October 1, 2004

ROBERT M. DICKSON
CURRICULUM VITAE

Educational Background:

B.S.	Chemistry	1991	Haverford College
Ph.D.	Physical Chemistry	1996	University of Chicago

Employment History:

Graduate Teaching Assistant, University of Chicago	1992-1993
Postdoctoral Fellow, Chemistry, UC-San Diego	1996-1998
Assistant Professor, Chemistry & Biochemistry, Georgia Tech	1998-2003
Associate Professor, Chemistry & Biochemistry, Georgia Tech	2003-Present

Current Fields of Interest:

Single molecule spectroscopy, fluorescence and Raman microscopy, laser spectroscopy and dynamics, nanoparticle synthesis and photophysics, optical data storage, single molecule electroluminescence and nanoscale/molecular electronics, biolabeling.

Honors and Awards:

- Visiting Lecturer, National Science Council, Taiwan, December, 2003
- Camille Dreyfus Teacher-Scholar Award, 2002.
- Blanchard Assistant Professor, 2001.
- Alfred P. Sloan Foundation Fellow, March, 2001.
- National Science Foundation, Faculty Early CAREER Award, February 2000.
- Research Corporation, Research Innovation Award, September 1999.
- Phi Beta Kappa, 1991

Current Funding:

- **National Institutes of Health, General Medical Sciences** – "R01-GM068732 – Dendrimer and peptide encapsulated fluorescent Ag nanodots" – Role: PI/PD
- **National Institutes of Health, Roadmap Initiative Center** – "P20-GM072021 – Single molecule Raman probes for *in vivo* imaging" – Role: PI/PD
- **National Science Foundation**, Division of Engineering – "Biophotonics: Genetically encodable single molecule fluorescence" – Role: PI/PD
- **Dreyfus Foundation** – "Single molecule electroluminescence" – Role PI/PD.
- **Sloan Foundation** – "Nanoclusters for optical data storage" – Role PI/PD.
- **Vassar-Woolley Foundation** – Role PI/PD.
- **DURIP** – "Acquisition of a dual beam focused ion beam (DB-FIB) microscope" – Role Co-PI
- **National Science Foundation**, Chemistry Research Instrumentation Facilities – "Acquisition of a dual beam FIB/SEM instrument" – Role Co-PI

Publications:

