

# Joseph E. Reiner, Ph.D.

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Virginia Commonwealth University  
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## Education

### **State University of New York at Stony Brook**, Stony Brook, NY

Ph. D. in physics received August 2003

Thesis title: "Conditional Measurements, Quantum Feedback, and Cold Atoms in Cavity QED", Thesis advisor: Dr. Luis A. Orozco.

M. A. in physics received December 2000

### **Rochester Institute of Technology**, Rochester, NY

B. S. in physics with Highest Honors received June 1997

## Employment

### **Virginia Commonwealth University**, Richmond, VA

Assistant Professor, Physics, August 2011 to present

Research interests: Single molecule measurements, nanopore-sensing, optical tweezers and correlation spectroscopy

### **National Institute of Standards and Technology**, Gaithersburg, MD

Research Physicist, July 2005 to July 2011

PI: John Kasianowicz

*Duties:* Perform research on biological nanopores for sensing applications with an emphasis on the development of simultaneous optical and electrical single molecule detection methodologies. Also developed accurate liposome characterization analysis via fluorescence autocorrelation spectroscopy.

### **National Institute of Standards and Technology**, Gaithersburg, MD

National Research Council Postdoctoral Fellow, July 2003 to July 2005

PI: Kristian Helmerson

*Duties:* Performed optical tweezer based research and developed biophysical sensing systems with an emphasis on single molecule confinement in emulsions and nanotubes.

**State University of New York at Stony Brook, Stony Brook, NY**

Graduate Research Assistant, May 1999 to June 2003

*Duties:* Performed research on optical cavity quantum electrodynamics with an emphasis on the development of quantum feedback protocols and the construction of optically slowed atomic beams for second-generation experiments. Studied correlation spectroscopy and its application to quantum optics experiments.

**Teaching Experience**

**Virginia Commonwealth University, Richmond, VA**

Spring 2016: PHYS 215 – Science, Technology and Society, Honors course – Lecture  
PHYS 697 – Directed graduate research – (2 students)  
PHYS 397 – Directed undergraduate research – (1 student)

Fall 2015: PHYS 591 – Topics: Optics (5 students) (*new prep: Graduate Level*)  
PHYS 697 – Directed graduate research (2 students)  
PHYS 397 – Directed undergraduate research (1 student)

Spring 2015: PHYS 208 – University Physics II (216 students)  
PHYS 697 – Directed graduate research (3 students)  
PHYS 397 – Directed undergraduate research (1 student)

Fall 2014: PHYS 208 – University Physics II (185 students)  
PHYS 697 – Directed graduate research (3 students)

Spring 2014: PHYS 208 – University Physics II (255 students)  
PHYS 697 – Directed graduate research (2 students)  
PHYS 397 – Directed undergraduate research (1 student)

Fall 2013: PHYS 208 – University Physics II (236 students)  
PHYS 697 – Directed graduate research (2 students)  
PHYS 397 – Directed undergraduate research (1 student)

Spring 2013: PHYS 208 – Co-taught University Physics II  
PHYS 352 – Guided inquiry for Physics II – Lecture  
PHYS 697 – Directed graduate research – (3 students)  
PHYS 397 – Directed undergraduate research – (1 student)

Fall 2012: PHYS 208-036, 937 – Recitation for PHYS 208  
PHYS 352 – Guided Inquiry for Physics II – Lecture  
PHYS 697 – Directed graduate research – (3 students)  
PHYS 397 – Directed undergraduate research – (1 student)

- Spring 2012:   PHYS 215 – Science, Technology and Society, Honors course – Lecture  
                  PHYS 697 – Directed graduate research – (2 students)  
                  PHYS 397 – Directed undergraduate research – (2 students)
- Fall 2011:     PHYS 215 – Science, Technology and Society, Honors course – Lecture  
                  PHYS 697 – Directed graduate research – (2 students)  
                  PHYS 397 – Directed undergraduate research – (1 student)

### **Research Advising**

#### *Graduate Students*

David Dancho, M. S. Physics awarded May 2013  
John Wray, M. S. Physics awarded May 2013  
Christopher Angevine, M. S. Physics awarded May 2014  
Kyle Brady, M. S. Physics awarded May 2015  
Amy Chavis

#### *Undergraduate Students*

Christopher Angevine, B. S. Physics awarded May 2012  
Kyle Brady, B. S. Physics awarded May 2013  
Amy Chavis, B. S. Physics awarded May 2014  
Grace Cummings  
Tameshwar Surujpaul  
Grace Hatmaker

### **National Institute of Standards and Technology, Gaithersburg, MD**

Postdoctoral Research Advisor, March 2008 to October 2010

- Co-supervised the research of a NRC postdoctoral fellow.

