Curriculum Vitae

Garth J. Simpson

I. General

A. Education

Postdoctoral Studies: Stanford University, 2000-2001.
Advisor: Richard N. Zare.
Graduate Studies: University of Colorado, Boulder, 1995-2000.
Advisor: Kathy L. Rowlen.
Undergraduate Studies: Western Washington University, 1988-1995.
Advisor: Mark E. Bussell.

B. Previous Positions: none

C. Present Position

Associate Professor, Purdue University, 2006-present.
Assistant Professor, Purdue University, 2001-2006.

D. Awards and Honors

-ACS Division of Analytical Chemistry Arthur F. Findeis Award (2007).
-Alfred P. Sloan Research Fellowship (2005).
-Cottrell Teacher-Scholar Award from the Research Corporation (2004).
-Beckman Foundation Young Investigator Award (2004).
-Eli Lilly Analytical Chemistry Academic Contact Committee (ACACC) New Untenured Faculty Grantee Award (2003).
-Camille and Henry Dreyfus New Faculty Award (2001).
-Research Innovation Award from the Research Corporation (2001).
-ACS Division of Colloid and Interface Science Victor K. LaMer Award (2001).
- Life Sciences Research Foundation Pfizer Postdoctoral Fellowship (2000/2001).
-Theresa Fonseca Memorial Prize for Graduate Research in Physical Chemistry (1999).

E. Professional and Scholarly Associations

-Member of the American Chemical Society, Division of Analytical Chemistry and Division of Colloid and Interface Science
-Member of the Optical Society of America
-Member of the Biophysical Society

II. Discussion of Teaching

A. Teaching Assignments at Purdue

Semester & Year	Course Number, Credit Hour and Type	Title of Course	# of Students	Student Classification
Fall 2001	CHM 620, 3cr. lecture	Spectrochemical Instrumentation	26	Graduate
Fall 2002	CHM 620, 3cr. lecture	Spectrochemical Instrumentation	29	Graduate
Spring 2003	CHM 370, 3cr. lecture	Topics in Physical Chemistry	32	Undergraduate
Fall 2003	CHM 620, 3cr. lecture	Spectrochemical Instrumentation	25	Graduate
Spring 2004	CHM 370, 3cr. lecture	Topics in Physical Chemistry	30	Undergraduate
Fall 2004	CHM 620, 3cr. lecture	Spectrochemical Instrumentation	30	Graduate
Spring 2005	CHM 370, 3cr. lecture	Topics in Physical Chemistry	28	Undergraduate
Fall 2005	CHM 620, 3cr. lecture	Spectrochemical Instrumentation	29	Graduate
Spring 2006	CHM 370, 3cr. lecture	Topics in Physical Chemistry	24	Undergraduate
Fall 2006	CHM 620, 3cr. lecture	Spectrochemical Instrumentation	23	Graduate
Spring 2007	CHM 370, 3cr. lecture	Topics in Physical Chemistry	27	Undergraduate
Fall 2007	CHM 620, 3cr. lecture	Spectrochemical Instrumentation	20	Graduate

B. Selected Discussion of Courses

Chemistry 620 Spectrochemical Instrumentation: The primary objectives for this course are to provide incoming graduate students with skills for constructing and adapting scientific instrumentation for research. The focus for the first ~1/3 of the semester is basic electronics (RC circuits, op amps, specific applications). The next topic is basic optics (lenses in series, fluorescence and confocal microscopy, polarization of light, polarizing optics, Jones matrices, ellipsometry), then lasers (gas, diode, dye, solid state, Q-switching, mode-locking), diffraction and monochrometers, photodetectors (PMTs, photodiodes, photodiode arrays, CCD arrays), and finally an overview of complete instruments (infrared spectrometers, Fourier transforms, Raman, FT Raman, NMR, FT-NMR, scanning probe microscopy, SERS, and SPR). The course is arranged such that new material is constantly referenced back to previous material (e.g., circuit analysis is covered upon introducing CCD and photodiode arrays, CCD arrays are detailed in discussions of Raman and optical microscopy, Fourier transforms in spectroscopy are related back to mode-locking in lasers and to bandwidth issues in electronics applications, etc.). The focus is on instrumentation rather than on data interpretation. A key element of the course is challenging weekly problem sets, often requiring 10-15 hours of dedicated effort to complete. It is through the problems sets that the material is truly learned. Allowing and encouraging students

to work in groups (hopefully) provides a forum for first-year students to develop social bonds more quickly.

In order to foster written and oral communication skills, an integral component of the graduate course is the preparation of mock white papers, research proposals, manuscripts, and posters. An emphasis is placed on introducing graduate students to the format and process for writing and submitting research proposals and papers. While most graduate students are familiar and reasonably comfortable with the structure of scientific reports and papers, many have never been exposed to the unique attributes of proposal writing. In an attempt to maximize the emphasis on writing and speaking while at the same time allowing students to be creative, students proposed and wrote up mock research work, from the entirely practical to the entirely outlandish (modeled after the Annals of Improbable Research). At the end of the semester, students present their fictional results at a peer-graded poster session.

Chemistry 370 Topics in Physical Chemistry: Chemistry 370 is a required physical chemistry course for undergraduate chemical engineering students. The primary goal for this course is to introduce the students to quantum mechanics and statistical mechanics, since kinetics and thermodynamics are covered extensively in other engineering courses. Following graduation, chemical engineers are most likely to encounter quantum mechanics in spectroscopy and computational chemistry. Consequently, this course differs from most traditional introductory physical chemistry courses in two significant respects: 1) the frequency use of the solutions to the time-dependent Schrödinger equation, and 2) the introduction of material and concepts within the context of computational chemical calculations. Starting with the simple sets of differential equations describing wave motion, students work through the particle-in-a-box to the hydrogen atom to motions of polyatomic molecules. Once the energy levels for the various motions are developed, spectroscopy can be understood by connecting various states through time-dependent "sloshing" of the wavefunctions. Thermodynamic and kinetic properties are connected to the individual molecular responses through statistical mechanics, providing a link between the microscopic and the macroscopic. Using transition state theory, statistical mechanics is then linked to kinetics.

Three key aspects of the course are being developed to assist in clarifying and visualizing physical chemistry concepts:

1. MathCad movie clips are generated by the students to allow visualization of the wavefunctions as they evolve in time. The term "stationary state solutions" implies that the hydrogenic wavefunctions are static in time, when they are actually quite dynamic. From these simple quantum calculations visualizations, the wave nature of the particles is conceptually easier to accept, especially when describing concepts such as orbital angular momentum. Furthermore, the programs allow the students to easily chart the time-dependence of linear combinations of wavefunctions to construct p-orbitals, visualize how an oscillating radiation field can dynamically drive transitions between quantum states, and develop an intuitive understanding of how linear combinations of wavefunctions recover classical-like particle motion (i.e., the time-dependent correspondence principle).

2. Molecular modeling calculations are performed by the students to introduce them to fundamental concepts of quantum principles as well as the computational tools they are likely to encounter in professional positions. At the atomic level, the Hartree-Fock self-consistent field approximation is central to discussions of electron shielding and the splitting of the atomic

energy levels in all nuclei but hydrogen. The construction of molecular orbitals from linear combinations of atomic orbitals (or an appropriate alternative basis set of Gaussian orbitals) forms the foundation of molecular orbital theory and computational chemistry. Diagonalization of the moment of inertial matrix and the force matrix yield the rotational and vibrational constants, respectively. From the complete set of rotational, vibrational, and electronic energies obtained from quantum chemical calculations, thermodynamic properties can be generated using the partition functions. Finally, kinetics can be cast in terms of thermodynamics through transition state theory.

