

Julie S. Biteen

Postdoctoral Scholar
Stanford University Department of Chemistry
333 Campus Drive #121, Mailbox #192
Stanford, CA 94305-5080
(650) 724-4052
jsbiteen@stanford.edu
<http://www.stanford.edu/~jsbiteen>

RESEARCH INTERESTS

My research focuses on applying single-molecule and superresolution imaging, metal nanoparticle plasmonics, and semiconductor nanocrystal quantum dots to live-cell imaging. Undertaking such an endeavor at the crossroads of Chemistry, Biology and Engineering requires the development of sensitive experimental methods and careful, quantitative analysis procedures. My research seeks to maximize the impact of the tools of nanoscale photonics through applications to physiologically relevant questions.

ACADEMIC TRAINING

Stanford University , <i>Stanford, CA</i> Postdoctoral Scholar, <i>Specialty in superresolution imaging in live bacterial cells</i> Research Advisor: W. E. Moerner (Chemistry)	2007-November 2009
California Institute of Technology , <i>Pasadena, CA</i> Ph.D. Chemistry; <i>Specialty in silicon nanocrystal optoelectronics and metal plasmonics</i> Research Advisors: Harry Atwater (Applied Physics) and Nathan Lewis (Chemistry)	2006
California Institute of Technology , <i>Pasadena, CA</i> M.S. Applied Physics, GPA 3.85	2003
Princeton University , <i>Princeton, NJ</i> A.B. Chemistry with Highest Honors, GPA 3.92	2001

HONORS, AWARDS AND FELLOWSHIPS

Burroughs Wellcome Fund Career Award at the Scientific Interface	2009-2013
University of Michigan Biological Scholar	2009
Materials Research Society Graduate Student Silver Medalist	2005
Society of Chemical Industry Perkin Medal Scholarship	2004
Laser Focus World Commendation for Excellence in Technical Communications	2004
PEO Scholar Award	2004
Dow Chemical Company Travel Stipend	2003
Princeton University, Phi Beta Kappa	2001
Princeton University Department of Chemistry, Highest Honors	2001
Sigma Xi Society	2001
Hypercube, Inc. Award in Computational Chemistry	2001
Manfred Pyka Memorial Physics Prize	1999

RESEARCH

Postdoctoral Scholar, Stanford University December 2006 – Present
(Advisor: W. E. Moerner)

Single-molecule imaging of biophysical processes in cells

- Applying superresolution techniques to epifluorescence microscopy to investigate protein structure and dynamics in bacteria cells *in vivo*.
- Implementing sophisticated image-processing algorithms.
- Studying the bulk and single-molecule optical properties of novel fluorescent proteins using microscopy, fluorimetry, and spectroscopy.
- Performing bacteria cell growth, maintenance and handling.
- Supervising a small team of researchers (myself, one graduate student, and one undergraduate student).

Postdoctoral Scholar, California Institute of Technology June 2006 – November 2006
(Advisor: H. A. Atwater)

Silicon nanorod photovoltaics and plasmon-coupled superconductor detectors

- Probed band edge luminescence of silicon nanorods.
- Investigated the properties of NbN superconductors by ellipsometry.
- Predicted the plasmonic properties of long-wavelength metal particles for coupling to superconductive detectors with finite-difference time-domain simulations.
- Coordinated my numerical experiments with laboratory experiments at the NASA Jet Propulsion Laboratory in La Cañada, CA.

Graduate Researcher, California Institute of Technology 2002 – 2006
(Advisors: H. A. Atwater and N. S. Lewis)

Silicon nanocrystal optoelectronics and metal nanoparticle plasmonics

- Tuned the emission energy, intensity and quantum efficiency of Si quantum dots coupled to metal nanoparticles.
- Demonstrated plasmon-enhanced photoluminescence and electroluminescence.
- Complemented laboratory experiments with finite-difference time-domain simulations in order to develop a computational model for our results.
- Examined the effects of surface modifications and metal-semiconductor interactions on the optoelectronics of silicon nanocrystals.
- Demonstrated the existence of surface states in oxide-terminated Si quantum dots.
- Employed optical and electronic characterization tools including photoluminescence spectroscopy in the UV-visible and IR ranges, time-resolved photoluminescence decay, ellipsometry, and electroluminescence.
- Utilized surface science techniques including atomic force, scanning electron and transmission electron microscopy, X-ray photoelectron spectroscopy (including synchrotron experience), X-ray and reflection high-energy electron diffraction.
- Employed lithographic and benchtop synthetic fabrication methods, such as optical and electron-beam lithography and wet chemical synthesis, including sample preparation and handling in inert atmosphere using a glove box.

