

Kristen Delane Alexander

Curriculum Vitae

2894 South Coast Highway #3
Laguna Beach, CA 92651
USA

kristen@einsteinslighthouse.com

T: +1 (949) 244-8194

Education:

2011: PhD in Physics, University of North Carolina, Chapel Hill, NC, USA
Dissertation Title: *“Fundamentals and Technology of Surface Raman Enhancement”*

2007: MSc in Physics, University of North Carolina, Chapel Hill, NC, USA
Project Title: *“The Effects of Phosphoric Acid as an Etchant on Multi-walled Nanotubes”*

2003: BSc (1st class Hon) in Physics and Mathematics, University of Sydney, Department of Physics and Astronomy, NSW, Australia

2002: Russian Language Certificate, Saint Petersburg State University, Saint Petersburg, Russia

Employment:

2013-Present: Owner and Private Tutor – Einstein’s Lighthouse, Laguna Beach, CA

2013-2014: Freelance Scientific Editor – CACTUS Communications, Philadelphia, PA

2013-2014: Private Math and Science Tutor – Varsity Tutors, Los Angeles, CA

2012-2013: English Language Instructor for Chinese-speakers (CEC), Chapel Hill, NC

2011-2012: Postdoctoral Research Fellow – University of Notre Dame, Department of Chemistry and Biochemistry

2011: Postdoctoral Research Fellow – University of North Carolina at Chapel Hill, Department of Physics and Astronomy

2005-Present: Freelance Scientific Editor – ETP Editing Services, Chapel Hill, NC

2005-2011: Graduate Research Associate – University of North Carolina at Chapel Hill, Department of Physics and Astronomy, Chapel Hill, NC, USA

2004-2005: Physics and Mathematics Instructor – Army Education Center, Fort Campbell, KY, USA

2000-2002: Undergraduate Research Associate – University of Sydney, Department of Physics and Astronomy, NSW, Australia

1999-2000: Undergraduate Research Associate – University of Californian, Department of Physics, Berkeley, CA, USA

Teaching Experience:

2013-Present: Private Math and Science Tutor – Einstein’s Lighthouse, Laguna Beach, CA

2013-2014: Private Math and Science Tutor – Varsity Tutors, Los Angeles, CA

2012-2013: English language tutor for Chinese-speakers (CEC)

2005-2010: Teaching Assistant, PHYS 104, 105, 211, 201, 301, 311, 321 – intermediate and senior level physics lecture courses (UNC-CH)

2009: Teaching Fellow, PHYS 100 – introductory physics course for non-majors (UNC-CH)

2004-2005: Instructor, PHYS 1005, MATH 1710 – Introductory level physics and mathematics courses (Army Education Center, Fort Campbell Army Post)

2001-2003: Teaching Assistant, PHYS 1001/1A, 1002/1B – junior level physics courses (University of Sydney)

Research:

- Targeted attachment of conjugated nanoparticles to specific integrins in the plasma membrane of cells through the use of antibodies and peptides
- Spectral probing of targeted cell membrane proteins via phase feedback tip-enhanced Raman spectroscopy towards the detection of mutant integrins in metastatic colon cancer cells
- Metal nanowire fabrication via electrochemistry
- Fabrication of SERS-active nanoparticle structures
- Controlled placement of nanoparticle structures using capillary force deposition techniques
- Detection and measurement of SERS signal arising from “hot spots” via Raman mapping
- Manipulation of nanoparticle position via strain variation on elastomeric substrates
- Study of the nanoparticle optical coupling and its relationship with structural morphology.
- Nanoelectromechanical system fabrication and development towards the study of inter-shell tribology in carbon nanotubes
- Deposition of and electrical measurement across individual multi-walled carbon nanotubes
- Low-signal electrical characterization of changing systems
- Study of chemical etchant effects on transport properties of carbon nanotubes and highly ordered pyrolytic graphite sheets

Specialized Technical Skills:

- Phase feedback Tip enhanced Raman spectroscopy
- Nanoparticle peptide and antibody conjugation via EDC chemistry

- Electron microscopy
- AFM microscopy
- Focused ion beam nanofabrication
- Integrated design and maintenance of Raman microscope
- Sample Processing Techniques: single- and multi-layer optical and electron beam lithography, wet and dry etching, thin film deposition (thermal, electron beam, plasma sputtering), critical point drying
- Energy Dispersive X-ray spectroscopy (EDAX system)
- Finite Element Method (COMSOL)
- Finite Difference Time Domain Method (FDTD)
- Generalized Mie Theory
- Electrochemical growth of heterogeneous nanorods and wires
- Nanoparticle synthesis
- Elastomer preparation techniques
- Self assembled monolayer deposition of organic molecules
- Micro- and Nanoelectromechanical system (MEMS and NEMS) design

Society Membership:

American Physical Society (APS)
 American Chemical Society (ACS)
 American Association of Physics Teachers
 SPIE
 Materials Research Society
 Sigma Delta Epsilon/Graduate Women in Science (SDE/GWIS)

Publications:

Alexander, K.D. Schultz, Z.D., *Tip-Enhanced Raman Detection of Antibody Conjugated Nanoparticles on Cellular Membranes*, Analytical Chemistry, 2012, 7408-7414

Alexander, K.D. et al, *Relationship between Length and Surface-Enhanced Raman Spectroscopy Signal Strength in Metal Nanoparticle Chains: Ideal Models versus Nanofabrication*, Journal of Nanotechnology, 2012, Journal of Nanotechnology, 2012 (2012), 840245

Alexander, K.D. et al, *Tunable SERS in Gold Nanorod Dimers Through Strain Control on an Elastomeric Substrate*, 2010, Nano Letters, 10, 11, 4488-4493

Alexander, K. D. et al, *A High Throughput Method for Controlled Hot Spot Fabrication in SERS-Active Gold Nanoparticle Dimers*, 2009, Journal of Raman Spectroscopy, 40, 12, 2171-2175

Zijlstra A. A. et al, *Period and chemical evolution of SC star*, 2004, Monthly Notices of the Royal Astronomical Society, 352, 325

Presentations:

Targeted TERS studies of adhesion proteins in cancer cell membranes using functionalized Au nanoparticles, Gordon Research Conference, Noble Metal Nanoparticles, Mount Holyoke College, South Hadley, MA 2012

Probing the SERS Gap Dependence Through Controlled Nanoparticle Positioning, Federation of Analytical Chemistry and Spectroscopy Society, Raleigh, NC, October 2010 (oral session)

Propagating Plasmons on Metal Nanowires, SPIE Optics+Photonics, San Diego, CA, August 2010 (oral session)

Probing the SERS Gap Dependence Through Controlled Nanoparticle Positioning, Materials Research Society Fall Meeting, Boston, MA, December 2010 (oral session)

Controlled Interparticle Gap Tuning for SERS-active Structures on Elastomeric Substrates, **K. Alexander**, A. Dhawan, S. Zhang, H. X. Xu, R. Lopez, MRS Fall Meeting, Boston, MA, December 2, 2009

Nanosphere Templating Through Controlled Evaporation: A High Throughput Method for Building SERS Substrates, American Physical Society March Meeting, Pittsburgh, PA, March 18, 2009 (oral session)

Nanosphere Templating Through Controlled Evaporation: A High Throughput Method for Building SERS Substrates, **K. Alexander**, American Physical Society March Meeting, Pittsburgh, PA, March 18, 2009

Community Outreach:

2008-2009: Program Leader, NC-HCAP Science Enrichment Program (UNC-CH)

2006-present: Mentor, Women and Math Mentoring Association

References:

Available by request