3. The success of the multi-step project in Chemistry 620 suggested that the undergraduates may also find a similar project beneficial. Students were assigned an instrument used for physical chemistry measurements and were asked to prepare a mock proposal, publication, and poster presentation of their work at the end of the semester. This approach also has the distinct advantage of minimizing plagiarism, since the overwhelming majority of the proposed projects are entirely impractical.

To date, we have submitted one manuscript for publication in a chemical education journal on the topic of developing intuitive real-life examples of quantum mechanical concepts at they apply to the Heisenberg Uncertainty Principle, and are preparing an additional manuscript on related topics. Additionally, this foray into education research has recently been presented at a 2006 Cottrell Scholars Annual Meeting, the 2006 Fall ACS National Meeting in San Francisco, and the 2007 Spring ACS National Meeting.

C. Course Evaluations

1. Student Evaluations

Course	Enrollment	Overall Course Rating	Overall Instructor Rating	Weakest Rating	Strongest Rating
CHM 620, 2001	26	4.0 / 5.0	4.1 / 5.0	"My instructor suggests specific ways I can improve" (3.4)	"My instructor is readily available for consultation" (4.9)
CHM 620, 2002	29	4.3 / 5.0	4.6 / 5.0	"My instructor suggests specific ways I can improve" (3.2)	1."My instructor seems well-prepared for class" 2."My instructor is open to students' questions" (4.9)
CHM 370, 2003	32	3.9 / 5.0	4.5 / 5.0	"My instructor suggests specific ways I can improve" (3.0)	1."My instructor seems well-prepared for class" 2."I would enjoy taking another course from this instructor" 3."My instructor is open to students' questions" (4.5)
CHM 620, 2003	25	4.7 / 5.0	4.9 / 5.0	"Exams are reasonable in length and difficulty" (3.9)	1."My instructor seems well-prepared for class" 2."Lecture information is highly relevant to the course objectives" 3. "Assignments are related to the goals of this course" 4. "My instructor is readily available for consultation" 5. "I like the way the instructor conducts this course" 6. "My instructor shows respect for me and other students in this class" 7."My instructor is open to students' questions" 8. "My instructor encourages an atmosphere where ideas can be exchanged freely and easily" (4.8)
CHM 370,	30	2.9 / 5.0	3.6 / 5.0	"Exams are of	1."My instructor seems well-prepared for class"

2004				reasonable length and difficulty" (2.4)	2."My instructor is open to students' questions" (4.3)
CHM 620, 2004	30	4.7 / 5.0	4.9 / 5.0	1. "Exams are of reasonable length and difficulty" 2. "My instructor suggests specific ways I can improve" (4.2)	1. "My instructor is readily available for consultation" 2."My instructor is open to students' questions" 3. "My instructor encourages an atmosphere where ideas can be exchanged freely and easily" (4.9)
CHM 370, 2005	28	3.6 / 5.0	4.8 / 5.0	1. "The instructor lets me know how well I am doing in this course" 2. My instructor suggests specific ways I can improve" (3.6)	1. "My instructor shows respect for me and other students in this class" 2. My instructor is open to students' questions" 3. My instructor encourages an atmosphere where ideas can be exchanged freely and easily" (4.8)
CHM 620, 2005	27	4.1 / 5.0	4.3 / 5.0	1. "My instructor suggests specific ways I can improve" (3.7)	1. "My instructor takes my views and comments seriously" 2."My instructor is open to students' questions" 3. "My instructor encourages an atmosphere where ideas can be exchanged freely and easily" (4.7)
CHM 370, 2006	24	4.0 / 5.0	4.8 / 5.0	1. "My instructor suggests specific ways I can improve" (3.7)	1. "My instructor seems well prepared for class" 2. "My instructor readily maintains rapport with this class" 3. "My instructor shows respect for me and other students in this class" 4. "My instructor is open to students' questions" 5. "My instructor encourages an atmosphere" where ideas can be exchanged freely and easily" 6. "My instructor takes my views and comments seriously" (4.9)
CHM 620, 2006	23	4.2/5.0	4.8/5.0	1. "My instructor suggests specific ways I can improve" (3.6)	1.. "My instructor shows respect for me and other students in this class" 2. "My instructor is open to students' questions" (4.9)
CHM 370, 2007	27	3.9 / 5.0	4.8 / 5.0	1. "My instructor suggests specific ways I can improve" (3.4)	1. "My instructor readily maintains rapport with this class" 2. "I would enjoy taking another class from this instructor." 3. "My instructor shows respect for me and other students in this class" 4. "My instructor is open to students' questions" (4.8)
CHM 620 2007	22	4.1/5.0	4.2/5.0	1. "My instructor suggests specific ways I can improve" (3.5)	1. "My instructor seems well prepared for class" 2. "My instructor is open to students' questions" 3. "My instructor encourages an atmosphere" where ideas can be exchanged freely and easily" (4.7)

2. Project Evaluations (submitted as Additional Questions on the course evaluations):

5 = strongly agree, 1 = strongly disagree

Question 1: "The knowledge I gained from the problem sets was worth the time and effort spent"

Question 2: "The knowledge I gained from studying for and taking the exams was worth the time and effort spent"

Question 3: "The knowledge I gained from the lectures was worth the time and effort spent"
Question 4. "The experience and knowledge I gained from the project was worth the time and effort spent"
Question 5: "I recommend keeping the project in its current form for future classes"

Course	Question 1	Question 2	Question 3	**Question 4**	**Question 5**
CHM 370, 2003	2.7	3.8	4.0	**3.6**	**3.7**
CHM 620, 2003	4.2	4.0	4.6	**4.4**	**4.7**
CHM 370, 2004	3.1	3.0	2.0	**3.0**	**3.1**
CHM 620, 2004	4.3	4.4	4.7	**4.5**	**4.6**

In general, the students place a value on the project that compares favorably with more traditional pedagogical practices (e.g., lectures, problem sets, and exams).

III. Other Contributions to Undergraduate Education

IV. Creative Endeavor, Research, Scholarship

A. Discussion of Research

Nonlinear Optics**:** Early research efforts have focused on understanding and exploiting the high sensitivity of second harmonic generation (SHG) and sum-frequency generation (SFG) measurements to chirality. Whereas absorbance circular dichroism (CD) and optical rotary dispersion (ORD) are subtle effects relative to the analogous achiral properties of absorption and refraction, the chiral responses in second harmonic generation and sum-frequency generation are on the same order of magnitude as the achiral responses. Furthermore, this chiral-specific response often originates from a single molecular monolayer in a diffraction-limited spot size, corresponding to a conservative detection limit of ~10^6 molecules required for chiral analysis. A bulleted list of specific efforts and accomplishments is provided below.