Graduate Researcher, California Institute of Technology 2001 – 2002
(Advisor: K. P. Giapis)

Physics and chemistry of low-energy ion beam interactions with surfaces

Research Assistant, Princeton University 2000 – 2001
(Advisor: H. A. Rabitz)

Nonlinear maps for quantum control

Research Assistant, McGill University/Montreal General Hospital 1999
(Advisor: L. Rosenberg)

Intracellular signaling pathways in islet cell apoptosis

REFEREED JOURNAL PUBLICATIONS

- S.R.P. Pavani, M.A. Thompson, **Julie S. Biteen**, S.J. Lord, N. Liu, R.J. Twieg, R. Piestun and W.E. Moerner, “Three-Dimensional Single-Molecule Fluorescence Imaging Beyond the Diffraction Limit Using a Double-Helix Point Spread Function,” *PNAS*, **106** 2995-2999 (2009).
- Julie S. Biteen**, M.A. Thompson, N.K. Tselentis, G.R. Bowman, L. Shapiro, and W.E. Moerner, “Superresolution Imaging in Live *Caulobacter Crescentus* Cells Using Photoswitchable EYFP,” *Nature Methods*, **5** 947-949 (2008).
- M.C. Traub, **Julie S. Biteen**, D.J. Michalak, L.J. Webb, B.S. Brunshwig, and N.S. Lewis, “Phosphine Functionalization of GaAs(111)A Surfaces,” *Journal of Physical Chemistry C, J. Phys. Chem. C*, **112** 18467-18473 (2008).
- N.R. Conley, **Julie S. Biteen**, W.E. Moerner, “Cy3-Cy5 Covalent Heterodimers for Single-Molecule Photoswitching,” *Journal of Physical Chemistry B*, **112** 11878-11880 (2008).
- M.C. Traub, **Julie S. Biteen**, B.S. Brunshwig, and N.S. Lewis, “Passivation of GaAs nanocrystals by chemical functionalization,” *Journal of the American Chemical Society*, **130** 955-964 (2008).
- Julie S. Biteen**, L.A. Sweatlock, H. Mertens, N.S. Lewis, H.A. Atwater, and A. Polman, “Plasmon-enhanced photoluminescence of silicon quantum dots: Simulation and experiment,” *Journal of Physical Chemistry C*, **111** 13372 – 13377 (2007).
- H. Mertens, A. Polman, **Julie S. Biteen**, and H.A. Atwater, “Polarization-Selective Plasmon-Enhanced Silicon Quantum Dot Luminescence,” *Nano Letters*, **6** 2622 – 2625 (2006).
- L.J. Webb, D.J. Michalak, **Julie S. Biteen**, B.S. Brunshwig, A.S.Y. Chan, D.W. Knapp, H.M. Meyer, E.J. Nemanick, M.C. Traub, and N.S. Lewis, “High-Resolution Soft X-ray Photoelectron Spectroscopic Studies and Scanning Auger Microscopy Studies of the Air Oxidation of Alkylated Silicon(111) Surfaces,” *Journal of Physical Chemistry B*, **110** 23450 – 23459 (2006).
- M.C. Traub, **Julie S. Biteen**, D.J. Michalak, L.J. Webb, B.S. Brunshwig, and N.S. Lewis, “High-resolution X-Ray photoelectron spectroscopy of chlorine-terminated GaAs(111)A surfaces,” *Journal of Physical Chemistry B*, **110** 15641 – 15644 (2006).
- Julie S. Biteen**, N.S. Lewis, H.A. Atwater, H. Mertens, and A. Polman, “Tuning the spectral emission of plasmon-enhanced Si quantum dot luminescence,” *Applied Physics Letters*, **88** 131109 (2006).
- Julie S. Biteen**, D. Pacifici, N.S. Lewis, and H.A. Atwater, “Enhanced radiative emission rate and quantum efficiency in coupled silicon nanocrystal-nanostructured gold emitters,” *Nano Letters*, **5** 1768 – 1773 (2005).
- A.L. Tchegotareva, M.J.A. de Dood, **Julie S. Biteen**, H.A. Atwater, and A. Polman, “Quenching of Si nanocrystal photoluminescence by doping with gold or phosphorous,” *Journal of Luminescence*, **114** 137 – 144 (2005).
- L.J. Webb, E.J. Nemanick, **Julie S. Biteen**, D.W. Knapp, D.J. Michalak, M.C. Traub, A.S.Y. Chan, B.S. Brunshwig, and N.S. Lewis, “High-resolution X-ray photoelectron spectroscopic studies of alkylated silicon(111) surfaces,” *Journal of Physical Chemistry B*, **109** 3930 – 3937 (2005).
- Julie S. Biteen**, N.S. Lewis, H.A. Atwater, and A. Polman, “Size-dependent oxygen-related electronic states in silicon nanocrystals,” *Applied Physics Letters*, **84** 5389 – 5391 (2004).
- Julie S. Biteen**, J.M. Geremia, and H. Rabitz, “Closed-loop quantum control utilizing time domain maps,” *Chemical Physics*, **290** 35 – 45 (2003).
- Julie S. Biteen**, J.M. Geremia, and H. Rabitz, “Optimal quantum control field design using logarithmic maps,” *Chemical Physics Letters*, **348** 440 – 446 (2001).