52. L. A. Peyser, J. Zheng, and R. M. Dickson, "Nanoparticle-Free Single Molecule Antistokes Raman Spectroscopy", *Submitted to Phys. Rev. Lett.* (2004).
51. J. I. Gonzalez, T.-H. Lee, M. D. Barnes, Y. Antoku, and R. M. Dickson, "Nonclassical single gold nanocluster electroluminescent light source at room temperature", *Phys. Rev. Lett.*, **93**, 147402 (2004).
50. T-H. Lee, J. Zheng, J. I. Gonzalez, and R. M. Dickson "Single molecule optoelectronics", *Accounts Chem. Res.*, **In Press** (2004).
49. P. Kumar, M. D. Dadmun, A. Mehta, R. M. Dickson, M. D. Barnes, "Effect of solvent on the collapse and orientation of conjugated polymer chains", *Poly. Prepr.*, **45**, 165-166 (2004).
48. J. Zheng, C. Zhang, and R. M. Dickson, "Highly fluorescent, water-soluble, size-tunable gold quantum dots", *Phys. Rev. Lett.*, **93**, 077402 (2004).
47. T.-H. Lee and R. M. Dickson, "Nanocomputing with Nanocrystals", *Optics and Photonics News*, **15**, 22-27 (2004).
46. J. T. Petty, J. Zheng and R. M. Dickson, "DNA Templated Ag Nanocluster Formation", *J. Amer. Chem. Soc.*, **126**, 5207-5212 (2004).
45. T.-H. Lee and R. M. Dickson, "Single Molecule LEDs from Nanoscale Electroluminescent Junctions", *J. Phys. Chem. B*, **107**, 7387-7390 (2003).
44. P. Kumar, T-H. Lee, R. M. Dickson, A. Mehta, B. G. Sumpter, M. D. Barnes, "Photon antibunching from oriented semiconducting polymer nanostructures", *J. Amer. Chem. Soc.*, **126**, 3376-3377 (2004).
43. J. Zheng, J. T. Petty, and R. M. Dickson, "High Quantum Yield Blue Emission from Water-Soluble Au_8 Nanodots", *J. Amer. Chem. Soc.*, **125**, 7780-7781 (2003).
42. T-H. Lee, R. M. Dickson, P. Kumar, A. Mehta, M. D. Barnes, "Photon antibunching from a single oriented semiconducting polymer nanostructure", *Appl. Phys. Lett.* **85**, 100-102 (2004).
41. T.-H. Lee, C. R. Hladik, and R. M. Dickson, "Facile, on-demand electronic nanodevice fabrication from photo and electro-active silver oxide", *Appl. Phys. Lett.*, **84**, 118-120 (2004).
40. T.-H. Lee, C. R. Hladik, and R. M. Dickson, "Asymmetric photoconductivity within nanoscale break junctions", *NanoLett.*, **3**, 1561-1564 (2003).
39. P. Kumar, A. Mehta, M. D. Dadmun, J. Zheng, L. Peyser, A. P. Bartko, R. M. Dickson, T. Thundat, B. G. Sumpter, and M. D. Barnes, "Narrow-bandwidth spontaneous luminescence from oriented semiconducting polymer nanostructures", *J. Phys. Chem. B*, **107**, 6252-6257 (2003).
38. A. Mehta, P. Kumar, M. D. Dadmun, J. Zheng, R. M. Dickson, T. Thundat, B. G. Sumpter, and M. D. Barnes, "Oriented Nanostructures from Single Molecules of a Semiconducting Polymer: Polarization Evidence for Highly Aligned Intramolecular Geometries", *Nanolett.*, **3**, 603-607 (2003).
37. A. Mehta, T. Thundat, M. D. Barnes, V. Chabra, R. Bhargava, A. P. Bartko, R. M. Dickson, "Size-correlated spectroscopy and imaging of rare-earth-doped nanocrystals", *Appl. Opt.*, **42**, 2132-2139 (2003).
36. T.-H. Lee and R. M. Dickson, "Discrete two-terminal single nanocluster quantum optoelectronic logic operations at room temperature", *Proc. Nat. Acad. Sci. USA*, **100**, 3043-3046 (2003).

