, PA, September 2005.
35. William Pyle Philips Distinguished Visitor, Haverford College, "The Sad Case of Hendrik Schön," Haverford, PA, September 2005.
36. 9th Annual European Conference on Micro- and Nano-scale Technologies for the Biosciences, "Molecular Sensing Using an On-Chip Artificial Pore," Montreaux, Switzerland, November 2005.
37. Politecnico di Torino, "Introduction to Nanotechnology and Nanoscience" (series of 5, three-hour lectures), Turin, Italy, November 2005.
38. NASA Ames Research Center, "Molecular Sensing Using an On-Chip Artificial Pore," Moffett Field, CA, December 2005.
39. Vogel Moral Courage Award Talk, Principia College, "The Sad Case of Hendrik Schön," St. Louis, MO, April 2006.
40. Colloquium, Dept. of Physics, UC Riverside, "Applications to Artificial Pores—From Immunoassays to Cytometry," Riverside, CA, May 2006.
41. QB3 Biomedical Engineering Symposium, "Applications to Artificial Pores—From Immunoassays to Cytometry," San Francisco, CA, April 2006.
42. Golden Gate Polymer Forum, "Sensing with Artificial Pores," Mountain View, CA, September 2006.
43. Berkeley Sensor & Actuator Center, "Point-of-Care Technology to Diagnose and Monitor Cancer," Berkeley, CA, September 2006.
44. Dept. of Bioengineering, Massachusetts Institute of Technology, "Sensing with Artificial Pores: From Single Molecules to Single Cells," Cambridge, MA, November 2006.
45. 4th USA-Korea Joint Symposium on MEMS and BioSystems Technology, "NanoCytometry: A New Cell Assay for Disease Diagnosis and Monitoring," UC Berkeley, November 2006.
46. Neyman Lecture, Dept. of Statistics, UC Berkeley, "Cell Characterization Using Chemically Functionalized Pores," UC Berkeley, February 2007.
47. Division of Engineering and Applied Sciences, Harvard University, "Characterizing Cells Using a Chemically Functionalized Pore," Cambridge, MA, May 2007.
48. J. William Fulbright Foreign Scholarship Board, "Nanocytometry: Ushering a New Era in Personalized Medicine," UC Berkeley, August 2007.
49. "A Night with Industry," Keynote Speaker, Society of Women Engineers, UC Berkeley, November 2007.
50. Applied Science & Technology Colloquium, "Cell Characterization Using Chemically Functionalized Pores," UC Berkeley, February 2008.
51. 4th Annual Conference for Undergraduate Women in Physics, University of Southern California, Los Angeles, CA, January 2009.
52. UC Berkeley/Nanyang Technological University Workshop, "Microfluidic-Based Methods for Stem-Cell Purification," Singapore, March 2009.
53. Berkeley Stem-Cell Center, "Isolation of Single Organ Stem Cells from their Precise Anatomical Niche," Asilomar, CA, May 2010.
54. Berkeley-Shangai Biotech Forum, "Label-Free Cell Diagnostics," Shanghai, China, November 2011.
55. 7th Gotham Metro Condensed Matter Meeting, New York Academy Sciences, "The Scientific Fraud of Hendrik Schön," New York, May 2012.
56. Berkeley Breakfast Club, "Label-Free Cell Diagnostics", Berkeley, CA, June 2012.
57. W. M. Keck Foundation Workshop on Imaging Detection of Single Molecules: Challenges and Opportunities, "Label-Free Single-Cell Analysis," National Academies, Beckman Center, Irvine, CA, August 2012.
58. CITRIS Research Exchange Talk, "Label-Free Single-Cell Analysis," UC Berkeley, November 2012.
59. Dept. of Mechanical Engineering, University of California, Davis, "Label-Free Single-Cell Analysis," February 2012.
60. American Physical Society Annual March Meeting, "Uncovering stem-cell heterogeneity in the microniche with label-free microfluidics," in the Micro/Nanofluidics Session sponsored by the Division of Fluid Dynamics and Group on Statistical and Nonlinear Physics, Baltimore, MD, March 2013.
61. 57th International Conference on Electron, Ion, and Photon Beam Technology and Nanofabrication, "Electonic Sensing of Stem Cells" (Tentative Title), Nashville, TN, May 2013.