Graduate Research Advisor, July 2006 to June 2009

- Co-supervised the research of a University of Maryland graduate student.

Undergraduate Research Advisor, May 2004 to August 2005

- Supervised the research of four undergraduate summer research students (2 per summer).

### **State University of New York at Stony Brook, Stony Brook, NY**

Graduate and undergraduate research advisor, September 2002 to June 2003

- Advised the research projects for two students.

Electricity and magnetism assistant lecturer, Fall 2002

- Lectured for junior level electricity and magnetism classes (at the level of Griffiths).

Introductory physics laboratory teaching assistant, Spring 1999

- Taught the laboratory section for a freshman level, non-science major, physics class.

Calculus for business major's recitation instructor, Fall 1998

- Taught two recitation sections (30 students each) of introductory calculus.

Optics laboratory teaching assistant, Spring 1998

- Taught the laboratory section of a junior level undergraduate optics class.

## Awards and Fellowships

- NIST-ARRA Senior Fellowship (2011)
- National Research Council/NIST Postdoctoral Research Associateship (2003-2005).
- Graduate Council Commendation to Distinguished Doctoral Students (2003).
- American Physical Society, Division of Laser Sciences travel grant (1999-2000).
- Government Assistance for Areas of National Need Fellowship (1997-1999).
- Rochester Institute of Technology Outstanding Undergraduate Award (1996).
- Elected to Sigma Pi Sigma (physics national honor society) (1996).
- Dean's List all quarters at the Rochester Institute of Technology (1992-1997).

## Publications

### Articles in peer reviewed journals

C. J. Freeman, A. A. Farghaly, H. Choudhary, A. E. Chavis, K. T. Brady, J. E. Reiner, M. M. Collinson, "Microdroplet-based potentiometric redox measurements on gold nanoporous electrodes," *Anal. Chem.* doi: 10.1021/acs.analchem.5b04668 (2016).

C. E. Angevine, S. J. Seashols-Williams, J. E. Reiner, "Infrared laser heating applied to nanopore sensing for DNA duplex analysis," *Anal. Chem.* **88**, 2645 (2016).

A. E. Chavis, K. T. Brady, N. Kothalawala, J. E. Reiner, "Voltage and blockade state optimization of cluster-enhanced nanopore spectrometry," *Analyst*, **140**, 7718 (2015).

K. T. Brady, J. E. Reiner, "Improving the prospects of cleavage-based nanopore sequencing engines," *J. Chem. Phys.*, **143**, 074904 (2015).

Z. Ridgway, A. L. Picciano, P. M. Gosavi, Y. S. Moroz, C. E. Angevine, A. E. Chavis, J. E. Reiner, I. V. Korendovych, G. A. Caputo, "Functional characterization of a melittin analog containing a non-natural tryptophan analog," *Biopolymers*, **54**, 1444 (2015).

C. E. Angevine, A. E. Chavis, N. Kothalawala, A. Dass, J. E. Reiner, "Enhanced single molecule mass spectrometry via charged metallic clusters," *Anal. Chem.*, **86**, 11077 (2014).

B. J. Nablo, R. G. Panchal, S. Bavari, T. L. Nguyen, R. Gussio, W. Ribot, A. Friedlander, D. Chabot, J. E. Reiner, J. W. F. Robertson, A. Balijepalli, K. M. Halverson, J. J. Kasianowicz, "Anthrax toxin-induced rupture of artificial lipid bilayer membranes," *J. Chem. Phys.*, **139**, 065101 (2013).

A. Balijepalli, J. W. F. Robertson, J. E. Reiner, J. J. Kasianowicz, R. W. Pastor, "Theory of polymer-nanopore interactions refined using molecular dynamics simulations," *J. Am. Chem. Soc.*, **135**, 7064 (2013).

J. E. Reiner, J. W. F. Robertson, D. L. Burden, L. K. Burden, A. Balijepalli, J. J. Kasianowicz, "Temperature sculpting in yoctoliter volumes," *J. Am. Chem. Soc.*, **135**, 3087 (2013).