35. A. Mehta, P. Kumar, J. Zheng, R. M. Dickson, B. Sumpter, and M. D. Barnes, "Oriented luminescent nanostructures from single molecules of conjugated polymers", Mater. Res. Soc. Symp. Proc., **771**, 301-305 (2003)
34. J. Zheng and R. M. Dickson, "Individual Water-Soluble Dendrimer-Encapsulated Silver Nanodot Fluorescence", *J. Amer. Chem. Soc.*, **124**, 13982-13983 (2002).
33. T.-H. Lee, J. I. Gonzalez, and R. M. Dickson, "Strongly Enhanced Field Dependent Single Molecule Electroluminescence", *Proc. Nat. Acad. Sci. USA*, **99**, 10272-10279 (2002).
32. A. P. Bartko, K. Xu, R. M. Dickson, "Three-Dimensional Single Molecule Rotational Diffusion in Glassy State Polymer Films", *Phys. Rev. Lett.*, **89**, 026101/1-026101/4 (2002).
31. L. A. Peyser, T.-H. Lee, R. M. Dickson, "Mechanism of Ag_n Nanocluster Photoproduction from Silver Oxide Films", *J. Phys. Chem. B*, **106**, 7725-7728 (2002).
30. A. P. Bartko, L. A. Peyser, R. M. Dickson, A. Mehta, T. Thundat, R. Bhargava, and M. D. Barnes, "Observation of dipolar emission patterns from isolated Eu^{3+}:Y_2O_3 doped nanocrystals: New evidence for single ion luminescence", *Chem. Phys. Lett.*, **358**, 459-465 (2002).
29. L. A. Peyser, T.-H. Lee, R. M. Dickson, "Harnessing Single Particle Dynamics in Silver Nanomaterials", *Proc. SPIE-Int. Soc. Opt. Eng.*, **4636**, 81-87 (2002).
28. L. A. Peyser, A. E. Vinson, A. P. Bartko, and R. M. Dickson, "Photoactivated Fluorescence from Individual Silver Nanoclusters", *Science*, **291**:103-106 (2001).
27. J. C. Quirin, A. P. Bartko, R. M. Dickson, J. M. Torkelson, "Signature of nanoscale dynamic heterogeneity in polymers near the glass transition: non-Gaussian displacement distribution from single-molecule probe diffusion studies", *Polym. Prepr. Amer. Chem. Soc.*, **42**, 174 (2001).
26. R. M. Dickson and L. A. Lyon, "Unidirectional Plasmon Propagation in Metallic Nanowires", *J. Phys. Chem. B*, **104**, 6095-6098 (2000).
25. A. P. Bartko and R. M. Dickson, "Imaging Three-Dimensional Orientations of Single Molecules", *J. Phys. Chem. B*, **103**, 11237-11241 (1999).
24. A. P. Bartko and R. M. Dickson, "Three-Dimensional Orientations of Polymer-Bound Single Molecules", *J. Phys. Chem. B* **103**, 3053-3056 (1999).
23. "Transmitted Light Confocal Microscope", Patent applied for.
22. "Water-Soluble Photoactivated Metal Nanodots for Single Molecule Biological Labeling", Patent pending.
21. "Two-terminal quantum electronic logic gates", Patent applied for.
20. "Color-Tunable Single Molecule Light Emitting Diodes", Patent applied for.
19. "Photoactivated Nanoparticle Fluorescence for Optical Data Storage", Patent applied for.
18. US Patent No. 6,539,156: "Apparatus and method of optical transfer and control in plasmon supporting metal nanostructures," Issued March 25, 2003.
17. M. Cordonnier, D. Uy, R. M. Dickson, K. E. Kerr, Y. Zhang, and T. Oka, "Selection rules for nuclear spin modifications in ion-neutral reactions involving H_3^+", *J. Chem. Phys.* **113**, 3181-3193 (2000).
16. R. M. Dickson, D. J. Norris, and W. E. Moerner, "Simultaneous Imaging of Individual Molecules Aligned Both Parallel and Perpendicular to the Optic Axis", *Phys. Rev. Lett.* **81**, 5322-5325 (1998).