Invited talks declined due to health/family reasons

•PITTCON 2005, "Molecular Sensing Using an Artificial Pore," February 2005.
•Molecular Medical Diagnostic Technologies, 5th China Medical Biotech Forum, Bejing, China, November 2011.

Invited talks and oral presentations by students and postdocs

1. O. A. Saleh, "A Quantitative Nanoscale Coulter Counter," Oral presentation, 2001 MicroTas Conference, October 2001.
2. A. Thupil, "Axonal Chemotaxis in a Microfluidic Gradient Generator," Oral presentation, 51st Annual Biophysical Society Meeting, March 2007.
3. A. Thupil, "A Controllable Microfluidic Gradient Generator for Studying Neuronal Polarization," Oral presentation, Materials Research Society Spring Meeting, April 2007.
4. A. Carbonaro, "Cell Characterization Using Protein Functionalized Pores," Oral presentation, 11th International Conference on Miniaturized Systems for Chemistry and Life Sciences, Paris, France, October 2007.
5. N. Sanford, "Hydrodynamic Stretching of Molecules of DNA Bound to an Individual Nanowire," Oral presentation, Materials Research Society Fall Meeting, Boston, MA, November 2007.
6. R. Dylla-Spears, "Use of Stagnation Point Flows for DNA Trapping, Manipulation, and Target Sequence Detection," Oral presentation, The XVth International Congress on Rheology, Monterey, CA, November 2007.
7. S. K. Mohanty, "Stem-Cell Surface Marker Interrogation via Resistive-Pulse Sensing," Oral presentation, Biomedical Engineering Society 2009 Annual Meeting, Pittsburgh, PA, October 2009.
8. N. Ho, "Using Microfluidics to Diagnose Leukemia at the Point-of-Care," Oral presentation, Biomedical Engineering Society 2009 Annual Meeting, Pittsburgh, PA, October 2009.
9. R. Dylla-Spears, "Single-Molecule Target Sequence Detection Using Extensional Flow," Oral presentation, AICHE 2009 Annual Meeting, Nashville, TN, November 2009.
10. S. K. Mohanty, "Stem-Cell Surface Marker Interrogation via Resistive-Pulse Sensing: Screening for Sca-1 Expression in Mouse Muscle Stem Cells," Oral presentation, 13th International Conference on Miniaturized Systems for Chemistry and Life Sciences, Korea, November 2009.
11. S. K. Mohanty, "Isolation and Analysis of Satellite Cells from the Muscle Niche Using Microfluidics," Invited talk, The Ottowa Conference on New Directions in Biology and Disease of Skeletal Muscle, Ottowa, Canada, May 2010.
12. M. R. Chapman, "Label-free Screening of Niche-to-Niche Variation in Satellite Stem Cells Using Functionalized Pores," Oral presentation, to be given at the Nanopores Conference, Lanzarote, Spain, January 2012.
13. K. Balakrishnan, "Label-free Screening of Multiple Cell-surface Antigens Using a Single Pore," Oral presentation, to be given at the Nanopores Conference, Lanzarote, Spain, January 2012.
14. M. R. Chapman, "Label-free screening of niche-to-niche variation in satellite stem cells using functionalized pores," Oral presentation, American Physical Society Annual March Meeting, Boston, MA, February 2012.
15. E. Lyall, "Characterizing Spatial Organization of Cell Surface Receptors in Human Breast Cancer with STORM," Oral presentation, American Physical Society Annual March Meeting, Boston, MA, February 2012.
16. K. Balakrishnan, "Label-free Screening of Multiple Cell-surface Antigens Using a Single Pore," Oral presentation, American Physical Society Annual March Meeting, Boston, MA, February 2012.
17. M. R. Chapman, "Using a light-activated culture matrix to determine the microenvironmental cues that initiate breast-cancer tumor metastasis," Oral presentation, 243rd ACS National Meeting (BIOT Division), San Diego, CA, March 2012.
18. K. Balakrishnan, "Using label-free screening to investigate stem-cells from their microanatomical niche," Oral presentation, 243rd ACS National Meeting (BIOT Division), San Diego, CA, March 2012.
19. K. Balakrishnan, "Toward Multimarker Cellular Screening Using Variable Cross-Section Pores," 6th International Conference on Bioengineering and Nanotechnology, Berkeley, CA, June 2012.