- C. E. Angevine, N. Kothwalawala, A. Dass, J. E. Reiner, "Characterizing individual Au<sub>25</sub>(SG)<sub>18</sub> clusters within a nanopore detector," *MRS proceedings*, 1484, imrc12-1484-7a-21, doi:10.1557/op1.2012.1625 (2012).
- J. E. Reiner, A. Balijepalli, J. W. F. Robertson, B. S. Drown, D. L. Burden, J. J. Kasianowicz, "The effects of diffusion on an exonuclease/nanopore-based DNA sequencing engine," *J. Chem. Phys.*, **137**, 214903 (2012).
- J. E. Reiner, A. Balijepalli, J. W. F. Robertson, J. Campbell, J. Suehle, J. J. Kasianowicz, "Disease detection and management via single nanopore-based sensors," *Chem. Rev.*, **112**, 6431 (2012).
- S. Kumar, C. Too, M. Chien, B. Hellner, A. Balijepalli, J. W. F. Robertson, Z. Li, J. J. Russo, J. E. Reiner, J. J. Kasianowicz, "PEG-Labeled nucleotides and nanopore detection for single molecule DNA sequencing by synthesis," *Sci. Reports*. **2**, 684, doi: 10.1038/srep00684 (2012).
- J. E. Reiner, R. B. Kishore, B. C. Levin, T. Albanetti, N. Boire, A. Knipe, K. Helmerson, K. H. Deckman, "Detection of heteroplasmic mitochondrial DNA in single mitochondria," *PLoS One*. **5**, e14359 (2010). doi:10.1371/journal.pone.0014359.
- J. W. F. Robertson, J. J. Kasianowicz, J. E. Reiner, "Changes in ion channel geometry resolved to sub-angstrom precision via single molecule mass spectrometry," *J. Phys.: Condens. Matter*. **22**, 454108 (2010).
- J. E. Reiner, J. J. Kasianowicz, B. J. Nablo, J. W. F. Robertson, "Theory for nanopore-based single-molecule mass spectrometry," *Proc. Natl. Acad. Sci. USA*. **107**, 12080-12085 (2010).
- J. E. Reiner, A. Jahn, S. M. Stavis, M. J. Culbertson, W. N. Vreeland, D. L. Burden, J. Geist, M. Gaitan, "Accurate optical analysis of single molecule entrapment in nanoscale vesicles," *Anal. Chem.* **82**, 180-188 (2010).
- J. Tang, A. M. Jofre, R. B. Kishore, J. E. Reiner, M. E. Greene, M. Lowman, J. S. Denker, C. C. Willis, K. Helmerson, L. S. Goldner, "Generation and mixing of subfemtoliter aqueous droplets on demand," *Anal. Chem.* **81**, 8041-8047 (2009)
- J. J. Kasianowicz, J. W. F. Robertson, E. R. Chan, J. E. Reiner, V. M. Stanford, "Nanosopic Porous Sensors," *Ann. Rev. Anal. Chem.* **1**, 737-766 (2008).
- J. Tang, A. M. Jofre, G. M. Lowman, R. B. Kishore, J. E. Reiner, K. Helmerson, L. S. Goldner, M. E. Greene, "Green Fluorescent Protein in Inertially Injected Aqueous Nanodroplets," *Langmuir*, **24**, 4975-4978 (2008).
- A. Jahn, J. Reiner, W. Vreeland, D. DeVoe, L. E. Locascio, M. Gaitan, "Preparation of nanoparticles by continuous-flow microfluidics," *J. Nanop. Res*, **10**, 925-934 (2008).
- J. E. Reiner, A. Jahn, L.E. Locascio, M. Gaitan, J. J. Kasianowicz, "Liposome Characterization with Fluorescence Cumulant Analysis," *Proc. SPIE Noise and Fluctuations in Biological, Biophysical, and Biomedical Systems*, Florence, Italy, p. 66020I-1-11 (2007).

J. E. Reiner, A. M. Crawford, R. B. Kishore, L. S. Goldner, M. K. Gilson, K. Helmerson, "Optically trapped aqueous droplets for single molecule studies," *Appl. Phys. Lett.* **89**, 013904 (2006).