1. We have developed a general and self-consistent approach for simplifying the molecular interpretations of broad classes of nonlinear optical and multi-photon processes (*J. Phys. Chem. A* **2005**; *J. Phys. Chem. B.* **2004**). These developments have engendered new, intuitive visualization methods for depicting the molecular tensor with full quantitative rigor (*J. Phys. Chem. B,* **2005**, *J. Comput. Chem.* **2007**, *Acc. Chem. Res.* **2007**) . In brief, standard sum-over-states expressions for the tensors describing NLO or multi-photon phenomena derived from time-dependent perturbation theory were shown to be intuitively and concisely represented by simple direct products of lower-order effects without requiring any additional assumptions or approximations. *This approach is very general, providing a simple method for interpreting the overall magnitudes and polarization dependences of broad classes of nonlinear optical and multi-photon process, including SHG, SFG, coherent anti-Stokes Raman spectroscopy, higher harmonic generation, hyper-Raman spectroscopy, multi-photon absorption, etc*. In the specific case of electronically resonant SHG and SFG, the molecular tensor was rigorously shown for the

first time to be given by the simple product of the tensor for two-photon absorption and the transition moment for stimulated emission.

2. Theory and instrumentation for nonlinear optical ellipsometry (NOE). In order to extract the maximum information possible from a given nonlinear optical analysis, we have developed a conceptual and experimental framework for performing NOE, in which all relative phase information is retained in nonlinear optical surface measurements (*Rev. Sci. Instr.* **2007**, *Phys. Rev. B* **2005**; *Anal. Chim. Acta*, **2004**). Using this approach, SHG and SFG measurements can be used to experimentally determine the both relative magnitudes of all nonzero elements in the Jones tensor and the relative phases, effectively doubling the number of observables available from a given measurement. In one application, the increased information content afforded by NOE was used to directly determine the effective interfacial optical constant of an ultrathin surface layer and assess the merits of different thin film models (*Anal. Chem.* **2005**). In another, chiral-specific SHG was performed to selectively probe the real-time surface binding kinetics of an unlabeled protein (*J. Am. Chem. Soc.* **2004**; *J. Am. Chem. Soc*. **2005**).

3. The exquisite sensitivity of polarization-dependent SHG and SFG measurements to chirality have fueled the need for the development of general predictive tools at both the molecular level (*J. Phys. Chem. B* **2006**; *Chem. Phys. Lett.* **2004**) and in the laboratory frame (*ChemPhysChem* **2004**; *J. Am. Chem. Soc.* **2003**; *Phys. Rev. B.* **2002**; *J. Chem. Phys.* **2002**). Within the molecular frame, a simple perturbation theory approach was developed for quantitatively predicting the second-order NLO properties of systems containing coupled chromophores. The predictions of the model are consistent with previous experimental measurements and provide a simple context for interpreting the NLO properties of dimeric and polymeric systems. At the macroscopic level, it was demonstrated both experimentally (*J. Am. Chem. Soc.* **2003**, *J. Am. Chem. Soc.* **2006**) and theoretically (*Phys. Rev. B.* **2002**; *J. Chem. Phys.* **2002**, *J. Am. Chem. Soc.* **2006**) that orientational effects alone can yield large chiral effects in SHG and SFG measurements of surface assemblies. In brief, chirality within the sterics driving surface packing generally leads to asymmetric orientation of the chromophore planes. This structural origin of chirality is analogous to that arising in a propeller, in which the blades themselves are not required to be chiral in order to generate a chiral macrostructure. Unlike chiral effects in absorbance CD, coupling between the achiral chromophores is not required for the generation of chiral-specific surface measurements. Experimental measurements of achiral chromophores assembled at chiral-templated interfaces have confirmed that these orientational effects can be quite large. Most significantly, the experimentally measured magnitudes, signs, and trends for the chiral and achiral nonlinear optical properties of bacteriorhodopsin Langmuir-Blodgett films were quantitatively predicted through molecular modeling calculations using the known structure and orientation of the retinal chromophore with no adjustable parameters (*J. Am. Chem. Soc.* **2006**). The intrinsic chirality of the retinal chromophore was calculated to be insignificant, confirming that the macroscopic chiral responses arose exclusively from simple orientational effects.

<u>Dielectrophoretic Force Microscopy</u>:

1. A novel scanning probe microscopy technique has allowed dielectrophoretic force imaging with nanoscale spatial resolution (*Langmuir* **2005**, *Anal. Chem.* **2005**, *Biophys. J.* **2006**). Dielectrophoresis (DEP) traditionally describes the mobility of polarizable particles in

inhomogeneous alternating current (AC) electric fields. Integrating DEP with atomic force microscopy allows for non-contact imaging, in which the image contrast relates directly to the local dielectric polarizability. By tuning the AC frequency, dielectric spectroscopy can be performed at solid/liquid interfaces with high spatial resolution. In studies of cells, the frequency-dependent dielectrophoretic force is sensitive to biologically relevant electrical properties, including local membrane capacitance and ion mobility. Consequently, dielectrophoretic force microscopy (DEPFM) is well suited for in vitro non-contact scanning probe microscopy of biological systems. Even in it simplest applications, DEPFM provides a convenient and highly controllable route for reliable non-contact imaging in aqueous media.

B. Publications

Peer reviewed.

51. Gualtieri, E. J.; Haupert, L. M.; Simpson, G.J. "Interpreting the Nonlinear Optics of Biopolymer Assemblies: Finding a Hook" *submitted.*
50. Wanapun, D.; Hall, V. J.; Begue, N. J.; Grote, J. G.; Simpson, G. J. "DNA-Based Polymers as Chiral Templates for Second-Order Nonlinear Optical Materials" *submitted*.
49. Haupert, L. M.; Simpson, G. J. "Chirality in Nonlinear Optics" *submitted*.
48. Wampler, R. D.; Kissick, D. J.; Dehen, C. J.; Gualtieri, E. J.; Grey, J. L.; Wang, H.-F.; Thompson, D. H.; Cheng, J.-X.; Simpson, G. J. "Selective Detection of Protein Crystals by Second Harmonic Microscopy" *submitted.*
47. Zhu, H.; Coleman, D. M. ; Dehen, C. J.; Geisler, I. M.; Zemlyanov, D.; Chmielewski, J.; Simpson, G. J.; Wei, A. "Assembly of Dithiocarbamate-Anchored Monolayers on Gold Surfaces in Aqueous Solutions" *accepted for publication in Langmuir*.
46. Cheng, X.; Gurkan, U. A.; Dehen, C. J.; Tate, M. P.; Simpson, G. J.; Hillhouse, H. W.; Akkus, O. "An Electrochemical Process for Assembly of Anisotropically Oriented Collagen Bundles" *Biomat.* **2008**, *29*, 3278-3288.
45. Wanapun, D.; Wampler, R. D.; Begue, N. J.; Simpson, G. J. "Polarization-Dependent Two-photon Absorption for the Determination of Protein Secondary Structure: A Theoretical Study" *Chem. Phys. Lett.* **2008**, *455*, 6-12 (*featured on the cover*).
44. Davis, R. P.; Moad, A. J.; Goeken, G. S.; Wampler, R. D.; Simpson, G. J. "Selection Rules and Symmetry Relations for Four-Wave Mixing measurements of Uniaxial Assemblies" *J. Phys. Chem. B* **2008**, *112*, 5834-5848.
43. Wampler, R. D.; Begue, N. J.; Simpson, G. J. "Molecular Design Strategies for Optimizing the Nonlinear Optical Properties of Chiral Crystals" *Cryst. Growth and Design* **2008**, *8*, 2589-2594.
42. Halter, M.; Liao, L,; Plocinik, R. M.; Coffey, D. C.; Bhattachargee, S.; Mazur, U.; Simpson, G. J.; Robinson, B. H.; Keller, S. L. "Molecular Self-Assembly of Mixed High-Beta Zwitterionic and Neutral Ground State NLO Chromophores" *Chem. Mater.* **2008**, *20*, 1778-1787.
41. Dehen, C. J.; Everly, R. M.; Plocinik, R. M.; Simpson, G. J. "Discrete Retardance Second Harmonic Generation Ellipsometry" *Rev. Sci. Instr.* **2007**, *78*, 013106 (1-7).