SELECTED PUBLICATIONS

1. M. S. Rzchowski, L. L. Sohn, and M. Tinkham, *Frequency Dependence of Shapiro Steps in Josephson-Junction Arrays*, Rapid Communications, Physical Review **B43**, 8682 (1991).
2. L. L. Sohn, M. S. Rzchowski, J. U. Free, S. P. Benz, M. Tinkham and C. J. Lobb*, Absence of fractional giant Shapiro steps in diagonal Josephson-junction arrays*, Rapid Communications, Physical Review **B44**, 925 (1991).
3. L. L. Sohn, M. S. Rzchowski, J. U. Free, and M. Tinkham*, Phase transitions in Josephson junction arrays with long-range interaction*, Physical Review **B47**, 967 (1993).
4. L. L. Sohn, M. T. Tuominen, M. S. Rzchowski, J. U. Free, and M. Tinkham*, AC and DC properties of Josephson junction arrays with long-range interaction*, Physical Review **B47**, 975 (1993).
5. W. J. Elion, J. J. Wachters, L. L. Sohn, and J. E. Mooij*, Observation of the Aharonov-Casher effect of vortices in Josephson-junction arrays*, Phys. Rev. Lett. **71**, 461 (1993).
6. L. L. Sohn, J. J. Wachters, U. Geigenmuller, W. J. Elion, and J. E. Mooij*, Static and Dynamic Properties of Vortices in Small Josephson-Junction Arrays*, Physica **B**, 1059 (1994).
7. W. J. Elion, J. J. Wachters, L. L. Sohn, and J. E. Mooij*, Quantum Interference of Vortices in Josephson-Junction Arrays*, Physica **B**, 1001 (1994).
8. L. L. Sohn, J. Romijn, E. v. d. Drift, W. J. Elion, and J. E. Mooij, *Fabrication of a Quasi-3-Dimensional Josephson-Junction Array*, Physica **B**, 125 (1994).
9. W. J. Elion, J. J. Wachters, L. L. Sohn, and J. E. Mooij, *The Aharonov-Casher Effect for Vortices in Josephson-Junction Arrays*, Physica **B**, 497 (1994).
10. L. L. Sohn and M. Octavio, *Half-integer steps in single-plaquette Josephson-junction arrays*, Rapid Communications, Physical Review **B49**, 9236 (1994).
11. L. L. Sohn, A. Pinczuk, B. S. Dennis, L. N. Pfeiffer, K. W. West, and L. Brey*, Dispersive Collective Excitation Modes in the Quantum Hall Regime*, Solid State Commun. **93**, 897 (1995).
12. T. J. Shaw, M. J. Ferrari, L. L. Sohn, D. H. Lee, M. Tinkham, and J. Clarke*, Magnetic Flux Noise Study of the KTB Transition in an Overdamped Josephson-Junction Array*, Phys. Rev. Lett. **76**, 2551 (1996).