15. R. M. Dickson, A. B. Cubitt, R. Y. Tsien, and W. E. Moerner, "On/Off Blinking and Switching Behaviour of Single Green Fluorescent Protein Molecules", *Nature*, **388**, 355-358 (1997).
14. R. M. Dickson, D. J. Norris, Y. L. Tzeng, and W. E. Moerner, "Three Dimensional Imaging of Single Molecules Solvated in the Pores of Polyacrylamide Gels", *Science*. **274**, 966-969 (1996).
13. W. E. Moerner, E. J. G. Peterman, S. Brasselet, S. Kummer, R. M. Dickson. "Optical methods for exploring dynamics of single copies of green fluorescent protein", *Cytometry*. **36**, 232-238 (1999).
12. S. Kummer, R. M. Dickson, and W. E. Moerner, "Probing Single Molecules in Polyacrylamide Gels", *Proc. SPIE-Int. Soc. Opt. Eng.*, **3273**, 165-173 (1998).
11. R. M. Dickson, and T. Oka, "Variation of Intermolecular Interaction and Local Lattice Distortion of Parahydrogen Crystals upon Vibrational Excitation", *Phys. Rev. B.* **57**, 950-957 (1998).
10. R. M. Dickson, T. Momose, T. J. Byers, and T. Oka, "High Resolution Spectroscopy of the Impurity Induced $Q_3(0)$ Transition of Solid Parahydrogen" *Phys. Rev. B.* **57**, 941-950 (1998).
9. W. E. Moerner, R. M. Dickson, and D. J. Norris, "Single Molecule Spectroscopy and Quantum Optics in Solids", *Adv. Atom., Molec., and Opt. Physics*. **38**, 193-236 (1997).
8. W. E. Moerner, R. M. Dickson, and D. J. Norris, "Single Molecule Nanophotonics in Solids. *Mat. Sci. and Eng. B.* **48**, 169-183 (1997).
7. R. M. Dickson, D. J. Norris, Y. L. Tzeng, R. Sakowicz, L. S. B. Goldstein, and W. E. Moerner, "Single Molecules Solvated in Pores of Polyacrylamide Gels", *Mol. Cryst. Liq. Cryst.*, **291**, 31-34 (1996).
6. R. M. Dickson, T. J. Byers, and T. Oka, "Direct Measurement of the Crystal Field Splitting of Isolated J=1 Impurities in Solid Parahydrogen", *J. Low Temp. Phys.* **102,** 241-243 (1996).
5. R. M. Dickson and T. Oka, "Observation of the $S_3(0)$ Transition in Solid Parahydrogen and a Theory of Solid State Rovibrational Linewidths", *J. Phys. Chem.* **99**, 2617-2627 (1995).
4. T. Momose, K. E. Kerr, D. P. Weliky, C. M. Gabrys, R. M. Dickson, and T. Oka, "Charge induced H_2 Spectrum in γ-ray irradiated para-H_2 crystals", *J. Chem. Phys.* **100**, 7840-7843 (1994).
3. D. P. Weliky, T. J. Byers, K. E. Kerr, T. Momose, R. M. Dickson, and T. Oka, "High-resolution laser spectroscopy of the $Q_V(0)$ transitions in solid parahydrogen", *Appl. Phys. B.* **59**, 265-276 (1994).
2. P. R. Rablen, M. A. Deuber, A. C. Lim, R. M. Dickson, and C. E. Wintner, "Cyclic Ketals of 9-Fluorenone", *J. Chem. Ed.*, **68**, 796-798 (1992).
1. U.S. Patent No. 6,046,925. "Photochromic Fluorescent Proteins and Optical Memory Storage Devices Based on Fluorescent Proteins." Issued April 4, 2000.

Invited Talks (1999-present):

64. Columbia University, Chemistry Department, November 4, 2004
63. Single Photon Sources, Optical Society of America Annual Meeting, San Francisco, CA, October 12, 2004
62. ARDA/ITIC Quantum Cryptography Research Conference, September 1, 2004