40. Begue, N. J.; Simpson, G. J. "Thunder: An Acoustic Model for the Heisenberg Uncertainty Principle" *accepted for publication in Chem. Educ.*
39. Hilton, A. M.; Jacobson, K. W.; Lynch, B. P.; Simpson, G. J. "Enhanced Local Oxidation of Silicon Using a Conducting AFM in Water" *J. Vac. Sci. Technol. B.* **2008**, *20*, 1778-1787.
38. Moad, A. J., Moad, C. W.; Perry, J. M.; Wampler, R. D.; Begue, N, J.; Shen, T.; Goeken, G. S.; Heiland, R.; Simpson, G. J. "NLOPredict: Visualization and Data Analysis Software for Nonlinear Optics" *J. Computational Chem.* **2007**, *28*, 1996-2002.
37. Wampler, R. D.; Moad, A. J.; Moad, C. W.; Heiland, R.; Simpson, G. J. "Visual Methods for Interpreting Optical Nonlinearity" *Acc. Chem. Res.* **2007**, *40*, 953-960 (invited).
36. Wampler, R. D.; Zhou, M.; Thompson, D. H.; Simpson, G. J. "Mechanism of the Chiral SHG Activity of Bacteriorhodopsin Films" *J. Am. Chem. Soc.*, **2006**, *128*, 10994-10995.
35. Lynch, B. P.; Hilton, A. M.; Simpson, G. J. "Nanoscale Dielectrophoretic Spectroscopy of Individual Immobilized Mammalian Blood Cells" *Biophys. J.* **2006**, *91*, 2678-2686.
34. Hilton, A. M.; Lynch, B. P.; Simpson, G. J. "Reduction of Tip-Sample Contact Using Dielectrophoretic Force Scanning Probe Microscopy" *Anal. Chem.* **2005**, *77*, 8008-8012.
33. Perry, J. M.; Moad, A. J.; Begue, N. J.; Wampler, R. D.; Simpson, G. J. "Electronic and Vibrational Second-Order Nonlinear Optical Properties of Protein Secondary Structural Motifs" *J. Phys. Chem. B.* **2005**, *109*, 20009-20026.
32. Plocinik, R.M.; Everly, R. M., Moad, A. J.; Simpson, G. J. "A Modular Ellipsometric Approach for Mining Structural Information from Nonlinear Optical Polarization Analysis" *Phys. Rev. B* **2005**, *72*, 125409(1-14).
31. Polizzi, M. A.; Plocinik, R. M.; Simpson, G. J. "Correction: Ellipsometric Approach for the Real-Time Detection of Label-Free Protein Adsorption by Second Harmonic Generation" *J. Am. Chem. Soc*. **2005**, *127*, 1058.
30. Lynch, B. P.; Hilton, A. M.; Doerge, C. H.; Simpson, G. J. "Dielectrophoretic Force Microscopy of Aqueous Interfaces" *Langmuir* **2005**, *21*, 1436-1440.
29. Moad, A. J.; Simpson, G. J. "Self-Consistent Approach for Simplifying the Molecular Interpretation of Nonlinear Optical and Multi-Photon Phenomena" *J. Phys. Chem. A* **2005**, *109*, 1316-1323.
28. Simpson, G. J.; Dailey, C. A.; Plocinik, R. M.; Moad, A. J.; Polizzi, M. A.; Everly, R. M. "Direct Determination of Effective Interfacial Optical Constants by Nonlinear Optical Null Ellipsometry of Chiral Films" *Anal. Chem.* **2005**, *77*, 215-224.
27. Simpson, G, J.; Perry, J. M.; Moad, A. J.; Wampler, R. D. "Uncoupled Oscillator Model for Interpreting Second Harmonic Generation Measurements of Oriented Chiral Systems" *Chem. Phys. Lett.* **2004**, *399*, 26-32.
26. Polizzi, M. A.; Plocinik, R. M.; Simpson, G. J. "Ellipsometric Approach for the Real-Time Detection of Label-Free Protein Adsorption by Second Harmonic Generation" *J. Am. Chem. Soc.* **2004**, *126*, 5001-5007.
25. Simpson, G. J. "Molecular Origins of the Remarkable Chiral Sensitivity of Second Order Nonlinear Optics" *ChemPhysChem* **2004**, *5*, 1301-1307 (invited).
24. Dailey, C. A.; Burke, B. J.; Simpson, G. J. "The General Failure of Kleinman Symmetry in Practical Nonlinear Optical Applications" *Chem. Phys. Lett.* **2004**, *390*, 8-13.

23. Moad, A. J.; Simpson, G. J. "A Unified Treatment of Selection Rules and Symmetry Relations for Sum-Frequency and Second Harmonic Spectroscopies" *J. Phys. Chem. B.* **2004**, *108*, 3548-3562.
22. Plocinik, R. M.; Simpson, G. J. "Polarization Characterization in Surface Second Harmonic Generation by Nonlinear Optical Null Ellipsometry" *Anal. Chim. Acta* **2003**, *496*, 133-142 (invited).
21. Burke, B. J.; Moad, A. J.; Polizzi, M. A.; Simpson, G. J. "Experimental Confirmation of the Importance of Orientation in the Anomalous Chiral Sensitivity of Second Harmonic Generation" *J. Am. Chem. Soc.* **2003**, *125*, 9111-9115.
20. Simpson, G. J., Perry, J. M.; and Ashmore-Good, C. L. "Molecular and Surface Hyperpolarizability of Oriented Chromophores of Low Symmetry" *Phys. Rev. B.* **2002**, *66*, 165437-(1-10).
19. Simpson, G. J. "Structural Origins of Circular Dichroism in Surface Second Harmonic Generation" *J. Chem. Phys.* **2002**, *117*, 3398-3410.
18. Wilson, C. F.; Wallace, M. I.; Korishima, K.; Simpson, G. J.; Zare, R. N. "Coupled Electrorotation of Polymer Microspheres for Microfluidic Sensing and Mixing" *Anal. Chem.* **2002**, *74*, 5099-5104.
17. Simpson, G. J.; Wilson, C. F.; Gericke, K.-H.; Zare, R. N. "Coupled Electrorotation: Two Proximate Microspheres Spin in Registry with an AC Electric Field" *ChemPhysChem* **2002**, *3*, 416-423.
16. Simpson, G. J.; Wohland, T.; Zare, R. N. "Irradiation of Dye-Doped Microspheres with a Strongly Focused Laser Beam Results in Alignment Upon Optical Trapping" *Nano Lett.* **2002**, *2*, 207-210.
15. Wilson, C. F.; Simpson, G. J.; Chiu, D. T.; Strömberg, A.; Orwar, O.; Rodriguez, N.; Zare, R. N. "Nanoengineered Structures for Holding and Manipulating Liposomes and Cells" *Anal. Chem,* **2001**, *73*, 787-791 (featured on the cover).
14. Simpson, G. J. "New Tools for Surface Second Harmonic Generation" *Appl. Spec.* **2001**, *55*, 16A-32A, *Focal Point Article* (invited).
13. Simpson, G. J; Rowlen, K. L. "Measurement of Orientation in Organic Thin Films" *Acc. Chem. Res.* **2000**, *33*, 781-789, (invited).
12. Simpson, G. J.; Rowlen, K. L. "Orientation Insensitive Methodology for Second Harmonic Generation. Part 1: Theory" *Anal. Chem.* **2000**, *72,* 3399-3406, *Accelerated Article.*
11. Simpson, G. J.; Rowlen, K. L. "Orientation Insensitive Methodology for Second Harmonic Generation. Part 2: Applications to Adsorption Isotherm and Kinetics Measurements" *Anal. Chem.* **2000**, *72,* 3407-3411*, Accelerated Article.*
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9. Simpson, G. J.; Rowlen, K. L. "Influence of Substrate Roughness on Orientation Measurements by Second Harmonic Generation" *Chem. Phys. Lett.* **2000**, *317*, 276-281.
8. Simpson, G. J.; Rowlen, K. L. "Evaluation of Molecular-Scale Roughness at Liquid Interfaces" *Chem. Phys. Lett.* **1999**, *309*, 117-122.