13. L. L. Sohn and R. L. Willett, *Fabrication of Nanostructures Using Atomic-Force-Microscope Based Lithography*, Appl. Phys. Lett. **67**, 1552 (1995).
14. L. L. Sohn and R. L. Willett*, Fabrication of Metallic Nanostructures with an Atomic Force Microscope*, Surf. Sci. 362, 874 (1996).
15. Y. Xia, J. McClelland, R. Gupta, D. Qin, X. Zhao, L. L. Sohn, R. Celotta, and G. M. Whitesides, *Replica Molding Using Polymeric Materials: A Practical Step Toward Nanomanufacturing*, Adv. Mater. **9**, 147 (1997).
16. L. Sohn, C. T. Black, M. Eriksson, M. Crommie, and H. Hess*, Scanning Probe Microscopes and Their Applications*, in Mesoscopic Electron Transport, NATO ASI Series, Vol. **E** 345, eds. L. L. Sohn, L. P. Kouwenhoven, and G. Schön (Boston, Kluwer Academic Publishers (1997).
17. Mesoscopic Electron Transport, NATO ASI Series, Vol. **E** 345, eds. L. L. Sohn, L. P. Kouwenhoven, and G. Schön (Boston, Kluwer Academic Publishers 1997).
18. O. B. Bakajin, J. P. Brody, J. Chou, S. S. Chan, T. Duke, J. Knight, L. Sohn, A. Vishwanath, R. H. Austin, and E. C. Cox, *Polymer Dynamics and Fluid Flow in Microfabricated Devices*, Proc. SPIE **3258**, 100 (1998).
19. L. L. Sohn, *Quantum Leap for Electronics*, Nature **394**, 131 (1998).
20. Mingshaw W. Wu and Lydia L. Sohn, *Nanometer-scale Copper Electrodeposition from an On-Chip Source*, IEEE Electron Device Letters **21**, 277 (2000).
21. L. L. Sohn, O. A. Saleh, G. R. Facer, A. Beavis, R. S. Allan, and D. A. Notterman, *Capacitance Cytometry: Measuring Biological Cells One-by-One,* Proc. Natl. Acad. Sci. **97**, 10687 (2000).
22. L. L. Sohn, O. A. Saleh, G. R. Facer, A. Beavis, R. S. Allan, and D. A. Notterman, *Capacitance Cytometry: Measuring Biological Cells One-by-One,* Biophysical Journal 80 (1): 639, Part 2 Jan 2001.
23. G. R. Facer, D. A. Notterman, and L. L. Sohn*, Electronic Characterization of Biological Fluid Samples: 40 Hz to 30 GHz*, Biophysical Journal 80 (1): 652, Part 2 Jan 2001.
24. O. A. Saleh and L. l. Sohn, *A Resistive Sensing Device for Biological Solutions*, Biophysical Journal 80 (1): 637, Part 2 Jan 2001.