61. Multiphoton Excitation Users Meeting, Emory University, August 20, 2004
60. Single Photon Sources, CLEO/QELS, San Francisco, CA, May 20, 2004
59. Physical Chemistry of Interfaces and Nanomaterials III, SPIE Annual Meeting, Denver, CO, August 2004.
58. Gordon Research Conference – Bioanalytical Sensors, Queens College, Oxford, UK, July, 2004.
57. University of Minnesota, Chemical Engineering and Materials Science, February 10, 2004.
56. National Sun Yat Sen University, Optoelectronics Department, KaoHsiung, Taiwan, December 5, 2003.
55. Institute of Chemistry, Academia Sinica, Taipei, Taiwan, December 4, 2003.
54. National Tsing Hwa University, Chemistry Department, Hsinjhu, Taiwan, December 3, 2003.
53. National Taiwan University/Institute of Atomic and Molecular Sciences, Academia Sinica, Taipei, Taiwan, December 2, 2003.
52. University of California San Diego, Chemistry Department, November 25, 2003.
51. Yale University, Chemistry Department, November 4, 2003.
50. Duke University, Chemistry Department, October 31, 2003.
49. Emory University, Chemistry Department, September 22, 2003.
48. American Chemical Society, Annual Meeting, New York, NY, September 2003.
47. Unconventional Photoactive Systems: UPS'03, Leuven, Belgium, September 2003.
46. Physical Chemistry of Interfaces and Nanomaterials II, SPIE Annual Meeting, San Diego, CA, August 2003.
45. Gordon Research Conference – Photochemistry, Mount Holyoke College, South Hadley, MA, July, 2003.
44. American Chemical Society, Annual Meeting, New Orleans, LA, April 2003.
43. American Physical Society, Annual Meeting, Austin TX, March 2003.
42. Kansas State University, Chemistry Department, January 30, 2003.
41. University of Kansas, Chemistry Department, January 29, 2003.
40. University of California – Berkeley, Chemistry Department, January 21, 2003.
39. Hewlett-Packard, Advanced Technology Seminar, Corvallis, OR, November 13, 2002.
38. Stanford University, Chemistry Department, November 11, 2002
37. Duke University, Chemistry Department, November 1, 2002
36. University of North Carolina – Chapel Hill, Chemistry Department, October 31, 2002
35. University of Chicago, James Franck Institute, October 22, 2002
34. Harvard University, Chemistry Department, October 10, 2002
33. Physical Chemistry of Interfaces and Nanomaterials, SPIE Annual Meeting, Seattle, WA, July 2002.
32. Gordon Research Conference - Electronic Processes in Organic Materials, Newport, RI, July 2002.
31. Advances in Assays, Molecular labels, signaling & detection, Cambridge Healthtech Institute's 6th annual meeting, Washington DC, June 2002.
30. Conference on Lasers and Electro-Optics (CLEO 2002), Long Beach, CA, May 2002.
29. University of Washington - Seattle, Chemistry Department, April 2002
28. American Chemical Society, 223rd National Meeting, Orlando, FL, April 2002.
27. University of Illinois - Urbana-Champaign, Chemistry Department, March 13, 2002.

26. University of Maryland, Chemistry Department, February 13, 2002.
25. University of Texas - Austin, Chemistry Department, February 8, 2002.
24. Photonics West, International Society for Optical Engineering (SPIE). January 2002.
23. National Academy of Science: Thirteenth Symposium on Frontiers of Science, November 2001.
22. Optical Society of America, 2001 Fall Meeting, Long Beach, CA, October 2001.
21. National Taiwan University, Department of Chemistry, Taipei, Taiwan, June 2001
20. University of Pittsburgh, Chemistry Department, May 2001
19. Carnegie Mellon University, Data Storage Systems Center, Pittsburgh, PA, May 2001
18. Carnegie Mellon University, Chemistry Department, Pittsburgh, PA, May 2001
17. American Chemical Society, 221st National Meeting, San Diego, CA, April 2001.
16. Boston College, Chemistry Department, Boston, MA, March 2001
15. Kyoto University, Chemistry Department, Kyoto, Japan, March 2001.
14. 4th NAIR Workshop Ultrahigh-Density Optical Storage and Related Techniques, Tsukuba, Japan, March, 2001
13. American Physical Society, March 2001 National Meeting, Seattle, WA, March 2001.
12. Electrochemical Society, 199th Meeting, Washington, DC, March, 2001.
11. Materials Research Society, 2000 Fall Meeting, Boston, MA, November, 2000.
10. Materials Research Society, 2000 Fall Meeting, Boston, MA, November, 2000.
9. University of Notre Dame, Chemistry Department, Notre Dame, IN, November, 2000.
8. University of Florida, Physics Department, Gainesville, FL, November 2000.
7. Federation of Analytical Chemists and Spectroscopy Society, Nashville, TN, September 2000.
6. Oak Ridge National Laboratory, Knoxville, TN, March, 2000.
5. Quantitative Challenges in the Post-Genomic Sequence Era, Division of Biological Physics, American Physical Society, January 2000.
4. Inter-American Photochemistry Society, 11th Annual Meeting, Clearwater Beach, FL, January 2000.
3. Knowledge Foundation, Emerging Single Molecule Methods, Boston, MA, August, 1999.
2. Nations' Symposium: Frontiers in Photochemistry, Atlanta, GA, May 1999.
1. Atlanta Area Chemical Physics Seminar, Atlanta, GA, April, 1999.