7. Simpson, G. J.; Rowlen, K. L. "An SHG Magic Angle: The Dependence of Second Harmonic Generation Orientation Measurements on the Width of the Orientation Distribution" *J. Am. Chem. Soc.* **1999**, *121*, 2635-2636.
6. Simpson, G. J.; Rowlen, K. L. "Molecular Orientation at Surfaces: Surface Roughness Contributions to Measurements based on Linear Dichroism" *J. Phys. Chem. B*, **1999**, *103*, 3800-3811, *Feature Article*.
5. Simpson, G. J.; Rowlen, K. L. "Quantification of 'Local' Surface Orientation: Theory and Experiment" *J. Phys. Chem. B*, **1999**, *103*, 1525-1531.
4. Simpson, G. J.; Sedin, D. L.; Rowlen, K. L. "Surface Roughness by Contact versus Tapping Mode Atomic Force Microscopy" *Langmuir* **1999**, *15*, 1429-1434.
3. Doughty, S. K.; Simpson, G. J.; Rowlen, K. L. "Evolution of Orientation in the Growth of Azo Dye Zirconium Phosphate-Phosphonate Multilayers" *J. Am. Chem. Soc.* **1998**, *120*, 7997-7998.
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7. Simpson, G. J. *Book Review:* "Vibrational Spectroscopy of Biological and Polymeric Materials" Ed. V. S. Gregoriou and M. S. Braiman, *J. Am. Chem. Soc.* **2006**, *128*, 12030-12031.
6. Simpson, G. J. "Biological Imaging: The Diffraction Barrier Broken" *Nature* **2006**, *440*, 879-880.
5. Hilton, A. M.; Lynch, B. P.; Simpson, G. J. "Dielectrophoretic force microscopy" *Amer. Lab.* **2006**, *38*, 23-25.
4. Simpson, G. J. *Book Review:* "Laser Fundamentals, 2nd Edition" by William T. Silfvast, *Appl. Spec.* **2004**, *58*, 268A.
3. Simpson, G. J.; Plocinik, R. M. "Exploiting Polarization in Nonlinear Optical Surface Spectroscopy" Monophotonic Materials *SPIE Proceedings* **2004**, *5510*, 97-106.
2. Simpson, G. J. "Dielectrophoretic Force Imaging of Biological Systems", Proceedings of the Birck Nanotechnology Center Workshop on Scanning Probe Microscopy, Purdue University, February, 2004.
1. Simpson, G. J.; Ashmore-Good, C. L.; Perry, J. M.; Plocinik, R. M. "Nonlinear Optics of Oriented Chiral Systems" *OSA Trends in Optics and Photonics Vol. 79 Nonlinear Optics* (Optical Society of America, Washington DC, 2002), 348-350.

Patents.

3. "Discrete Retardance Second Harmonic Generation Ellipsometry" Dehen, C. J.; Everly, R. M.; Plocinik, R. M.; Simpson, G. J.
2. "System and Method for Nonlinear Optical Null Ellipsometry**"** Plocinik, R. M.; Polizzi, M. A.; Simpson, G. J. (patent pending).
1. "Spinning Microsphere for Microfluidic Devices and Biosensors" Simpson, G. J.; Wilson, C. F.; Zare, R. N. (patent pending).

C. Invited Lectures

48. "Precise Structural Analysis of Interfaces and Materials by Nonlinear Optical Stokes Ellipsometry" FACSS, Reno NV, 2008.
47. "NLO Properties of Biopolymers and Biopolymer Assemblies" Telluride Research Conference, Telluride CO, 2008.
46. "Organizing and Running a Topical Summer Short Course: What returns can you expect on your investment of time?" Cottrell Scholars Meeting, Tuscon AZ, 2008 (poster).
45. "Molecular Insights from Polarization-Dependent Nonlinear Optical Measurements" Department of Energy Meeting, Annapolis MD, 2008.
44. "Nonlinear Optical Ellipsometry of Chiral Films", International Conference on Organic Nonlinear Optics, Santa Fe NM, 2008.
43. "Improving the Approachability of Introductory Quantum Mechanics Using Wavepacket Dynamics" Chemical Education Seminar, Purdue University, West Lafayette IN, 2008.
42. "The Remarkable Sensitivity of Nonlinear Optics to Chirality" Physical Chemistry seminar, University of California, Los Angeles, 2008.
41. "Nonlinear Optics of Biomolecular Assemblies", Physical Chemistry seminar, University of Pennsylvania, 2007.
40. "Nonlinear Optics of Biomolecules" Beckman Young Investigator Meeting, Irvine CA, 2007.
39. "Molecular Mechanisms Driving the Chiral Sensitivity of Second Order Nonlinear Optics" ACS National Meeting, Chicago IL, 2007.
38. "Frequency Doubling and Frequency Mixing in Biomolecules" Pittcon, Chicago IL, 2007.
37. "Nonlinear Optics of Chiral Systems" Physical Chemistry Seminar, University of Washington, Seattle WA, 2006.
36. "Novel Approaches for Investigating Biological Interfaces" Departmental Seminar, Western Washington University, Bellingham WA 2006.
35. "Gentle Nanoscale Imaging of Living Cells using Dielectrophoretic Forces" Nanoscience Seminar, City College, New York NY, 2006.
34. "Dielectrophoretic Force Microscopy of Cells" Departmental Seminar, Hunter College, New York, NY, 2006.
33. "Nonlinear Optics of Chiral Systems" Analytical Seminar, Notre Dame University, North Bend IN, 2006.
32. "Chemistry at Surfaces" Purdue Sci110 Honors Science Majors guest lecturer, West Lafayette IN, 2006.
31. "Nonlinear Optical Ellipsometry" American Chemical Society National Meeting, San Francisco CA, 2006.
30. "Nonlinear Optical Platforms for Biosensing" Beckman Young Investigator Annual Meeting, Irvine CA, 2006 (poster).