25. G. R. Facer, D. A. Notterman, and L. L. Sohn, *Dielectric Spectroscopy for Bioanalysis: 40 Hz to 26.5 GHz in a Microfabricated Waveguide,* Appl. Phys. Lett. **78**, 996 (2001).
26. D. C. G. Klein, L. Gurevich, J. W. Janssen, L. P. Kouwenhoven, J. D. Carbeck, and L. L. Sohn, *Ordered Stretching of Single Molecules of DNA*, Appl. Phys. Lett. **78**, 2396 (2001).
27. O. A. Saleh and L. L. Sohn, *A Quantitative Nanoscale Coulter Counter*, in the Fifth International Conference on Miniaturized Chemical and Biochemical Analysis Systems, Kluwer Academic Publishers (2001).
28. O. A. Saleh and L. L. Sohn, *Quantitative Sensing of Sub-Micron Colloids Using a Microchip Coulter Counter*, Rev. Sci. Inst. **72**, 4449 (2001).
29. G. R. Facer, D. A. Notterman, and L. L. Sohn, *Electronic Biosensing*, appears as an invited chapter in the National Institutes of Environmental Health Sciences, National Institutes of Health, Biomarkers of Environmentally Associated Disease, eds. S. H. Wilson and W. A. Suk, CRC Press, 527-548 (2002).
30. Bockrath, N. Markovic, A. Shepard, M. Tinkham, L. Gurevich, L. P. Kouwenhoven, M. W. Wu, and L. L. Sohn, *Scanned Conductance Microscopy of Carbon Nanotubes and λ-DNA*, NanoLetters, **2**, 187-190, 2002.
31. S. Stupp, L. L. Sohn *et al*., *Small Wonders, Endless Frontiers*: *A Review of the National Nanotechnology Initiative*, National Research Council & National Academy of Engineering (2002).
32. O. A. Saleh and L. L. Sohn, *Correcting Off-Axis Effects in an On-chip Resistive Pulse Analyzer*, Rev. Sci. Inst. **73**, 4396-4398 (2002).
33. O. A. Saleh and L. L. Sohn, *An Artificial Nanopore for Molecular Sensing*, NanoLetters **3**, 37-38 (2003).
34. O. A. Saleh and L. L. Sohn, *Direct Detection of Antibody-Antigen Binding Using an On-Chip Artificial Pore*, Proc. Natl. Acad. Sci. **100**, 820-824 (2003).
35. T. Messina, L. N. Dunkleberger, G. A. Mensing, A. S. Kalmbach, R. Weiss, D. Beebe, and L. L. Sohn, *A Novel High-Frequency Sensor for Biological Discrimination*, in the International Conference on Miniaturized Chemical and Biochemical Analysis Systems 2003, Kluwer Academic Publishers (2003).
36. I. H. Chan, A. Carbonaro, and L. L. Sohn, *Artificial Pores for Performing Immunoassays*, International Conference on Miniaturized Chemical and Biochemical Analysis Systems 2004, Kluwer Academic Publishers (2004).
37. O. A. Saleh and L. L. Sohn, *Biological Sensing with an On-Chip Resistive Pulse Analyzer*, 26th Annual International Conference, IEEE Engineering in Medicine and Biology Society, 2004.
38. S. W. Mohanty, L. L. Sohn, and D. J. Beebe, *Hybrid Polymer/Thin-Film Impedance System for Label-Free Monitoring of Cells*, 26th Annual International Conference, IEEE Engineering in Medicine and Biology Society (2004).
39. O. A. Saleh and L. L. Sohn, *An On-Chip Artificial Pore for Molecular Sensing,* in the Handbook of BioMEMS and Biomedical Nanotechnology, eds. R. Bashir and S. Wereley, Kluwer Academic Press (2005).
40. B. K. Weis, L. L. Sohn, et al., *Personalized Exposure Assessment: Enabling Population-Based Environmental Research*, Environmental Health Perspectives **113**, 840-848.
41. A. Carbonaro and L. L. Sohn, *A Resistive Pulse Sensor for Multianalyte Detection*, Lab Chip **5**, 1155-1160, 2005.
42. A. Carbonaro, L. A. Godley, and L. L. Sohn, The NanoCytometer: *A New Method of Cell Detection Performed at the Nanoscale*, in the Tenth International Conference on Miniaturized Systems for Chemistry and Life Sciences, Japan Academic Association (2006).
43. L. L. Sohn, J. L. Herberg, B. D. Harteneck, D. R. Myers, and J. A. Liddle, *Fabrication of an On-Chip NMR Microfluidics Device*, in the Tenth International Conference on Miniaturized Systems for Chemistry and Life Sciences, Japan Academic Association (2006).
44. A. Thupil, M-m. Poo, and L. L. Sohn, *Studying Cell Chemotaxis Using a Microfluidic-Gradient Generator*, The Proceedings of μTAS 2007 Conference 2007, eds. J. –L. Viovy, P. Tabeling, S Descroix, and L. Malaquin, The Chemical and Biological Microsystems Society (2007).
45. A. Carbonaro, L. A. Godley, and L. L. Sohn, *Cell Characterization Using Protein-Functionalized Pores*, The Proceedings of μTAS 2007 Conference 2007, eds. J. –L. Viovy, P. Tabeling, S Descroix, and L. Malaquin, The Chemical and Biological Microsystems Society (2007).
46. A. Shamloo, N. Ma, M.-M. Poo, L.L. Sohn, S.C. Heilshorn, *Endothelial cell chemotaxis in a shear stress free microfluidic device*, Lab Chip **8**, 1292-1299 (2008).