J. E. Reiner, R. B. Kishore, C. Pfefferkorn, K. Helmerson, "Stable polymer nanotubes stretched from polymersomes," *Proc. Natl. Acad. of Sci. USA* **103**, 1173 (2006).

J. E. Reiner, W. P. Smith, L.A. Orozco, H. M. Wiseman, J. Gambetta, "Quantum feedback in a weakly driven cavity QED system," *Phys. Rev A* **70**, 023819 (2004).

J. E. Reiner, F. M. Dimler, L. A. Orozco, "Broadening mechanisms and their effects in non-classical correlations on cavity QED with atomic beams," *J. Opt. B* **6**, 135-142 (2004).

J. E. Reiner, H. M. Wiseman, H. Mabuchi, "Quantum jumps between dressed states: a proposed cavity QED test using feedback," *Phys. Rev. A* **67**, 042106 (2003).

G. T. Foster, W. P. Smith, J. E. Reiner, L. A. Orozco, "Time-dependent electric field fluctuations at the sub-photon level," *Phys. Rev. A* **66**, 033807 (2002).

W. P. Smith, J. E. Reiner, L. A. Orozco, S. Kuhr, H. M. Wiseman, "Capture and release of a conditional state of a cavity QED system by quantum feedback," *Phys. Rev. Lett.* **89**, 133601 (2002).

G.T. Foster, W.P. Smith, J.E. Reiner, L.A. Orozco, "Third-order correlations in cavity quantum electrodynamics," *J. Opt. B* **4**, S281-S284 (2002).

J.E. Reiner, W.P. Smith, L.A. Orozco, H.J. Carmichael, P.R. Rice, "Time evolution and squeezing of the field amplitude in cavity QED," *J. Opt. Soc. Am. B* **18**, 1911-1921 (2001).

Strachan W. J., Reiner J., Goodhue W. D., Karakashian A. S., Casasanta V., Geller J. D., "Analysis of molecular beam epitaxy grown Ga<sub>1-x</sub>Al<sub>x</sub>As/Ga<sub>1-y</sub>Al<sub>y</sub>As dielectric mirrors using complex indices of refraction," *J. Vac. Sci and Tech. B* **14**, 2318-2321 (1996).

## Book Chapters

J. J. Kasianowicz, J. E. Reiner, J. W. F. Robertson, S. E. Henrickson, C. Rodrigues, O. V. Krasilnikov, "Detecting and characterizing individual molecules with single nanopores," *Nanopore-Based Technology*, Editor: Maria E. Gracheva, Springer-Verlag, NY 2012.

H. J. Carmichael, G. T. Foster, L. A. Orozco, J. E. Reiner, P. R. Rice, "Intensity-field correlations of non-classical light," *Progress in Optics Volume 46*, Editor: Emil Wolf, Elsevier, New York 2004.

## Citations

B. W. McNeill, "Researchers develop new DNA analysis technique using infrared laser heat," *VCU News*, Feb. 19, 2016.

B. W. McNeill, "Team led by VCU physicist uses gold nanoparticles to improve molecular sensing," *VCU News*, Nov. 11, 2014.

C. Boutin, "New explanation for key step in anthrax infection proposed by NIST and USAMRIID," *NIST TechBeat*, Aug. 8, 2013.

C. Boutin, "Temp-controlled 'nanopores' may allow detailed blood analysis," *NIST TechBeat*, Mar. 5, 2013.

"Success in modeling the interaction of molecules in nanopores," *Nanomedicine*, **5**, 839-841, Aug. 2010.

C. Boutin, "NIST team advances in translating language of nanopores," *NIST TechBeat*, June 23, 2010.

L. Ost, "Micro-boxes of water used to study single molecules," *NIST TechBeat*, July 20, 2006.

L. Ost, "Stable polymer nanotubes may have a biotech future," *NIST TechBeat*, Feb 2, 2006.

B. D. Guenther, "Optics in 2002," *Optics and Photonics News*, **13**, 53, December 2002.

## Patents

J. J. Kasianowicz, J. W. F. Robertson, A. Balijepalli, J. E. Reiner, D. L. Burden, L. K. Burden, "Systems and methods for controlling temperature of small volumes," Pending. Application number: US20140064324A1, Mar. 6, 2014.