29. “Visualizing the Time-Evolution of Particles in Boxes” Cottrell Teacher-Scholar Annual Meeting, Tuscon AZ, 2006.
28. “Nonlinear Optical Ellipsometry” American Chemical Society National Meeting, Atlanta GA, 2006.
27. “Chiral Phenomena in Nonlinear Optics” American Physical Society National Meeting, Baltimore MD, 2006.
26. “Nonlinear Optics of Biological Interfaces” Analytical Chemistry Seminar, Indiana University, Bloomington IN, 2005.
25. “Nonlinear Optical Properties of Biological Interfaces” Physical Chemistry Seminar, Purdue University, W. Lafayette IN, 2005.
24. “Nonlinear Optical Properties of Biological Interfaces” Analytical Seminar, University of Colorado, Boulder CO, 2005.
23. “Imaging Ion Mobility in Cells by Dielectrophoretic Force Microscopy”, Nanoscience Seminar, West Virginia University, WV, 2005.
22. “Chiral Effects in Nonlinear Optics”, American Chemical Society, Washington D.C., 2005.
21. “Novel Methods for Probing Molecular Interactions at Biological Interfaces” School of Science Presidential Review, Purdue University, 2005.
20. “The Unique Nonlinear Optical Properties of Biological Interfaces” Physical/Analytical Chemistry Seminar, Texas A&M, College Station TX, 2005.
19. “The Unique Nonlinear Optical Properties of Biological Interfaces” Physical Chemistry Seminar, Northwestern University, Evanston IL, 2005.
18. “The Unique Nonlinear Optical Properties of Biological Interfaces” Physical Chemistry Seminar, University of Illinois, Urbana IL, 2005.
17. “Nonlinear Optical and Scanning Probe Microscopy Studies of Biological Interfaces”, Chemical Physics / Physical Chemistry Seminar, University of Maryland, Adelphi MD, 2004.
16. “The Remarkable Chiral Sensitivity of Nonlinear Optics”, ACS Great Lakes Regional Meeting, Peoria IL, 2004.
15. “Designing Strategies to Look for the Unexpected”, Younger Chemists Committee, ACS Fall National Meeting, Philadelphia PA, 2004.
14. “Nonlinear Optics for Biosensing”, Beckman Foundation, Irvine CA, 2004 (poster).
13. “Exploiting Polarization in Nonlinear Optical Surface Spectroscopy” SPIE National Meeting, Denver CO, 2004.
12. “Practical Applications of Nonlinear Optical Methods for Probing Chiral Surface Interactions” Eli Lilly Analytical Chemistry Academic Contact Committee New Untenured Faculty Award Presentation, Indianapolis IN, 2004.
11. “Bridging Nonlinear Optics and Molecular Surface Structures” Rao Symposium at Purdue University, West Lafayette IN, 2004.
10. “The Surprising Nonlinear Optical Properties of Biological Interfaces” Analytical Chemistry Seminar at Michigan State University, East Lansing MI, 2004.
9. “Second Harmonic Ellipsometry for Label Free Detection of Surface Binding”, Pittcon, Chicago IL, 2004.
8. “Dielectrophoretic Force Microscopy for Ultrahigh Resolution Imaging in Aqueous Environments”, Showalter Trust Committee, Purdue University, 2003.

7. "Nonlinear Optical and AC Electrokinetic Measurements of Nanoscale Structure and Function", Wright Patterson Air Force Base, OH, 2003.
6. "Nonlinear Optics of Biological Interfaces: The New Rules of the Game", Ohio State University, Columbus OH, 2003.
5. "Nonlinear Optical Investigations of Biological Interfaces", ACS National Meeting, New Orleans LA, 2003.
4. "Second Harmonic Generation as a Structural Probe of Biological Systems", ACS National Meeting, New Orleans LA, 2003.
3. "Nonlinear Optics of Biological Interfaces" 2nd German American Symposium on the Frontiers of Chemistry, Durham NH, 2002 (poster).
2. "Nonlinear Optical Ellipsometry in Surface Science" New Laser Scientists Conference in conjunction with the Interdisciplinary Laser Science Conference, Long Beach CA, 2001.
1. "Molecular Orientation at Surfaces and Interfaces" Victor K. LaMer Award Plenary Lecture, ACS National Meeting of the Division of Colloid and Interface Science, Carnegie Mellon University, 2001.

D. Other Presented Papers

42. "Second order nonlinear optical imaging of chiral crystals (SONICC)" FACSS, Reno NV, 2008.
41. "Microarrays with nonlinear optical readout for rapid screening of protein crystallization conditions" ACS National Meeting, Philadelphia PA, 2008.
40. "Microarrays for Rapid Screening of Protein Crystallization Conditions" Midwestern Universities Analytical Chemistry Conference, Urbana-Champaign IL, 2007.
39. "Noncontact Imaging in Aqueous Media by Dielectrophoretic Force Microscopy" Veeco Seeing at the Nanoscale V, Santa Barbara CA, 2007.
38. "Time-Evolution of Wavepackets as a Means to Bridge Quantum and Classical Concepts" ACS National Meeting, Chicago IL, 2007.
37. "Dielectrophoretic Spectroscopy and Noncontact Imaging of Single Cells using AC Electrokinetics" ACS National Meeting, Chicago IL, 2007.
36. "Dielectrophoretic Imaging of Living Cells" Pittcon, Chicago IL, 2007.
35. "Nonlinear Optical Methods for Ultrasensitive Chiral Analysis" Pittcon, Chicago IL, 2007 (presided).
34. "The Time-Dependent Schrödinger Equation in Undergraduate Physical Chemistry" ACS National Meeting, San Francisco CA, 2006.
33. "NLOPredict: A new visualization and data analysis tool for interpreting the nonlinear optical properties of oriented thin films and polymers" ACS National Meeting, San Francisco CA, 2006.
32. "Gentle Nanoscale Microscopy of Single Cells using Dielectrophoretic Forces" ACS National Meeting, San Francisco CA, 2006.
31. "The Remarkable Chiral Sensitivity of Second-Order Nonlinear Optics" ACS National Meeting, San Francisco CA, 2006.
30. "Dielectrophoretic Imaging and Analysis of Living Systems" ACS Colloid and Surface Science Symposium, Boulder CO, June 2006.
29. "The Unique Nonlinear Optical Properties of Ultrathin Chiral Films" ACS Colloid and Surface Science Symposium, Boulder CO, June 2006.

