

## Kristin L. Wustholz, Ph.D.

Department of Chemistry  
Northwestern University  
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### EDUCATION

Northwestern University (Evanston, IL)	2008 – present
Postdoctoral Fellow Advisor: Professor Richard P. Van Duyne	
University of Washington (Seattle, WA)	2002 – 2007
Ph.D. in Chemistry with Nanotechnology Advisors: Professors Philip J. Reid and Bart Kahr	
University of Washington (Seattle, WA)	2002 – 2004
M.S. in Chemistry	
Muhlenberg College (Allentown, PA)	1998 – 2002
B.A.S. in Chemistry and Philosophy, <i>cum laude</i>	

### RESEARCH EXPERIENCE

Surface-enhanced Raman spectroscopy (SERS), plasmonics, single-molecule SERS, and spectroelectrochemistry. Advisor: Prof. Richard P. Van Duyne; Department of Chemistry, Northwestern University	2008 – present
Single-molecule microscopy of fluorophores in mixed crystals. Advisors: Profs. Bart Kahr and Philip J. Reid; Department of Chemistry, University of Washington	2002 – 2007
Superoxide production from activated carbon in solution. Advisor: Dr. David Bjorkquist; PUR®, Procter & Gamble, Mason, OH	2002
Laser-initiated esterification, anhydride-, and amide-formation reactions. Advisor: Prof. Bruce Anderson; Department of Chemistry, Muhlenberg College	2001 – 2002
Ultrafast spectroscopic analysis of cobalt-carbon bond homolysis in fluorescent vitamin B <sub>12</sub> derivatives. Advisor: Prof. Roseanne J. Sension; Department of Chemistry, University of Michigan, Ann Arbor	2001

## Kristin L. Wustholz, Ph.D.

Development of undergraduate labs for Diels-Alder and asymmetric alkylation of chiral oxazolines. Advisor: Prof. Marsha Baar; Department of Chemistry, Muhlenberg College 2000 – 2001

### TEACHING EXPERIENCE

*Instructor*, Chemistry 348-0: Physical Chemistry, lectures on kinetics and single-molecule spectroscopy for Prof. Van Duyne 2009

*Private Tutor*, Organic and General Chemistry, Nanotechnology 2008 – present

*Research Mentor*, Supervised undergraduates during two 10-week sessions of the Research Experience for Undergraduates (REU) program; University of Washington 2005 – 2006

*Teaching Assistant*, Physical Chemistry, supervised labs, created quizzes, graded exams and reports; University of Washington 2002 – 2005

*Teaching Assistant*, Organic Chemistry, conducted pre-laboratory discussions, recitations, and monthly exam review sessions; graded exams and lab reports; University of Washington 2003

*Certified Peer Tutor*, Academic Services, Muhlenberg College 2000 – 2002

### SERVICE

“*Nano Scout Day*” Outreach Program volunteer, International Institute for Nanotechnology, Northwestern University 2008 – 2009

“*Hooked on Photonics*” REU Program Coordinator, Selected participants, arranged program logistics, calendar, social events, and served as Associate Editor for publications. Supervisors: Dr. Glen Shen, Dr. Jeanne Small, and Prof. Philip J. Reid; Science and Technology Center on Materials and Devices for Information Technology Research (STC-MDITR), University of Washington 2004 – 2006

Education Advisory Committee; STC-MDITR, University of Washington 2006

Education Committee; Nanotechnology and Nanoscience Student Association, University of Washington 2005 – 2006

### FELLOWSHIPS AND AWARDS

ACS Award for Excellence in Postdoctoral Research 2009

University of Washington Initiatives Fund Graduate Fellowship 2006 – 2007

STC-MDITR Graduate Travel Grant 2006

## Kristin L. Wustholz, Ph.D.

NSF-IGERT Graduate Fellowship	2006
STC-MDITR Graduate Fellowship	2005
REU Fellowship, University of Michigan, Ann Arbor	2001
Bob and Carolyn Buzzard Fellowship, Muhlenberg College	2001
Presidential Merit Scholarship, Muhlenberg College	1998 – 2002
Dana Associates Scholarship, Muhlenberg College	1998 – 2002
PennColor Corporation Chemistry Scholarship	1998