K. H. Deckman, B. C. Levin, K. Helmersen, R. B. Kishore, J. E. Reiner, "Isolation and characterization of a single mitochondrion," Active. Pub. No. US 9217740 B2, Dec. 22, 2015.

M. Gaitan, A. Jahn, L. E. Locascio, W. N. Vreeland, J. E. Reiner, "Microfluidic apparatus to control liposome formation," Active. Pub. No. US8715591 B2, May 6, 2014.

## Funded Proposals

R. Natarajan (PI), K. Sanford (co-PI), M. Collinson (co-PI), J. E. Reiner (co-I), "Attenuation of Red Blood Cell Storage Lesions with Vitamin C," Virginia Blood Foundation, (Feb. 2016 – Jan. 2017). Funded at \$100,000 for 12 months.

J. E. Reiner (PI) and S. E. Seasholls (co-PI), "Single molecule forensic DNA analysis with laser-induced nanopore heating," Jeffress Memorial Trust, (July 2015 – June 2016). Funded at \$100,000 for 12 months.

D. Ye (PI) and J. E. Reiner (co-PI), "The multiple molecular appearances of Amyloid- $\beta$  aggregates in Alzheimer's disease," ARDRAF, Virginia Center for Aging. (July 2013 – July 2014). Funded at \$7000 for 12 months.

M. Bertino (PI), J. E. Reiner (co-PI), D. Ye (co-PI), C. Taylor (co-PI), E. Carpenter (co-PI), "MRI: Acquisition of an imaging Raman spectrometer for research and training," CHE-NSF. September 2013. Funds in the amount of \$227,679 awarded for the purchase of a Raman imaging system.

J. E. Reiner (PI) and D. Ye (co-PI), "Single molecule metabolomics through nanopores and Raman spectroscopy," VCU-PRIP. (July 2012 – December 2013). Funded at \$50,000 for 18 months.

K. Brady (undergraduate student) and J. E. Reiner (PI), "Combining nanotubes and nanopores to overcome diffusion limitations with nanosensing," VCU-UROP. (Summer 2012). Funded at \$3500 for 3 months.

J. W. F. Robertson (co-PI), J.E. Reiner (co-PI), J. J. Kasianowicz (PI), "Development of a More than Moore Device for a Portable Anthrax Biosensor," Office of Microelectronics Programs, NIST. (May, 2010). Funded at \$100,000 for one year.

J. J. Kasianowicz (PI), J. W. F. Robertson (co-PI), J. E. Reiner (co-PI), "BioChip for Anthrax Toxin Detection and Anthrax Therapeutic High-Throughput Screening," Office of Law Enforcement Standards, NIST, (June, 2010). Funded at \$220,000 for one year.

## **Presentations**

### **Invited Talks**

"Metallic clusters for enhanced single molecule nanopore sensing," XIV International Materials Research Congress (MRC), Cancun, Mexico, Aug. 19, 2014.

"Nanoparticle enhanced single molecule nanopore detection," Virginia Commonwealth University, Department of Biophysics and Physiology Colloquium, Richmond, VA. Mar. 27, 2014.

"Single molecule nanopore sensing," University of Mary Washington Physics Department Colloquium, Fredericksburg, VA, Feb. 11, 2014.

"From academia to government and back to academia," SESAPS, Bowling Green, KY, Nov. 22, 2013.

"Enhanced single molecule mass spectrometry via gold nanoclusters," SESAPS, Bowling Green, KY, Nov. 22, 2013.

"There's gold in them there pores!: Nanogold structures for enhanced single molecule nanopore sensing," Appalachian State University Physics Department Colloquium, Boone, NC, Sept. 7, 2012.

"Enhanced nanopore sensing with direct attachment strategies," XII International Materials Research Congress (MRC), Cancun, Mexico, Aug. 14, 2012.

"Single molecule transport and characterization with bionanopores," VCU Physics Department Colloquium, Richmond, VA, Oct. 14, 2011.

"Little pores for large problems: Nanopore science with applications towards personalized medicine," VCU Chemistry Department Seminar, Richmond, VA, Sept. 15, 2011.



“Little pores for large problems: Nanopore science with applications from personalized medicine to energy generation,” VCU Physics Department Candidate Job Seminar, Richmond, VA, Feb. 3, 2011.

“Nanopore-based single molecule determination of polymer-cation binding and membrane protein dynamics,” ACS Fall National Meeting, Boston, MA. Aug. 24, 2010.