28. “Surface and Material Characterization by Nonlinear Optical Ellipsometry”, Great Lakes SPIE Meeting, Dayton, OH, June 2006.
27. “Nonlinear Optical Properties of Biopolymers”, Great Lakes SPIE Meeting, Dayton, OH, June 2006.
26. “Interpreting Chiral Phenomena in Second Harmonic and Sum Frequency Surface Spectroscopies”, Optical Society of America, Laser Science Symposium, Rochester NY, October 2004.
25. “Nonlinear Optical Properties of Biological Interfaces”, Optical Society of America, Laser Science Symposium, Rochester NY, October 2004 (poster).
24. “Exploiting Polarization in Nonlinear Optical Measurements of Biological Interfaces” Physical Chemistry Division, ACS Fall National Meeting, Philadelphia PA, August 2004.
23. “Nonlinear Optical Properties of Biological Interfaces” Gordon Research Conference on Chemistry at Interfaces, CN, 2004.
22. “Dielectrophoretic Force Microscopy and Spectroscopy” Gordon Research Conference on Chemistry at Interfaces, CN, 2004.
21. “The Molecular Origins of Optical Nonlinearity: Beyond Charge-Transfer Effects” SPIE National Meeting, Denver CO, August 2004.
20. “AC Electrokinetic and Nonlinear Optical Probes of Biological Interactions” Purdue Symposium on Bio-Nanotechnology, West Lafayette IN, 2004.
19. “Dielectrophoretic Force Imaging of Biological Systems” ACS Colloid and Surface Science Symposium, New Haven CN, 2004.
18. “Exploiting Polarization in Nonlinear Optical Spectroscopy” ACS Colloid and Surface Science Symposium, New Haven CN, 2004.
17. “Reinterpreting the Molecular Origins of Optical Nonlinearity” ACS National Meeting, Anaheim CA, 2004.
16. “Dielectrophoretic Force Microscopy of Nanostructured Materials” ACS National Meeting, Anaheim CA, 2004.
15. “Dielectrophoretic Force Imaging of Biological Systems”, Birck Nanotechnology Center Workshop on Scanning Probe Microscopy, Purdue University, February, 2004.
14. “Dielectrophoretic Force Microscopy: Electrokinetics at the Nanoscale” and “Nonlinear Optics of Chiral and Biological Interfaces”, Gordon Research Conference on Dynamics at Interfaces, Andover NH, August 2003 (posters).
13. “Dielectrophoretic Force Microscopy: Electrokinetics at the Nanoscale” and “Nonlinear Optics of Chiral and Biological Interfaces”, Gordon Research Conference on Analytical Chemistry, New London CT, June 2003 (posters).
12. “Interpreting Nonlinear Optical Measurements of Biological Interfaces”, Great Lakes Regional ACS Meeting, Chicago IL, May 2003.
11. “Nonlinear Optical Ellipsometry of Biological Interfaces” Federation of Analytical Chemistry and Spectroscopy Societies, Providence RI, 2002.
10. “Surface Second Harmonic Generation of Oriented Chiral Films” American Physical Society, Orlando FL, 2002.
9. “Orientational Origins of Chiroptical Effects in Surface Second Harmonic Generation Studies of Chiral Films” American Chemical Society, Boston MA, 2002.
8. “Nonlinear Optics of Oriented Chiral Systems” Nonlinear Optics, Optical Society of America, Maui HI, 2002.

7. "Nonlinear Optics of Biological Interfaces" Gordon Research Conference on Chemistry at Interfaces, Connecticut College, New London CT, 2002.
6. "What New Information is Available from Surface Second Harmonic Generation Studies of Chiral Films?" Great Lakes Regional Meeting of the ACS, Minneapolis MN, 2002.
5. "Chiral Effects in Nonlinear Optical Surface Studies" Pittcon, New Orleans LA, 2002.
4. "Spinning and Glowing Spheres: Manipulation and Measurement of Nanoscopic and Microscopic Particles" Pittcon, New Orleans LA, 2002.
3. "Spinning and Glowing Spheres" Industrial Associates Meeting, Purdue University, West Lafayette IN, 2001.
2. "Spinning and Glowing Spheres: Manipulation and Measurement of Nanoscale Objects" Nanotechnology Seminar Series, Purdue University, West Lafayette I, 2001.
1. "Spinning Nanostructures in Registry with an AC Field" ACS National Meeting, Chicago IL, 2001.

E. Other Professional Activities

1. Proposals Reviewed:

-Member of the NSF Biosensors III Peer Review Panel for small business innovation research (SBIR) / small business technology transfer (SBTT) proposals in the Spring of 2003 (7 proposals).
-Member of the NSF Biosensors III Peer Review Panel for small business innovation research (SBIR) / small business technology transfer (SBTT) proposals in the Spring of 2002 (8 proposals).
-Single-investigator proposals for the NSF (10).
-Multi-investigator proposals for the Research Grants Council of Hong Kong (1).
-Single-investigator proposals for the Science Foundation of Ireland (1).
-Single-investigator proposals for ACS-PRF (3).
-Cottrell College Science Award for Research Corporation (1).

2. Manuscripts Reviewed:

Journal	*2001-2004*	*2005*	*2006*	*2007*	*2008*
Anal. Chem.	8	5	2	2	
J. Amer. Chem. Soc.	6	6	2	1	2
Nature		1		1	1
Proc. Nat. Acad. Sci.		1	1		
J. Phys. Chem.	8	6	2	5	3
Chem. Phys. Lett.	1	1			1
Langmuir	2	1			
ChemPhysChem	1	2	2	1	
Appl. Spec.	4	1	2	2	
J. Chem. Phys.	2			1	
J. Opt. Soc. Am. B	2	1	1		
Other	4	1		2	3

2. Symposia Organizer/Presider:

5. *Nanobiotechnology: From Single Cell to the Single Molecule*, Sponsored by Pittcon, 2007.
Role: Presider.
4. *Biological and Analytical Applications of Nonlinear Optics*, Sponsored by the Analytical Division, ACS National Fall Meeting, 2007.
Role: Co-organizer with Ji-Xin Cheng.
3. *Biological and Analytical Applications of Nonlinear Optics*, Cosponsored by the Physical and Analytical Divisions, ACS National Fall Meeting, 2005.
Role: Co-organizer with Ji-Xin Cheng.
2. *Liquids and Liquid Interfaces*, Division of Physical Chemistry Symposium, ACS National Fall Meeting, 2004.
Role: Presider.
1. *Microfluidics and Electrokinetics*, ACS Colloid and Surface Science Symposium, New Haven CN, 2004.
Role: Presider.

4. Other:

-ACS Division of Analytical Chemistry Award in Chemical Instrumentation Jury Member (2006-2009).
-ACS Division of Colloid and Interface Science Victor K. LaMer Award Selection Committee Member (2004-2006).
-Consultant for Kenyon College in Gambier, OH (a primarily undergraduate institution) in designing experiments for undergraduate physical chemistry laboratories incorporating laser-based instrumentation, April 2003.

F. Interdisciplinary Activities

1. Administrative Member of the Purdue University Life Sciences (PULSe) program.

G. Funding

Current

Agency	Total Project Period	Total Award	Total Direct Costs	Total Indirect Costs	Current Project Period	Current Direct Costs	Current Indirect Costs
Showalter Trust (PI) Co-PIs: Chitta Das Minghao Qi	"Protein Crystallization Microchip with Nonlinear Optical Readout"						
	7/01/08 – 6/40/09	$75,000	$64,112	$10,888			
NSF (PI) Co-PIs: Mike Ladisch, Nate Mosier, Chris Staiger	"MRI: Development of an Imaging Nonlinear Optical Ellipsometer"						
	07/01/07 – 06/30/10	$436,064	$359,109	$76,955			
NSF	"Polarization-Dependent Nonlinear Optical Properties of Biomolecules"						
	1/1/07 – 12/31/09	$468,985	$348,582	$120,403			
Research Corporation	Cottrell Teacher-Scholar Award "Nonlinear Optical Probes of Structure and Function in Biological Systems"						

	6/1/04 – 5/31/09	$75,000	$75,000	$0			
Purdue Research Fund	"Development of Lissajous Trajectory Confocal Microscopy (LTM)"						
	6/1/08 – 5/31/09	$16,300	$16,300				

Pending

Agency	Total Project Period	Total Award	Total Direct Costs	Total Indirect Costs	Current Project Period	Current Direct Costs	Current Indirect Costs
ACS-PRF (PI) Co-PI: Nathan Mosier	"Nonlinear Optical Investigation of Cell Wall Deconstruction"						
	9/01/08 – 8/30/10	$100,000					

