

# Christine K. Payne

Chemistry and Biochemistry  
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## Educational Background

1998 B.S. Chemistry University of Chicago  
2003 Ph. D. Chemistry University of California, Berkeley, Advisor: Charles Harris

## Employment History

2013- Associate Professor, Georgia Institute of Technology  
2007-2013 Assistant Professor, Georgia Institute of Technology  
2003-2006 Postdoctoral Fellow, Harvard University, Advisor: Xiaowei Zhuang  
1998-2000 Graduate Teaching Assistant, University of California, Berkeley

## Research Interests

Kinetics and mechanisms of intracellular reactions  
Interactions of nanoparticles with cells  
Biomolecular and cellular synthesis of conducting polymers  
Development of new fluorescence microscopy methods

## Professional Memberships and Service

2012 NIH Peer Review, NANO, ad hoc  
2011 Symposium Organizer, "Advanced Microscopy...Biophysical Questions," ACS Meeting, Denver  
2011-2012 Reviewer, Center for Integrated Nanotechnologies (CINT), Los Alamos National Laboratory  
2010 Chair, Biophysical Subdivision, Division of Physical Chemistry, ACS  
2009- NSF Peer Review: DMR and Chemistry  
2009 Symposium Organizer, "Single Molecule Biophysics," OSA Annual Meeting, San Jose  
2007- Co-Organizer, Atlanta Area Chemical Physics (AACP) Seminar Series  
2003- Biophysical Society, member  
1999- American Chemical Society, member

## Honors and Awards

2011 DARPA Young Faculty Award  
2009 NIH Director's New Innovator Award  
2008 ACS PROGRESS-Dreyfus Lectureship Award  
2007-2010 Research Scholar Development Award; NIH  
2004-2006 Ruth L. Kirschstein National Research Service Award; NIH Postdoctoral Fellowship  
1998 B.S. with Honors in the College and in Chemistry, University of Chicago

## Research Grants

Current NIH Director's New Innovator Award, October 2009-June 2014, \$2.3M Total/\$1.5M Direct  
DARPA Young Faculty Award, July 2011-June 2013, \$300K Total/\$175K Direct  
Completed NIH Research Scholar Development Award, April 2007-March 2010, \$268K Total/\$250K Direct  
NIH R01 with R. Dickson (P.I.), C. Fahrni, and M. Kemp, September 2008-July 2012

## Teaching

Courses Statistical Mechanics (CHEM 6481, Graduate) Spring 07, Spring 09, Fall 10, Fall 12  
Quantum Mechanics (CHEM 3412, Undergraduate) Spring 08, Fall 08, Fall 09, Fall 11, Spring 13  
General Chemistry (CHEM 1310, Undergraduate) Spring 11

REU	Jenna Tomlinson (2008, PhD student at University of Michigan), Solaire Finkenstaedt-Quinn (2009, PhD student at University of Minnesota), Syeda Anum (2011, research assistant at Beth Israel Deaconess), Ryan Lannan (2012), Quachel Bazile (2012)
B.S.	Former: Nicole Fay (2007-2008, PhD student at UC Berkeley), Jesse Haulk (2008), Kevin Hardin (2008-2009), Paul Park (2010), Heather Jekot (2010, MD student at MCG), Jessica Obermiller (2011), Joshua Liu (2010-2011), Kelsey Killion (2012), Jairo Zapata (2009-2012), Candace Law (2012), Son Tran (2012), Joseph Kim (2011-2012, technician at Medical Neurogenetics) Current: Hursh Sureka (CHBE, 2011-2013), Patrick Chen (Biochem, 2012-2013), Kaitlyn Willingham (CHBE, 2013), Chelsea Thompson (Biochem, 2013-), Nina Mohebbi (BME, 2013-)
M.S.	Melinda Ogden (2009)
Ph.D.	Former: William Humphries (2011, microscopy specialist at B&B Microscopes) Current: Candace Fleischer
Postdocs	Former: Ashlee St. John Iyer (2008-2009), Don-Ricardo Miller (joint with Prof. Melissa Kemp, BME, 2009-2010), Craig Szymanski (2009-2011, postdoc at PNNL), Gerard Doorley (2010-2012, consultant), Umesh Kumar (2011-2012), Steven Hira (2011-2013, postdoc with El-Sayed) Current: Saheli Sarkar (joint with Prof. Melissa Kemp, BME), Debjyoti Bandyopadhyay, Austin Cyphersmith, Alexandra Hill, Josh Morris, Srikant Iyer