47. A. Carbonaro, H. Huang, L. A. Godley, and L. L. Sohn, *Cell Characterization Using a Protein-Functionalized Pore*, Lab Chip **9**, 1478-1485 (2008).
48. O. A. Saleh and L. L. Sohn, *Resistive-Pulse Sensing and On-Chip Artificial Pores for Biological Sensing*, Invited Chapter in Nano and MicroSensors for Chemical and Biological Surveillance, eds. J. B-H. Tok, Royal Society of Chemistry (2008).
49. Rebecca Dylla-Spears, Lydia L. Sohn, and Susan Muller, *Single-Molecule Target Sequence Detection Using Extensional Flow*, in AICHE 2009 Annual Meeting, Nashville, TN, Nov. 2009.
50. R. Dylla-Spears, J. E. Townsend, L. L. Sohn, L. Jen-Jacobson, and S. J. Muller, *Fluorescent Marker for Direct Detection of Specific dsDNA Sequences*, Anal. Chem. **81**, 10049-10054 (2009).
51. S. K. Mohanty, M. J. Conboy, I. Conboy, and L. L. Sohn, *Stem-Cell Surface Marker Interrogation via Resistive-Pulse Sensing*, in the Conference Proceedings for the Biomedical Engineering Society 2009 Annual Meeting, Pittsburgh, PA (Oct. 2009).
52. N. Ho, S. K. Mohanty, L. Godley, and **L. L. Sohn**, *Using Microfluidics to Diagnose Leukemia at the Point-of-Care*, in the Conference Proceedings for the Biomedical Engineering Society 2009 Annual Meeting, Pittsburgh, PA (Oct. 2009).
53. S. K. Mohanty, M. J. Conboy, I. Conboy, and L. L. Sohn, *Stem-Cell Surface Marker Interrogation via Resistive-Pulse Sensing: Screening for Sca-1 Expression in Mouse Muscle Stem Cells*, The Proceedings of μTAS 2009, Korea, November 2009.
54. E. B. P. Jabart, B. Helms, L. Sohn, and I. Conboy, *Site-directed Conjugation of Bioactive Molecules to Poly(lactic-co-glycolic) Acid Nanoparticles*, in the Society for Biomaterials 2010 Annual Meeting & Exposition, April 2010.
55. R. Dylla-Spears, J. E. Townsend, L. Jen-Jacobson, L. L. Sohn, and S. J. Muller, *Single-Molecule Sequence Detection via Microfluidic Planar Extensional Flow at a Stagnation Point*, Lab Chip **10**, 1543-9 (2010).
56. M. R. Chapman and L. L. Sohn, Label-Free Resistive-Pulse Cytometry, in Recent Advances in Cytometry, Part A, (Methods in Cell Biology), Vol 102. Eds. Zbigniew Darzynkiewicz, E. Holden, A. Orfao, W. G. Telford, and Donald Wlodkowic, Elsevier, (2011) ISBN: 9780123749123**.**
57. M. R. Chapman, K. Balakrishnan, M. J. Conboy, S. K. Mohanty, E. Jabart, H. Huang, J. Hack, I. M. Conboy, and **L. L. Sohn**, *Label-free Screening of Niche-to-Niche Variation in Satellite Stem Cells Using Functionalized Pores*, Proceedings to the Nanopores International Conference, Lanzarote, Spain (January 2012).
58. K. Balakrishnan, M. Chapman, A. Kesavaraju, and **L. Sohn**, *A Variable Cross-Section Pore for Screening Cells for Specific Markers*, Proceedings to the Nanopores International Conference, Lanzarote, Spain (January 2012).
59. M. R. Chapman and **L. L. Sohn**, *Using a light-activated culture matrix to determine the microenvironmental cues that initiate breast-cancer tumor metastasis*, 243rd American Chemical Society National Meeting (BIOT Division), San Diego, CA (March 2012).
60. K. Balakrishnan, M. R. Chapman, M. J. Conboy, S. K. Mohanty, E. Jabart, H. Huang, J. Hack, I. M. Conboy, and **L. L. Sohn**, *Using label-free screening to investigate stem-cells from their microanatomical niche*, Oral presentation, 243rd American Chemical Society National Meeting (BIOT Division), San Diego, CA (March 2011).
61. L. L. Sohn, *Review of Fields, Forces, and Flows in Biological Systems by Alan J. Grodzinsky*, The Quarterly Review of Biology **87**, 159 (2012).
62. K. Balakrishnan and **L. L. Sohn**, *Cell Screening Using Resistive-Pulse Sensing*, in Laboratory Methods in Cell Biology: Biochemistry and Cell Culture, Vol. 112. Ed. P. Michael Conn, Elsevier, (2012).
63. K. Balakrishnan, G. Anwar, T. Ngyuen, A. Kesavaraju, and **L. L. Sohn**, *Node-Pore Sensing: A Robust, High-Dynamic Range Method for Detecting Biological Species,* Lab Chip, (2013) DOI:10.1039/C3LC41286E.
64. M. R. Chapman, K. Balakrishnan, J. Li, M. J. Conboy, H. Huang, S. K. Mohanty, E. Jabart, J. Hack, I. M. Conboy, and **L. L. Sohn**, *Sorting Single Satellite Cells from Individual Myofibers Reveals Heterogeneity in Cell-Surface Markers and Myogenic Capacity*, Integrative Biology, (2013) DOI: 10.1039/C3IB20290A