“Single particle biophysics: Nanopores, liposomes and mitochondrial diseases,” UMD Biophysics Seminar, University of Maryland, College Park, MD Mar. 22, 2010

“Isolating the problem: What can we learn from single particle measurements?” RIT Physics Department Colloquium, Rochester Institute of Technology, Rochester, NY Feb. 2, 2010.

“Electronic detection and characterization of biomolecules and single molecule size spectrometry,” Seminar for the Laboratory of Computational Biology, NHLBI, Rockville, MD, Sep. 17, 2009

“Anthrax to optical tweezers: A tour through Nanobiotechnology,” St. Mary’s College of Maryland Natural Science & Mathematics Colloquium, St. Mary’s, MD, Sep. 24, 2008.

“Biophysics with Large Fluctuations,” Colloquium for the College of William and Mary Physics Department, Williamsburg, VA, Nov. 30, 2007.

“A Laser-Based Approach to Nanobiotechnology,” Colloquium for the Adelphi University Physics Department, Garden City, NY Apr. 23, 2007.

“Biophysics with Large Fluctuations,” Colloquium for the Wheaton College Chemistry Department, Wheaton, IL, June 6, 2007.

“Nanotubes and nanocontainers,” Colloquium for the Department of Physics at the University of Mary Washington, Fredericksburg, VA Apr. 13, 2005.

“Optically-drawn nanotubes and mixing with liposomes and polymersomes,” 2004 KY NanoMat International Workshop on Nanomaterials, Lexington, KY Sept. 20, 2004.

“Feedback with conditional measurements in cavity QED,” Colloquium for the Department of Physics at Griffiths University, Queensland, Australia January 28, 2002.

### **Submitted Talks**

J. E. Reiner, A. E. Chavis, K. T. Brady, N. Kothalawala, “Extended nanopore residence times via metallic clusters” PITTCON, Atlanta, GA. Mar. 9, 2016.

C. E. Angevine, A. E. Chavis, N. Kothalawala, A. Dass, J. E. Reiner, “Enhanced single molecule mass spectrometry with charged metallic clusters” Fall Meeting of the American Chemical Society, San Francisco, CA. Aug. 10, 2014.

J. E. Reiner, A. Balijepalli, J. W. F. Robertson, B. S. Drown, D. L. Burden, J. J. Kasianowicz, “The effects of diffusion on an exonuclease/nanopore-based DNA sequencing engine” March Meeting of the American Physical Society, Baltimore, MD. Mar. 20, 2013.

J. E. Reiner, J. W. F. Robertson, L. K. Burden, D. L. Burden, J. J. Kasianowicz, "Single molecule thermodynamics and nanopore-based thermometry" March Meeting of the American Physical Society, Boston, MA. Feb. 28, 2012.

J. E. Reiner, J. J. Kasianowicz, B. J. Nablo, J. W. F. Robertson, "Theory of high-resolution single molecule size determination using a solitary nanopore," Device Research Conference, Penn State University, University Park, PA, June 24, 2009

J. E. Reiner, A. Jahn, L.E. Locascio, M. Gaitan, J. J. Kasianowicz, "Liposome Characterization with Fluorescence Cumulant Analysis," SPIE Noise and Fluctuations in Biological, Biophysical, and Biomedical Systems meeting, Florence Italy May 14, 2007.

J. E. Reiner, R. B. Kishore, C. Pfefferkorn, J. Wells, K. Helmerson, P. Howell, W. Vreeland, S. Forry, L. E. Locascio, D. Reyes-Hernandez, M. Gaitan, "Optical manipulation of liposomes and polymersomes with optical tweezers," SPIE optical science and technology meeting, Denver, CO August 18, 2004

J. E. Reiner, W. P. Smith, L. A. Orozco, "Control and information with conditional quantum measurements," Quantum Electronics and Laser Science Conference, Long Beach, CA, May 11, 2002.

J. E. Reiner, W. P. Smith, H.M. Wiseman, L. A. Orozco, "Using quantum feedback to preserve the vacuum Rabi oscillations in cavity QED," Quantum Electronics and Laser Science Conference, Baltimore, MD, May 4, 2001.

J. E. Reiner, W. P. Smith, G. T. Foster, L. A. Orozco, H. J. Carmichael, P. R. Rice, "Time evolution and squeezing of the field amplitude in cavity QED," Quantum Electronics and Laser Science Conference, San Francisco, CA, May 5, 2000.