### Selected Invited Seminars, 2009-2012

"Imaging dynamic events inside living cells," 2012 National Meeting of the American Chemical Society/Biomacromolecules Symposium, Philadelphia, Pennsylvania; August 20, 2012.

"Imaging chemical reactions inside living cells," Department of Chemistry, University of Chicago; May 22, 2012.

"Probing nanoparticle-cell interactions with fluorescence microscopy and single particle tracking," Translational and Molecular Imaging Institute, Mount Sinai School of Medicine, New York; March 16, 2012.

"Imaging chemical reactions inside living cells," Physical Chemistry Seminar, School of Chemistry, University of California, Berkeley; March 13, 2012.

"Imaging nanoparticle-cell interactions," Physical Chemistry Seminar, Department of Chemistry and Biochemistry, University of California, San Diego; March 6, 2012.

"Using fluorescence microscopy to image chemical reactions inside living cells," Cardiovascular Biology Seminar, Division of Cardiology, Emory School of Medicine, Atlanta, Georgia; February 13, 2012.

"Imaging chemical reactions inside living cells," Physical Chemistry Seminar, Department of Chemistry and Biochemistry, University of Colorado, Boulder; January 27, 2012.

"Imaging chemical reactions inside living cells," Department of Chemistry, University of Wisconsin, Madison; January 24, 2012.

"Imaging chemical reactions inside living cells," Department of Chemistry and Biochemistry, University of California, Los Angeles; January 9, 2012.

"Imaging chemical reactions inside living cells," Department of Chemistry, UIUC; November 30, 2011.

"Imaging chemical reactions inside living cells: Two-color single particle tracking of the enzymatic degradation of low-density lipoprotein (LDL)," 2011 National Meeting of the American Chemical Society, Denver, Colorado; August 29, 2011.

"Imaging chemical reactions inside living cells," Biophysics Colloquia, Cornell, Ithaca, New York; April 27, 2011.

"Imaging chemical reactions inside living cells," Department of Chemistry, New York University; April 5, 2011.

"Imaging dynamic events inside living cells: Intracellular degradation of LDL," Single Molecule Approaches to Biology, Optical Society of America, Rochester, New York; October 27, 2010.

"Imaging nanoparticles in living cells: Unraveling interactions at the nano-bio interface," Functionalized Nanobiomaterials for Medical Applications, MRS Workshop, Denver, Colorado; October 6, 2010.

"Kinetics and mechanism of intracellular reactions: Probing the degradation of LDL," 2010 National Meeting of the American Chemical Society, San Francisco, California; March 24, 2010.

"Non-scanning two-photon microscopy for imaging in live cells," Single Molecule Biophysics, Optical Society of America, San Jose, California; October 15, 2009.

### Publications (\* indicates Georgia Tech publication)

30.\* "Cellular binding of anionic nanoparticles is inhibited by serum proteins independent of nanoparticle composition," C.C. Fleischer, U. Kumar, C.K. Payne, *Biomaterials Science*, **1**, 975-982 (2013).

29.\* "Protein-mediated synthesis of the conducting polymer PEDOT:PSS," S.M. Hira and C.K. Payne, *Synthetic Metals*, **176**, 104-107 (2013).

28.\* "Membrane potential mediates the cellular binding of nanoparticles," E.H. Shin, Y. Li, U. Kumar, H.V. Sureka, X. Zhang, C.K. Payne, *Nanoscale*, **5**, 5879-5886 (2013).