INVITED TALKS AND SEMINARS

- Julie S. Biteen, M. Thompson, N. Tselentis, L. Shapiro, and W.E. Moerner, "Superresolution imaging of protein superstructures in live *Caulobacter crescentus* cells with EYFP," ACS National Meeting, August 2009.
- Julie S. Biteen, M. Thompson, N. Tselentis, L. Shapiro, and W.E. Moerner, "Superresolution Imaging in Live Bacterial Cells by Single-Molecule Active-Control Microscopy (SMACM)," Rice University Chemistry Department Seminar, January 16, 2008.
- Julie S. Biteen, H. Mertens, L.A. Sweatlock, N.S. Lewis, H.A. Atwater, and A. Polman, "Plasmon-enhanced luminescence from silicon quantum dots coupled to nanostructured metals," University of Illinois at Chicago Chemistry Department Seminar, June 1, 2007.
- Julie S. Biteen, H. Mertens, L.A. Sweatlock, N.S. Lewis, H.A. Atwater, and A. Polman, "Plasmon-enhanced luminescence from silicon quantum dots coupled to nanostructured metals," University of Minnesota Nanoparticle IGERT Seminar, March 23, 2007.
- Julie S. Biteen, H. Mertens, L.A. Sweatlock, N.S. Lewis, H.A. Atwater, and A. Polman, "Plasmon-Enhanced Silicon Nanocrystals for Optoelectronic Applications," Rice University Nanophotonics Seminar, October 26, 2006.
- Julie S. Biteen, H. Mertens, L.A. Sweatlock, R. Walters, D. Pacifici, A. Polman, N.S. Lewis, H.A. Atwater, "Tuned Spectral Emission from Si Nanocrystals Coupled to Metal Island Arrays," MRS, Spring 2006 *I1.3.
- Julie S. Biteen, I. Garcia-Munoz, N.S. Lewis, and H.A. Atwater, "Plasmon-enhanced silicon nanocrystal photoluminescence via Au-Si near-field energy transfer processes," MRS, Fall 2004 *F8.3.
- Julie S. Biteen, N.S. Lewis, A. Polman, and H.A. Atwater, "The role of silicon nanocrystal functionalization and passivation in photoluminescence," MRS, Spring 2004 *M13.2 (**Session Chair**).
- Julie S. Biteen, N.S. Lewis, and H.A. Atwater, "Toward a Silicon Nanocrystal Laser: Engineering functionalized silicon nanocrystals for light emission applications," Lawrence Livermore National Laboratory, August 4, 2003.

CONFERENCE PUBLICATIONS

- Julie S. Biteen**, M.A. Thompson, N.K. Tselentis, G.R. Bowman, L. Shapiro, and W.E. Moerner, "Superresolution Imaging in Live *Caulobacter Crescentus* Cells Using Photoswitchable Enhanced Yellow Fluorescent Protein," SPIE Proceedings (2009).
- Julie S. Biteen**, M.A. Thompson, N.K. Tselentis, L. Shapiro, and W.E. Moerner, "Superresolution Imaging in Live Bacterial Cells by Single-Molecule Active-Control Microscopy," CLEO/QELS Extended Abstracts, **CFT2** (2008).
- Julie S. Biteen**, A.L. Tchegotareva, A. Polman, N.S. Lewis, and H.A. Atwater, "Controlled passivation and luminescence blue shifts of isolated silicon nanocrystals," MRS Proceedings, **770** I6.2.1 (2003).

CONTRIBUTED CONFERENCE PRESENTATIONS

- International Society for Optical Engineering (SPIE) Photonics West, San Jose, CA, January 2009.
- American Society for Cell Biology (ASCB) Annual Meeting, San Francisco, CA, December 2008.
- Gordon Research Conference on Single-Molecule Approaches to Biology, New London, NH, August 2008.
- CLEO Conference on Lasers and Electro-Optics, San Jose, CA, May 2008.