J. E. Reiner, W. P. Smith, G. T. Foster, L. A. Orozco, H. J. Carmichael, P. R. Rice, "Time evolution and squeezing of the field amplitude in cavity QED," Division of Atomic, Molecular, and Optical Physics Meeting of the APS, Storrs, CT, June 15, 2000.

### **Submitted Posters**

A. E. Chavis, C. A. Angevine, N. Kothalawala, A. Dass, J. E. Reiner, "Enhanced Single molecule mass spectrometry via charged metallic clusters," Mid-Atlantic CUWiP (Conference for undergraduate women in physics), University of Maryland, College Park, MD, January 17-19, 2014.

J. E. Reiner, J. J. Kasianowicz, J. W. F. Robertson, "Nanopore-based single molecule determination of polymer-cation binding and membrane protein dynamics," 4<sup>th</sup> Int. Symposium on Polymer Materials Science, NIST, Gaithersburg, MD., October 29, 2010.

J. E. Reiner, B. J. Nablo, J. J. Kasianowicz, J. W. F. Robertson, "High-resolution single molecule analysis of nanopore-based detection," American Chemical Society Fall Meeting, Washington D. C., August 16, 2009.

J. E. Reiner, B. J. Nablo, J. J. Kasianowicz, J. W. F. Robertson, "High-resolution single molecule analysis of nanopore-based detection," American Chemical Society Fall Meeting, Washington D. C., August 17, 2009.

- J. E. Reiner, A. Jahn, W. N. Vreeland, L. E. Locascio, M. Gaitan, "Fluorescence based liposome encapsulation studies," Nanoparticles 2008, Orlando, FL, May 12, 2008.
- J. E. Reiner, A. Jahn, W. N. Vreeland, L. E. Locascio, J. J. Kasianowicz, M. Gaitan "Liposome characterization using fluorescence cumulant analysis," ACS Fall Meeting, Boston, MA, August 18, 2007
- J. E. Reiner, R. B. Kishore, T. Albanetti, S. Peery, A. Knipe, A. Sheets, N. Boire, K. Deckman, B. Levin, "A methodology to separate single cells and single mitochondria to determine the location of heteroplasmy in mitochondrial DNA," APS March Meeting, Baltimore, MD, March 12, 2006.
- J. E. Reiner, A. M. Crawford, R. B. Kishore, K. Helmerson, "Single molecule detection in optically trapped nanocontainers," BioImage Summer School, ENS, Paris, France, July 12, 2005.
- J. E. Reiner, A. M. Crawford, R. B. Kishore, K. Helmerson, "Single molecule detection in optically trapped nanocontainers," Biophysical Society Annual Meeting, Long Beach, CA Feb. 10, 2005.
- J. E. Reiner, R. B. Kishore, C. Pfefferkorn, J. Wells, K. Helmerson, L. E. Locascio, "Stable polymer nanotubes from polymersomes," Biophysical Society Annual Meeting, Long Beach, CA Feb. 9, 2005.
- J. E. Reiner, R. B. Kishore, C. Pfefferkorn, J. Wells, K. Helmerson, P. Howell, W. Vreeland, S. Forry, L. E. Locascio, D. Reyes-Hernandez, M. Gaitan, "Optical Manipulation and formation of lipid and polymer nanotubes," SPIE optical technology meeting, Denver, CO August 17, 2004.
- J. E. Reiner, F. M. Dimler, L. A. Orozco, "Continuous cold atom beam for cavity QED studies," Quantum Electronics and Laser Science Conference, Baltimore, MD May 15, 2003.
- J. E. Reiner, W. P. Smith, H.M. Wiseman, L. A. Orozco, "Feedback with conditional measurements in cavity QED," 8<sup>th</sup> Conference on Coherence and Quantum Optics, Rochester, NY, June 15, 2001.
- J. Reiner, W. D. Goodhue, A. S. Karakashian, "Analysis of molecular beam epitaxy grown  $\text{Ga}_{1-x}\text{Al}_x\text{As}/\text{Ga}_{1-y}\text{Al}_y\text{As}$  dielectric mirrors using complex indices of refraction," New England Sectional meeting of the APS, Brown University, RI, Oct. 10, 1995.