SOHN LAB MEMBERS (PAST & PRESENT)

Postdoctoral Fellows

•Dr. Geoffrey R. Facer (1999-2001)
•Dr. Troy Messina (2003)
•Dr. Stephan Thiberge (2003)
•Dr. Ian Chan (2003-2004)
•Dr. Swomitra Mohanty (2007-2010)
—California Institute for Regenerative Medicine Postdoctoral Fellow (2009-2010)

Research Scientists

•James Hack (2009-present)
•Matthew Chambers (2012-present)
•Anand Kesavaraju (2012-present)
•Vincent Tuminelli (2011-2012)

Primary Ph.D. Students

•Omar A. Saleh, Princeton University PhD in Physics (2003)
A Novel Resistive Pulse Sensor for Biological Measurements
•Andrea Carbonara, UC Berkeley PhD in Mechanical Engineering (2008)
Cell Characterization Using Protein-Functionalized Pores
•Rebecca Dylla-Spears, UC Berkeley PhD in Chemical Engineering (2009)
Single-Molecule Target Sequence Detection via Microfluidic Planar Extensional Flow at a Stagnation Point
•Eric Jabart, Bioengineering, UC Berkeley (2009-present)
—2011 Siebel Foundation Scholar Award
•Karthik Balakrishnan, Mechanical Engineering, UC Berkeley (2010-present)
—2011 National Defense Science & Engineering Graduate Fellow

Co-Advised Ph.D. Students (e.g. Departmental PhD advisor)

•Merwan Benhabib, UC Berkeley PhD in Mechanical Engineering (2009)
Multichannel Mars Organic Analyzer for Planetary Analysis of Organic Molecules and Biomarkers
•Maria Schriver, UC Berkeley (2008-2012)

Masters Students

•Dionne C. G. Klein: "Ordered Stretching of Single Molecules of DNA," March 2000
Co-Advised with Prof. dr. Leo P. Kouwenhoven, Dept. of Applied Physics, Delft University of Technology
•Karthik Balakrishnan: "Microscale Biological Analysis Using Resistive Pulse Sensing," May 2011
UC Berkeley