Stanford University Molecular Biophysics Seminar Series, Stanford, CA, April 2008.
Stanford Bio-X Interdisciplinary Initiatives Symposium, Stanford, CA, February 2008.
Stanford Bio-X Life in Motion Symposium, Stanford, CA, October 2007.
Materials Research Society Fall Meeting, Boston, MA, November 2006 (**Session Chair**).
Gordon Research Conference on Plasmonics, Keene, NH, July 2006.
Materials Research Society Fall Meeting, Boston, MA, December 2005.
International Society for Optical Engineering (SPIE) Optics & Photonics Meeting, San Diego, CA, August 2005.
Photon Physics in the Netherlands, Amsterdam, The Netherlands, June 2005.
HP Labs Quantum Science Research Nanotechnology Symposium, Palo Alto, CA, March 2005.
American Physical Society National Meeting, Los Angeles, CA, March 2005.
Southern California Inorganic Photochemistry Conference, Two Harbors, CA, September 2004.
Materials Research Society Fall Meeting, Boston, MA, December 2003.
Materials Research Society Spring Meeting, San Francisco, CA, April 2003.

PRESS COVERAGE

Y. Carts-Powell, "Supercharging Microscope Resolution," Optics & Photonics News (July/August 2008).
R.J. Walters, Julie S. Biteen, G.I. Bourianoff, and H.A. Atwater, "Nanocrystal research targets optoelectronic components," Laser Focus World (September 2004).

SKILLS

Optical and Electronic Characterization:

Photoluminescence measurements in UV-visible and IR ranges, including time-resolved decay dynamics and confocal microscope spectroscopy. Electroluminescence measurements. Ellipsometry. Single-molecule epifluorescence microscopy in live cells. Fluorimetry.

Surface Science Techniques:

Atomic-force, scanning-electron and transmission-electron microscopy, X-ray photoelectron spectroscopy (including synchrotron experience), X-ray and reflection high energy electron diffraction.

Fabrication:

Optical and electron-beam lithography. Wet chemical synthesis, including sample preparation and handling in inert atmosphere using a glove box. Class 100 clean room experience.

Cell Biology:

Bacteria cell growth, maintenance and handling.

Computer Programming:

Finite difference time domain (FDTD) simulations in Mafra, image processing in Matlab, programming in Mathematica, numerical calculations in C and C++, instrument control in Labview, scientific typesetting in LaTeX.

Project Management:

Supervising undergraduate and graduate researchers, coordinating the purchase of large instruments.

Languages Spoken and Written Fluently:

English and French.

POSTDOCTORAL PROFESSIONAL DEVELOPMENT

Physics Machine Shop Certification Course (Stanford University)	2007
Responsible Conduct of Research Bioethics Course (Stanford University)	2007
Physical Biology Boot Camp (California Institute of Technology)	2006

TEACHING EXPERIENCE

Stanford University

Occasional Lecturer, Ch 175: Physical Chemistry	2008
Physics Summer Research Program Mentor: Oversaw the research of an undergraduate student	2007

California Institute of Technology

Teaching Assistant, Occasional Lecturer, APh 132: Optoelectronic Devices and Nanophotonics	2005
Teaching Assistant, Occasional Lecturer, APh 114: Solid State Physics	2005
Summer Undergraduate Research Fellowship Mentor: Oversaw the research of an undergraduate student	2004
Teaching Assistant, APh/EE 183: Device Physics	2004
Teaching Assistant, Ch 3a: Undergraduate General Chemistry Lab	2001 – 2002

Princeton University

Teaching Assistant, Ch 372: Junior Experimental Chemistry Lab	2001
Peer Tutor: Undergraduate Math, Physics, and Chemistry	1998 – 2001

OTHER ACTIVITIES

Professional Society Memberships:

American Physical Society (APS), Materials Research Society (MRS), The International Society for Optical Engineering (SPIE), American Chemical Society (ACS), American Society for Cell Biology (ASCB).

Stanford Distinguished Women in Science (DWIS) Seminar Series Steering Committee

Caltech Women in Engineering, Science and Technology (WEST)

REFERENCES

1. W. E. Moerner
Harry S. Mosher Professor of Chemistry and Professor, by courtesy, of Applied Physics
Stanford University
Department of Chemistry, M/C 5080
375 North-South Mall, Stauffer II Room 12
Stanford, CA 94305-5080
650-723-1727
wmoerner@stanford.edu
2. Harry A. Atwater
Howard Hughes Professor and Professor of Applied Physics and Materials Science
California Institute of Technology
246 Watson, MC 128-95
Pasadena, CA 91125
626-395-2197
haa@caltech.edu
3. Nathan S. Lewis
George L. Argyros Professor of Chemistry
California Institute of Technology
210 Noyes Lab, MC 127-72
Pasadena, CA 91125
626-395-6335
nslewis@caltech.edu
4. Lucy Shapiro
D. K. Ludwig Professor of Cancer Research
Stanford University
Department of Developmental Biology, B300 Beckman Center
Stanford, CA 94305
650-725-7678
shapiro@stanford.edu
5. Albert Polman
Director, FOM Institute for Atomic and Molecular Physics (AMOLF)
Kruislaan 407
1098 SJ Amsterdam, The Netherlands
011-31-20-608-1234
polman@amolf.nl