27.\* "Conditioned media downregulates nuclear expression of Nrf2," S. Sarkar, C.K. Payne, M.L. Kemp, *Cellular and Molecular Bioengineering*, **6**, 130-137 (2013).

26.\* "Imaging intracellular quantum dots: Fluorescence microscopy and transmission electron microscopy," C.J. Szymanski, H. Yi, J.T. Liu, E.R. Wright, C.K. Payne, in *Nanobiotechnology Protocols*, Eds. S.J. Rosenthal and D.W. Wright (Humana Press, New York, 2013).

25.\* "Nanoparticle surface charge mediates the cellular receptors used by protein-nanoparticle complexes," C.C. Fleischer and C.K. Payne, *J. Phys. Chem. B*, **116**, 8901-8907 (2012).

24.\* "Imaging lysosomal enzyme activity in live cells using self-quenched substrates," W.H. Humphries and C.K. Payne, *Analytical Biochemistry*, **424**, 178-183 (2012).

23.\* "Nanoparticles act as protein carriers during cellular internalization," G.W. Doorley and C.K. Payne, *Chem. Commun.*, **48**, 2961-2963 (2012).

22.\* "Fluorescent coumarin thiols measure biological redox couples," K.G. Reddie, W.H. Humphries, C.P. Bain, M.L. Kemp, C.K. Payne, N. Murthy, *Org. Lett.*, **14**, 680-683 (2012).

21.\* "Endo-lysosomal vesicles positive for Rab7 and LAMP1 are terminal vesicles for the transport of dextran," W.H. Humphries, C.J. Szymanski, C.K. Payne, *PLoS One*, **6**, e26626 (2011).

- 20.\* "Single particle tracking as a method to resolve differences in highly colocalized proteins," C.J. Szymanski, W.H. Humphries IV, C.K. Payne, *Analyst*, **136**, 3527-3533 (2011). Featured in "Emerging Investigators" edition.
- 19.\* "Cellular binding of nanoparticles in the presence of serum proteins," G.W. Doorley and C.K. Payne, *Chem. Commun.*, **47**, 466-468 (2011). Featured in "Emerging Investigators" edition.
- 18.\* "Intracellular degradation of low-density lipoprotein probed with two-color fluorescence microscopy," W.H. Humphries IV, N.C. Fay, C.K. Payne, *Integrative Biology*, **2**, 536-544 (2010).
- 17.\* "Pyrenebutyrate leads to cellular binding, not intracellular delivery, of polyarginine quantum dots," A.E. Jablonski, T. Kawakami, A.Y. Ting, C.K. Payne, *J. Phys. Chem. Lett.*, **1**, 1312-1315 (2010).
- x.\* "Pyrenebutyrate-mediated delivery of quantum dots across the plasma membrane of living cells," A.E. Jablonski, W.H. Humphries IV, C.K. Payne, *J. Phys. Chem. B*, **113**, 405-408 (2009). Withdrawn. The conclusions drawn from the data in this manuscript were incorrect. A full discussion can be found in Publication #17.
- 16.\* "Imaging gene delivery with fluorescence microscopy," C.K. Payne, *Nanomedicine*, **2**, 847-860 (2007).
- 15.\* "Cellular binding, motion, and internalization of synthetic gene delivery polymers," G.T. Hess, W.H. Humphries IV, N.C. Fay, and C.K. Payne, *Biochim. Biophys. Acta, Mol. Cell Res.*, **1773**, 1583-1588 (2007).
14. "Internalization and trafficking of cell surface proteoglycans and proteoglycan-binding ligands," C.K. Payne, S.A. Jones, C. Chen, and X. Zhuang, *Traffic*, **8**, 389-401 (2007).
13. "Photo-induced  $\beta$ -hydrogen elimination and radical formation with  $\text{CpW}(\text{CO})_3(\text{CH}_2\text{CH}_3)$ : Ultrafast IR and DFT studies," E.A. Glascoe, M.F. Kling, J.E. Shanoski, R.A. DiStasio Jr., C.K. Payne, B.V. Mork, T.D. Tilley, and C.B. Harris, *Organometallics*, **26**, 1424-1432 (2007).
12. "Temperature-dependent UV-Vis spectral changes in hydrogen- and deuterium-bonded photosynthetic reaction centers of *Rhodobacter sphaeroides*," A.E. Ostafin, J.A. Popova, C.K. Payne, H. Mizukami, J.R. Norris, *Photosynthetica*, **44**, 433-438 (2006).
11. "Nanophotonic light sources for fluorescence spectroscopy and cellular imaging," O. Hayden and C.K. Payne, *Ang. Chem. Int. Ed.*, **44**, 1395-1398 (2005).
10. "Ultrafast infrared mechanistic studies of the interaction of 1-hexyne with Group 6 hexacarbonyl complexes," J.E. Shanoski, C.K. Payne, M.F. Kling, E.A. Glascoe, and C.B. Harris, *Organometallics*, **24**, 1852-1859 (2005).
9. "Ultrafast UV pump/IR probe studies of C-H activation in linear, cyclic, and aryl hydrocarbons," M.C. Asplund, P.T. Snee, J.S. Yeston, M.J. Wilkens, C.K. Payne, H. Yang, K.T. Kotz, H. Frei, R.G. Bergman, and C.B. Harris, *J. Am. Chem. Soc.* **124**, 10605-10612 (2002).
8. "Intramolecular rearrangements on ultrafast timescales: Femtosecond infrared studies of ring slip in  $(\eta^1\text{-C}_5\text{Cl}_5)\text{Mn}(\text{CO})_5$ ," C.K. Payne, P.T. Snee, H. Yang, K.T. Kotz, L.L. Schafer, T.D. Tilley, and C.B. Harris, *J. Am. Chem. Soc.* **123**, 7425-7426 (2001).
7. "Dynamics of photosubstitution reactions of  $\text{Fe}(\text{CO})_5$ : An ultrafast infrared study of high spin reactivity," P.T. Snee, C.K. Payne, S.D. Mebane, K.T. Kotz, and C.B. Harris, *J. Am. Chem. Soc.* **123**, 6909-6915 (2001).

