Jennifer A. Dionne

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Summary

Assistant professor of materials science and engineering with research interests plasmonic and nanocrystalline metamaterials for nanoscale optical manipulation, imaging, computation, and solar-energy conversion. A team-player passionate about teaching and mentoring students to identify questions of fundamental importance and address issues of global impact.

Education

California Institute of Technology

Ph.D. in Applied Physics, June 2009: *"Flatland Photonics: Circumventing Diffraction with Planar Plasmonic Architectures"*

M.S. in Applied Physics, June 2005 (GPA: 4.0/4.0)

Washington University in St. Louis

B.S. in Physics, 2003

B.S. in Systems Science & Engineering (now the dept. of Electrical Engineering), 2003

Honors and Distinctions

- Stanford University Terman Fellow (2010 -)
- Francis and Milton Clauser Prize for Outstanding Caltech Thesis (2009)
- Faculty offers: Stanford (accepted)
  Harvard, MIT, Cornell
- Everhart Lecturer, Caltech (2008)
- Materials Research Society Gold Award for Outstanding Graduate Student (2008)
- Invited Plasmonics Gordon Research Conference Speaker (2008)
- Kavli Nanoscience Institute Graduate Conference Stipend Award Winner (2005)
- Best poster award at SPP2 conference in Graz, Austria (2005)
- National Science Foundation Graduate Research Fellow (2004)
- DoD National Defense Science and Engineering Graduate Research Fellow (2004)
- The Systems Science & Engineering award for outstanding senior (2003)
- The Tau Beta Pi outstanding student award (2003)
- Best poster award at ASLO conference in Salt Lake City, Utah (2003)
- The Omikron Delta Kappa Outstanding student award for campus and community service (2003)
- Tau Beta Pi National Engineering Honor Society (2002)
- Lucile N. Bodine Memorial Scholar (2000)
- Louis Feinstein Scholar (1999)

Research Experience

University of California, Berkeley and Lawrence Berkeley National Lab (December 2008-present)
Mentor: Professor Paul Alivisatos

Postdoctoral fellow in the department of Chemistry, investigating the electro-optic and photochemical properties of semiconductor and metallic nanocrystals for applications in solar energy conversion (i.e., solar fuel generation) and bio-electromagnetism (i.e., neuronal signal transmission).

California Institute of Technology (2003-2008)
Thesis Advisor: Professor Harry Atwater

Negative Index Materials and Sub-diffraction-limited Microscopy

- Experimental implementation of a negative index material at visible wavelengths
- Design and fabrication of visible-frequency negative index lenses for sub-diffraction-limited microscopy
- Investigation of the local density of states in positive and negative index plasmonic systems

Active Plasmonics

- Design and fabrication of a surface-plasmon-based Si field-effect modulator ('plasmostor')
- Design and fabrication of a full-color display based on plasmon resonances in metal/ferroelectric systems

Chip-based Plasmonic Elements

- Design and fabrication of waveguides for low-loss, highly-confined photonic and plasmonic transport within subwavelength dimensions
- Analysis and simulation of plasmons in multilayer metallodielectric systems

University of Rhode Island, Graduate School of Oceanography Summer Fellow (2002)
Project Advisor: Professor Peter Cornillon

Empirically investigated the formation and evolution of shear-driven fluid flow and developed a theoretical model of the transition from turbulent flow to an established shear region

Washington University Compton Physics Lab (2001)
Project Advisor: Professor Mark Conradi

Studied techniques of NMR lung imaging using hyperpolarized He-3 and constructed an apparatus to monitor and regulate respiration of small animals throughout imaging sequences.

SoloSpirit Mission Control (2001)

Analyzed telemetry data and assisted with the ground control operations for Steve Fossett's summer 2001 round-the-world balloon flight.

Teaching Experience

Graduate Mentor / co-Mentor to Caltech Summer Undergraduate Research Fellows:

- Philip Munoz: "Probing the local density of states in positive and negative index plasmon corrals", Summer 2007 and 2008
- Matthew Czubakowski: "Towards a full-color plasmonic display using Ag-bonded Lithium Niobate thin films", Summer 2007

Teaching assistant and occasional lecturer for:

- Solid State Physics (Graduate Course, Caltech), 2006 and 2007
- Optoelectronic Materials and Devices (Graduate Course, Caltech), 2006
- Introduction to Computing and Computer Applications (Undergraduate course introduction to C++, Washington University), 2002 and 2003
- Probability and Statistics (Undergraduate and Graduate Course, Washington University), 2003

- Freshman Engineering Seminar (Hands-on engineering project course for freshman, Washington University), 2003

Publications

1. J. Dionne, P. Munoz, and H. Atwater, "Photochemical imaging of plasmon corrals with nanometer-scale resolution", in preparation