Senior Theses, Princeton University

•Amit Shah: "Dielectric Spectroscopy of Cells" May 2002
•Sunil N. Goda: "Dephasing in One Dimensional Metallic Nanowires" May 2001
•Heather J. Lynch: "A Kondo Box: Coulomb Blockade and the Kondo Effect in Iron-Doped Copper Nanoparticles" May 2000
—*American Physical Society LeRoy Apker Award*, 2001
—*Material Research Society Undergraduate Research Initiative Award*, 2000
•Joshua W. Weitz: "Vortex and Charge Dynamics of Superconducting Arrays" May 1997

Junior Theses, Princeton University

•Ilana Witten: "Conduction through a DNA Molecule" May 2001
•Heather J. Lynch: "A Kondo Box: Coulomb Blockade and the Kondo Effect in Chromium-doped Aluminum Nanoparticles" May 1999
•Daniel I. Konieczny: "Magnetization Reversal in Nanosized Ferromagnetic Particles" May 1997

Undergraduate Research Assistants

•Jeremy Whang (2013-present): Bioengineering, UC Berkeley, Class of 2014
•Justin Inman (2013-present): Bioengineering, UC Berkeley, Class of 2014
•Richard Hwang (2012-present): Bioengineering, UC Berkeley, Class of 2013
•Eugene Chao (2012-present): Physics, UC Berkeley, Class of 2013
•Trong Ngyuen (2012-present): Engineering Physics, UC Berkeley, Class of 2013
•Bo Qing (2011-present): Bioengineering, UC Berkeley, Class of 2013
•Anand Kesavaraju (2011-2012): Bioengineering, UC Berkeley, Class of 2012
•Andrew Yu (2012): Bioengineering, UC Berkeley, Class of 2013
•Evan Lyall (2011-2012): Bioengineering, UC Berkeley, Class of 2012
•Katherine Mellis (2011): Bioengineering, UC Berkeley, Class of 2014
•Farzin Fatollah-Fard (2011): Mechanical Engineering, UC Berkeley, Class of 2012
•Sachin Rangarajan (2010-present): Bioengineering, UC Berkeley, Class of 2013
—Berkeley Stem-Cell Center Summer Apprenticeship (2011)
•Nga Ho (2008-2010): Bioengineering, UC Berkeley, Class of 2010
•James Hack (2008-2010): Engineering Physics, UC Berkeley, Class of 2010
•Jonathan Beard (2007): ME, UC Berkeley, Class of 2009
•Nathan Sanford (2006-2007): ME, UC Berkeley, Class of 2008
•Corinne Lieu (2005; 2009-2010): Engineering, UCSD, Class of 2008
•Jonathan Tesch (2005-2006): ME, UC Berkeley, Class of 2006
•Donald Winston (2004-2006): EECS, UC Berkeley, Class of 2006
•Jason Lee (Spring 2004): Mechanical Engineering, UC Berkeley, Class of 2005
•Alexander McDonald (2001-2002): Biology/Biophysics, Princeton Univ., Class of 2005
•Jonathan Hoffman (2001-2002): Biology, Princeton Univ., Class of 2002
•Richard Allan (1999-2001): Biology/Biophysics, Princeton Univ., Class of 2002
•Craig Nakan (2000): Biology concentrator, Princeton Univ., Class of 2003
•Christopher Roeser (1998): Harvard University Graduate Student

COURSES TAUGHT

•PRINCETON UNIVERSITY

Undergraduate Courses
Physics 101: Introductory Physics (non-calculus based, Mechanics)
Physics 102: Introductory Physics (non-calculus based, Electromagnetism)
Physics 103: Introductory Physics for Science and Engineering (Mechanics)
Physics 104: Introductory Physics for Science and Engineering (Electromagnetism)
Physics 312: Experimental Physics (Junior Physics Lab)

•UNIVERSITY OF CALIFORNIA, BERKELEY

Upper Division Undergraduate Courses

ME102A: Introduction to Measurement Systems for Mechatronics
ME107: Introduction to Experimentation and Measurement
ME118: Introduction to Nanotechnology and Nanoscience
ME119: Introduction to MEMS

Graduate Course

ME290L: Introduction to Nanobiology