### PUBLICATIONS

17. C. L. Brosseau, **K. L. Wustholz**, N. Greeneltch, R. P. Van Duyne, "Electrochemical and Surface-Enhanced Raman Spectroscopy Studies of the Adsorption of trans-1,2-bis(4-pyridyl)ethylene at a Silver Film-Over-Nanosphere (AgFON) Surface" Journal of Analytical Chemistry, in preparation (2009).
16. **K. L. Wustholz**, A.-I. Henry, M. E. Piotti, R. G. Freeman, M. J. Natan, G. C. Schatz, R. P. Van Duyne, "Correlated Single-Nanoparticle Spectroscopy and Transmission Electron Microscopy of Individual SERS Nanotags" Proceedings of the National Academy of Sciences, invited, in preparation (2009).
15. A.-I. Henry, **K. L. Wustholz**, S. L. Kleinman, R. P. Van Duyne, "Plasmonic Nanostructures for Surface-Enhanced Raman Spectroscopy," Chemical Reviews, invited, in preparation (2009).
14. **K. L. Wustholz**, A.-I. Henry, J. M. Bingham, S. L. Kleinman, R. G. Freeman, M. J. Natan, R. P. Van Duyne, "Exploring single-molecule SERS and single-nanoparticle plasmon microscopy," Proceedings of SPIE-The International Society for Optical Engineering, 7394, 739403 (2009).
13. K. M. Kosuda, J. M. Bingham, **K. L. Wustholz**, R. P. Van Duyne, "Nanostructures and Surface-Enhanced Raman Spectroscopy," Comprehensive Nanoscience and Technology, T. Odom, G. Wiederrecht, Eds., Elsevier, in press, (2009).
12. A. Barbon, E. D. Bott, M. Brustolon, M. Fabris, B. Kahr, W. Kaminsky, P. J. Reid, S. M. Wong, **K. L. Wustholz**, R. Zanré, "Triplet States of the Non-Linear Optical Chromophore DCM in Single Crystals of Potassium Hydrogen Phthalate and Their Relationship to Single-Molecule Dark States," Journal of the American Chemical Society, 131, 11548-11557, (2009).
11. **K. L. Wustholz**, C. L. Brosseau, F. Casadio, R. P. Van Duyne "Surface-Enhanced Raman Spectroscopy of Dyes: from Single Molecules to the Artists' Canvas," Physical Chemistry Chemical Physics, 11, 7350-7359, (2009); Cover article.
10. J. McMahon, A.-I. Henry, **K. L. Wustholz**, M. Natan, G. Freeman, R. P. Van Duyne, G. C. Schatz, "Gold Nanoparticle Dimer Plasmonics: Finite Element Method Calculations

## Kristin L. Wustholz, Ph.D.

of the Electromagnetic Enhancement to Surface-Enhanced Raman Spectroscopy,” Analytical and Bioanalytical Chemistry, 394, 1819-1825, (2009).

9. J. A. Dieringer, **K. L. Wustholz**, D. J. Masiello, J. P. Camden, S. L. Kleinman, G. C. Schatz, R. P. Van Duyne, “Surface-Enhanced Raman Excitation Spectroscopy of a Single Rhodamine 6G Molecule,” Journal of the American Chemical Society, 131, 849-854, (2009).

8. T. Bullard, **K. L. Wustholz**, E. D. Bott, M. Robertson, P. J. Reid, and B. Kahr, “Role of Kinks in Dyeing Crystals: Confocal Luminescence Microscopy from Single Molecules to Square Centimeters,” Crystal Growth and Design, 9, 982-990, (2009).

7. **K. L. Wustholz**, D. R. B. Sluss, B. Kahr, and P. J. Reid, “Single-Molecule Microscopy Studies in Dyed Composite Materials,” International Reviews in Physical Chemistry, 27, 167-200 (2008).

6. **K. L. Wustholz**, E.D. Bott, B. Kahr, and P. J. Reid, “Memory and Spectral Diffusion in Single-Molecule Emission,” Journal of Physical Chemistry C, 112, 7877-7885 (2008).

5. **K. L. Wustholz**, E. D. Bott, C. M. Isborn, X. Li, B. Kahr, and P. J. Reid, “Dispersive Kinetics from Single Molecules Oriented in Single Crystals of Potassium Acid Phthalate,” Journal of Physical Chemistry C, 111, 9146-9156 (2007).

4. **K. L. Wustholz**, B. Kahr, and P. J. Reid, “Single-Molecule Orientations in Dyed Salt Crystals,” Journal of Physical Chemistry B, 109, 16357-16362 (2005).

3. M. R. Baar and **K. L. Wustholz**, “Diels-Alder Synthesis of endo-cis-N-phenylbicyclo[2.2.2]oct-5-en-2,3-dicarboximide,” Journal of Chemical Education, 82, 1393-1394 (2005).

2. M. R. Baar, C. E. Russell, and **K. L. Wustholz**, “The Ethylene Ketal Protecting Group Revisited: The Synthesis of 4-hydroxy-4,4-diphenyl-2-butanone,” Journal of Chemical Education, 82, 1057-1058 (2005).