2. J. Dionne, L. Sweatlock, M. Sheldon, A. P. Alivisatos, and H. Atwater, "Si-based plasmonics for on-chip photonics," invited review article, *JSTQE* 16, 295 (2010)

3. K. Diest, J. Dionne, M. Spain, and H. Atwater, "Tunable color filters based on metal-insulator-metal resonators," *Nano Letters* 9, 2579 (2009)
   Featured in Nature Photonics 3, 426 (2009) "Compact colour filters"

4. J. Dionne*, K. Diest*, L. Sweatlock, and H. Atwater, "PlasMOStor: a metal-oxide-silicon field-effect plasmonic modulator", *Nano Letters* 9, 897 (2009) (*equal-author contributors)
   Featured in Science News, fall 2009

5. J. Dionne, E. Verhagen, A. Polman, and H. Atwater, "Are negative index materials achievable with surface plasmon waveguides? A case study of three plasmonic geometries", *Optics Express* 16, 19001 (2008)
   Featured in Nature Materials 7, 925 (2008) "True Negative Refraction"

6. K. Diest, M. Archer, J. Dionne, M. Czubakowski, and H. Atwater "Silver diffusion bonding and layer transfer of lithium niobate to silver", *Applied Physics Letters* 93, 092906 (2008)

7. E. Verhagen, J. Dionne, K. Kuipers, H. Atwater, A. Polman, "Near field visualization of strongly confined surface plasmon polaritons in metal-insulator-metal waveguides", *Nano Letters* 8, 2925 (2008)
   Awarded best paper at the Nano Meta conference in Tirol, Austria

8. H. Lezec*, J. Dionne*, and H. Atwater, "Negative refraction at visible frequencies", *Science* 316, 430 (2007) (*equal-author contributors)
   Originally published in Science Express on March 22, 2007
   Featured in Nature 445, 346 (2007) "How to drive light round the wrong bend"
   Featured in Scientific American, "Visible light bent the 'wrong' way" (March 22, 2007)

9. J. Dionne, H. Lezec, and H. Atwater, "Highly confined photon transport in subwavelength metallic slot waveguides" *NanoLetters* 6, 1928 (2006)
   Featured in Nature Materials 5, 765 (2006) "Light at the End of the Waveguide"
   Awarded best paper at the second Surface Plasmon Photonics conference in Graz, Austria

10. J. Dionne, L. Sweatlock, A. Polman, and H. Atwater "Plasmon slot waveguides: Towards chip-scale propagation with subwavelenth-scale localization" *Phys. Rev. B* 73, 035407 (2006)
    Selected for the Virtual Journal of Nanoscience

11. J. Dionne, L. Sweatlock, A. Polman, and H. Atwater "Planar metal plasmon waveguides: frequency-dependent dispersion, propagation, localization, and loss beyond the free electron model" *Phys. Rev. B* 72, 075405 (2005)

12. H. Atwater, S. Maier, A. Polman, J. Dionne, and L. Sweatlock, "The new 'PN junction': Plasmonics enables photonic access to the nanoworld" *MRS Bulletin* 30 (2005)

13. H. Atwater, J. Dionne, L. Sweatlock, "Subwavelength-scale plasmon waveguides." Book chapter in *Surface Plasmon Photonics* (pp. 87-104), M. L. Brongersma and P. G. Kik (Ed.), Dordrecht, NL: Springer

Patents:

Full Color Resonator-Based Plasmonic Display, patent #CIT-4929-P (2007)
Plasmostor: A MOS field effect plasmonic modulator, patent #CIT-5114-P (2008)

Community and Academic Activities

Materials Research Society Symposium Chair (Spring 2010 meeting)
Chemistry in the Classroom outreach program (2009)
Helped develop and implement a lesson plan for elementary and middle school students about light-energy conversion and storage, delivered each month to various local schools.
Kavli Nanoscience colloquium committee (2005-2007) and Chair (2006)
A premiere student-run monthly seminar series aimed at inviting distinguished leaders in nanoscience and engineering to Caltech. Invited speakers have included Dr. Steven Chu, Professor Sir John Pendry, Professor Carlos Bustamante, and Dr. Don Eigler.
Reviewer – Nano Letters, Nature Photonics, Optics Letters, Optics Express, Science
International Student Orientation Assistant (2005)
Residential Advisor (2003)
President, Society of Physics Students (2003)
Member, MRS and SPIE

Weekend Activities

Marathons and triathalons (sprint and olympic distances), including the Ventura Olympic Triathlon and San Jose half marathon
Hiking and Backpacking: Sierra Nevadas, Big Sur, Death Valley, Santa Barbara
Art, specifically oil painting, sculpture, and prints
Music, specifically guitar
Wine Tasting

References

Available upon request