6. "Femtosecond infrared study of the dynamics of solvation and solvent caging," H. Yang, P.T. Snee, K.T. Kotz, C.K. Payne, and C.B. Harris, *J. Am. Chem. Soc.* **123**, 4204-4210 (2001).
5. "Triplet organometallic reactivity under ambient conditions: An ultrafast UV pump/IR probe study," P.T. Snee, C.K. Payne, K.T. Kotz, H. Yang, and C.B. Harris, *J. Am. Chem. Soc.* **123**, 2255-2264 (2001).
4. "Ultrafast infrared studies of ligand rearrangement at coordinatively saturated transition metal centers," K.T. Kotz, H. Yang, P.T. Snee, C.K. Payne, and C.B. Harris, in *Ultrafast Phenomena XII*, Eds. T. Elsaesser, S. Mukamel, M.M. Murnane, and N.F. Scherer (Springer-Verlag, Berlin Heidelberg, 2000) p. 636.
3. "Femtosecond infrared studies of ligand rearrangement reactions: silyl hydride products from Group 6 carbonyls," K.T. Kotz, H. Yang, P.T. Snee, C.K. Payne, and C.B. Harris, *J. Organomet. Chem.* **596**, 183-192 (2000).
2. "Ultrafast infrared studies of the reaction mechanism of silicon-hydrogen bond activation by  $\eta^5$ -CpV(CO)<sub>4</sub>," P.T. Snee, H. Yang, K.T. Kotz, C.K. Payne, and C.B. Harris, *J. Phys. Chem. A* **103**, 10426-10432 (1999).
1. "Femtosecond infrared studies of a prototypical one-electron oxidative-addition reaction: Chlorine atom abstraction by the Re(CO)<sub>5</sub> radical," H. Yang, P.T. Snee, K.T. Kotz, C.K. Payne, and C.B. Harris, *J. Am. Chem. Soc.* **121**, 9227-9228 (1999).