Contributed Talks (1999-Present):

15. American Chemical Society, Annual meeting, Philadelphia, PA, August, 2004
14. Materials Research Society, 2003 Fall Meeting, Boston, MA, December 2003.
13. Gordon Research Conference – Clusters, Connecticut College, New London, CT, July, 2003.
12. Materials Research Society, 2003 Spring Meeting, San Francisco, CA, April 2003.
11. Materials Research Society, 2002 Spring Meeting, San Francisco, CA, April 2002.
10. Georgia Tech 2nd Annual Nanotechnology Conference, Atlanta, GA, September 2001.
9. American Chemical Society (2 papers), 221st National Meeting, San Diego, CA, April, 2001
8. American Physical Society, March 2001 National Meeting, Seattle, WA, March 2001.
7. Optical Society of America, 2000 Annual Meeting, Providence, RI, October, 2000.
6. Rocky Mountain Conference on Analytical Chemistry, Broomfield, CO, July, 2000.

5. Conference on Lasers and Electro-Optics/Quantum Electronics Laser Science (CLEO/QELS) 2000, San Francisco, CA, May, 2000.
4. American Physical Society (2 papers), Minneapolis, MN, March, 2000.
3. American Chemical Society, 218th National Meeting, New Orleans, LA, August, 1999.
2. International Conference on Photochemistry, Durham, NC, August, 1999.
1. American Physical Society, Centennial Meeting, Atlanta, GA, March, 1999.

Synergistic Activities:

Ad-hoc Reviewer and Participant, NIH – NHLBI study section, June, 2004

Program Committee and Session Chair, Physical Chemistry of Interfaces and Nanomaterials II, SPIE Annual Meeting, San Diego, CA, August 2003.

Ad-hoc Reviewer and Participant, NIH – BECM study section, June, 2003

Reviewer and Participant, NSF Review Panel, May 2003.

Ad-hoc Reviewer and Participant, NIH – BBCB study section, February, 2003

Organizer, Functional Nanostructured Materials through Multiscale Assembly and Novel Patterning Techniques, Materials Research Society Spring Meeting, San Francisco, CA (April 2002).

Organizer and Presenter, "*High Resolution Light Microscopy*" at the American Physical Society, Indianapolis, March 2002 (Division of Molecular, Optical and Atomic Physics)

Ad-hoc Reviewer and Participant, NIH – BECM study section, June, 2002

Session Chair, American Chemical Society, 221st National Meeting, San Diego, CA, April 2001

Session Chair, Electrochemical Society, 199th Meeting, Washington, DC, March, 2001

Session Chair, Materials Research Society, 2002 Spring Meeting, San Francisco, CA, April 2002

Session Chair, International Conference on Photochemistry, Durham, NC, August, 1999.

Reviewer for the following journals and granting agencies:

Physical Review Letters (~1/year)
Science (~1/year)
Nature Materials (~2/year)
Journal of Physical Chemistry (~5/yr)
Langmuir (~1/yr)
Optics Letters (~1/yr)
Chemistry of Materials (~3/yr)
Journal of the American Chemical Society (~5/yr)
Chemical Physics Letters (~2/yr)
National Science Foundation (~5 Proposals/yr)
National Institutes of Health (~10 Proposals/yr)
ACS – PRF (~2 Proposals/yr)