Completed

Agency	Total Project Period	Total Award	Total Direct Costs	Total Indirect Costs	Current Project Period	Current Direct Costs	Current Indirect Costs
Sloan Foundation	Sloan Research Fellowship						
	9/16/05 - 9/15/07	$45,000	$45,000	$0			
Beckman Foundation	Beckman Young Investigator Award "Nonlinear Optical Platforms for Biosensing"						
	9/1/04 – 8/31/07	$240,000	$240,000	$0			
Research Corporation	Research Innovation Award						
	5/15/02 – 5/14/07	$35,000	$35,000	$0	5/15/02	$35,000	$0
ACS-PRF Type G	"AC Electrokinetic Microscopy of Single Cells"						
	1/1/05 - 12/31/06	$35,000	$35,000	$0			
NSF	"Second Harmonic Ellipsometry and Spectroscopy of Biological Interfaces"						
	8/1/03 – 7/31/06	$319,000	$232,217	$86,783	8/1/03 – 7/31/06	$232,217	$86,783
Eli Lilly	Analytical Chemistry Academic Contact Committee New Untenured Faculty Grantee Award						
	10/1/03- 9/30/05	$40,000	$40,000	$0	$20,000	$20,000	$0
Purdue Research Fund	"New Interpretations of Nonlinear Optical Phenomena with Applications in Biosensing"						
	6/14/04 - 6/14/06	$14,715	$14,715	$0			
Dreyfus Foundation	New Faculty Award						
	7/26/01 - 7/26/06	$40,000	$39,500	$500	7/26/01- 7/26/06	$39,500	$500
Purdue Research Fund	"Using Nonlinear Optics to Probe Structure within Biological Interfaces"						
	5/03 – 8/03	$7000	$7000	$0			
Showalter Trust Fund	"Dielectrophoretic force microscopy for characterizing nanoscopic domains in biological interfaces"						

	7/1/02 – 6/31/04	$100,000	$92,343	$7,657			

H. Evidence of Involvement in Graduate Research Program

1. M.S. Students Graduated: 1

1. G. Scott Goeken (M.S. 2007) "Ultrasensitive Chiral-Specific Detection of Small Molecule Assemblies"
Current position: Pfizer, Research Scientist, Groton CT.

Ph.D. Students Graduated: 7

7. Ronald Wampler (Ph.D. 2008) "Second-Order Nonlinear Optical Activity of Biomolecular Assemblies"
Current position: post-doctoral associate, University of Utah.
6. Kyle Jacobson (Ph.D. 2008) "Electrodynamic Cavitation with Nanoscale Control"
5. Ryan Plocinik (Ph.D. 2007) "Nonlinear Optical Ellipsometry"
4. Al M. Hilton (Ph.D. 2006) "Dielectrophoretic Force Microscopy"
Current position: Post-doctoral associate at National Institute of Standards and Technology.
3. Brian P. Lynch (Ph.D. 2006) "Nanoscale Dielectrophoretic Force Spectroscopy of Cells in Solution"
Current position: Research scientist in Purdue Research Park.
2. Andrew J. Moad (Ph.D. 2006) "Polarization Effects in Nonlinear Optics"
Current position: Post-doctoral associate at National Institute of Standards and Technology.
1. Sally Wasileski (Ph.D. 2003) "Electrochemical Vibrational Spectroscopy: Fundamental Insight from Density Functional Theory Calculations"
Current position: Assistant Professor of Chemistry, University of North Carolina Asheville.

Number of Past Post Doctorates: 1

1. Brian Burke (2001-2002)
Current position: Research Scientist, Cardinal Health Pharmaceutical, North Carolina.

Number of Past Undergraduates: 4

1. Mark Polizzi (B.S. 2004)
2. Christopher Dailey (B.S. 2004)
3. John Perry (B.S. 2005)
4. Rachel Ispas (B.S. 2005)

2. Number of Current Graduate Students: 8

1. Christopher Dehen
2. Nathan Begue
3. Victoria Hall
4. Ellen Gilson
5. Duangporn (Debbie) Wanapun
6. Levi Haupert
7. David Kissick

8. Jeremy Madden

Number of Current Post Doctorates: 0

Number of Current Undergraduates: 4

1. Ryan Davis
2. Nick Ingram
3. Tony Ren
4. Kevin Jacobs

3. Graduate and undergraduate student awards:

2008

1. Ryan Davis, Margerum Undergraduate Summer Research Award

2005

1. Christopher Dehen, Merck Travel Grant Award
2. Ryan Plocinik, Student Poster Award at FACSS Annual Meeting

2004

1. Kyle Jacobson, GAANN award
2. Mark Polizzi, Dale W. Margerum Undergraduate Summer Fellowship
3. Katelyn Bryll, Emerson Kampen Scholar
4. Elizabeth Faust, School of Science Ruzicka Summer Fellowship

2003

1. Christopher Dailey: Hach Foundation Scholarship
2. Brian Lynch, Summer PRF Award
3. Andrew Moad, ACS Division of Physical Chemistry Poster Award at the National ACS meeting.
4. Ryan Plocinik, Epple Teaching Award
5. John Perry, Hypercube Scholar

2002

1. Sally Wasileski, F.M. Beckett Summer Research Fellowship
2. Brian Lynch, Summer PRF Award

V. Professional and Departmental/University Service

A. Discussion of Service

B. Department

1. Chair, graduate student recruitment committee (2007-present).
2. Member of the graduate studies committee (2008-present).
3. Member of the graduate student recruitment committee (2002-2007).
4. Member of the departmental faculty screening committee for an Analytical core hire (Fall 2004), leading to the successful hire of Eric Bakker.
5. Member of the steering committee for the Purdue Laboratory for Chemical Nanotechnology (2003-present).
6. Member of the departmental faculty search committee for a Physical Chemistry core hire (Fall 2005).
7. Member of the search and screen and recruitment committees for a Physical core hire leading to the successful hire of Brian Dian (Fall 2005, Spring 2006).
8. Jonathon Amy Facility for Chemical Instrumentation Review Committee member (2005 - present).

9. Member of the Nanoscience COALESCE faculty recruitment committee (Spring 2006).
10. Member of the advisory committee for the Departmental Laser Facility and the Facility for Chemical Nanotechnology (2006).

C. School

1. Member of the faculty recruitment committee for the Nanoscience Coalesce search (2005).
2. Member of the COALESCE faculty search committee in Nanotechnology (2003-2004).
3. Member of a School of Science Strategic Planning committee (2002-2003).

D. University

1. Administrative Member of PULSe (Purdue University Life Sciences) interdisciplinary graduate program, in the Membrane Biology Training Group (2003-present).
2. Member of Purdue Laser Safety Committee (2005-2006).

E. Professional

1. Currently serving as one of nine jury members for the National ACS Division of Analytical Chemistry Instrumentation Award (2005-2008).
2. Currently serving as one of four panel members for the Victor K. LaMer Award Selection Committee (2005-2008).

F. Public - Outreach or Other

1. Developed, organized, and implemented a new summer short course on interpreting polarization-dependent nonlinear optical measurements: *Annual Chautauqua on Nonlinear Optics*. Initiated in 2006, the upcoming meeting for the summer of 2008 will engage participants both from within the US and from abroad in intensive, high-level discussions of nonlinear optical phenomena. In addition, we have received corporate sponsorship for the program from Spectra-Physics/Newport Corporation supporting honoraria for an invited speaker (Alexander Benderskii from Wayne State University).
2. Panel member for the Iota Sigma Pi help session for preparing for oral defense of Original Proposals (2006).
3. Panel member for the Iota Sigma Pi help session for preparing for oral defense of Original Proposals (2003).
4. Co-taught a summer short course on optical instrumentation and spectroscopy with Rob Noll (2002).