1. D. W. Bjorkquist, D.I. Collias, M. D. Mitchell, S. A. Cummins, T. J. Wehmeier, H. A. Frederick, and **K. L. Wustholz**, “Contributions of Proton and Electron Transfer to Carbon Basicity,” Carbon 2005 Conference Proceedings, Gyeongju, Korea (2005).

## ABSTRACTS

**K. L. Wustholz**, J. A. Dieringer, D. J. Masiello, J. P. Camden, S. L. Kleinman, G. C. Schatz, R. P. Van Duyne, “Surface-enhanced Raman excitation spectroscopy of a single rhodamine 6G molecule,” Abstracts of Papers of the American Chemical Society, 238, (2009).

R. P. Van Duyne, **K. L. Wustholz**, “SERS for Homeland Security Applications,” Abstracts of Papers of the American Chemical Society, 232, (2009).

**K. L. Wustholz**, B. Kahr, and P. J. Reid, “Single-Molecule Orientations and Photophysics in Dyed Salt Crystals,” Abstracts of Papers of the American Chemical Society, 232, (2006).

## Kristin L. Wustholz, Ph.D.

**K. Wustholz** and B.D. Anderson, "Carbon Dioxide Laser Enhancement of Anhydride Formation from a Solution of Maleic Acid and Methanol," Abstracts of Papers of the American Chemical Society, 224, (2002).

### PRESENTATIONS

- "SERS for Homeland Security Applications," American Chemical Society National Meeting; Washington D.C. 2009
- "Single-Molecule Surface-Enhanced Raman Excitation Spectroscopy of a Single Rhodamine 6G Molecule", Postdoctoral Research Highlights, American Chemical Society National Meeting; Washington D.C. 2009
- "Single-Molecule Spectroscopy of Nanostructured Materials," Department of Chemistry and Biochemistry; Oregon State University 2008
- "Dispersive Kinetics from Single Molecules Oriented in Salt Crystals," Chemical Bonding Center; University of California, Irvine 2007
- "Dispersive Kinetics from Single Molecules Oriented in Salt Crystals," Department of Chemistry; Kobe University, Japan 2007
- "Twinkle, Twinkle, Single Molecule, How I Wonder Why You Blink?: Photophysics of Single Molecules in Crystals," Nanotechnology Student Seminar; University of Washington 2007
- "Blinking Dynamics of Single Molecules in Crystals," Photonics Seminar; University of Washington 2007
- "Single-Molecule Orientations and Photophysics in Dyed Salt Crystals," American Chemical Society National Meeting; San Francisco, CA 2006
- "Single-Molecule Nanoreporters in Dyed Salt Crystals," Nanotechnology Student Seminar; University of Washington 2005
- "Confocal Microscopy of Dyed Single Crystals," Bioengineering Student Seminar; University of Washington 2004

### POSTERS

- "Surface-Enhanced Raman Excitation Spectroscopy of a Single Molecule," Western Spectroscopy Association Conference; Monterey, CA 2009
- "New Isotope-Edited Chromophores for Single-Molecule Surface Enhanced Resonance Raman Spectroscopy," Materials Research Science and Engineering Center Annual Meeting; Evanston, IL 2008
- "Wavelength-Scanned Single-Molecule Surface Enhanced Raman Spectroscopy," Gordon Conference on Vibrational Spectroscopy; South Hadley, MA 2008

## Kristin L. Wustholz, Ph.D.

- “Power-Law Blinking Behavior of Single Molecules in Crystal and Polymer Matrices,” STC-MDITR Annual Retreat; University of Washington 2007
- “Single-Molecule Orientations and Photophysics in Dyed Salt Crystals,” STC-MDITR Annual Retreat, (3<sup>rd</sup> place award); University of Arizona, Tuscon, AZ 2006
- “Single-Molecule Microscopy Studies of Chromophore Alignment in Crystal Hosts,” STC-MDITR Annual Retreat, (2<sup>nd</sup> place award); Georgia Institute of Technology, Atlanta, GA 2005
- “Single-Molecule Microscopy Studies of Chromophore Alignment in Crystal Hosts,” 52<sup>nd</sup> Annual Western Spectroscopy Association Conference; Asilomar Conference Grounds, Monterey, CA 2004
- “Ultrafast Spectroscopy of Cobalafluors,” Ohio-Michigan NSF-REU Undergraduate Research Symposium; John Carroll University, University Heights, OH 2001

### PERSONAL INTERESTS

Choir, piano, cooking, volleyball, kickboxing, yoga, football, <http://www.lasertastic.com>.

### REFERENCES

#### **Professor Richard P. Van Duyne**

Department of Chemistry  
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#### **Professor Bart Kahr**

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