

Igor V. Stiopkin

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Education

- **Columbia University**, Physics Department, New York, NY
 - Ph. D., Physics**, 2005
 - Thesis title: “*Resonant Heterodyne Two-Dimensional Electronic Spectroscopy*”
 - Ph.D. research, **UC Berkeley, Chemistry Department**, 2001-2005
 - Advisor Professor **Graham R. Fleming**
 - Ph.D. research, **Columbia University, Physics Department**, 2000-2001
 - Advisor Professor **Tony F. Heinz**
 - M. Phil., Physics**, 2001
 - M. A., Physics**, 2000
- **Moscow Institute of Physics and Technology**
 - M. S., Applied Physics**, 1998
 - M. S., Applied Mathematics**, 1998
 - B. S., Physics**, 1996
- **Kiev School of Physics and Mathematics**, Kiev, Ukraine
 - HS Diploma**, 1992

Academic Honors

Poster Award, Gordon Research Conference: Vibrational Spectroscopy, 2010
ACS Award for Excellence in Postdoctoral Research, August 2009
Faculty Fellowship, Physics Department, Columbia University, 1998-2001
Diploma with Honors, Moscow Institute of Physics and Technology, Russia, 1998

Research Highlights

First Application of 2D Electronic (Optical) Spectroscopy to Photosynthetic Excitonic Systems

Experimentally and theoretically demonstrated heterogeneity of ultrafast energy transfer rates in a model photosynthetic system
Currently 13 experimental groups in the world study excitonic systems with 2D Optical Spectroscopy

Principal Designer of Passively Phase-Stabilized 2D Electronic (Optical) Spectroscopy

Currently 4 groups in the world use elements of this experimental methodology

Principal Designer of Heterodyne Detected SFG which provides sub-monolayer detection sensitivity

Currently 4 groups in the world are implementing elements of this experimental methodology

Demonstrated that Hydrogen Bonds at the Top Monolayer of the Air/Water Interface are as Strong as in Bulk Water

This work resolved a long-standing controversy about water structure at the interfaces. This work was *published in Nature* and also was highlighted by Nature News and Views Editorial, and by a number of popular scientific websites

Research cited 15 times by Science, Nature, and PNAS journals

Authored a book on Two-Dimensional Spectroscopy

Teaching Experience

- “Modern Molecular Spectroscopy” (2007)
Contributed to lecturing to a graduate course read by A.V. Benderskii, Wayne State, Detroit, MI
- “Femtosecond Interface Spectroscopy” (2007)
Lectured at Chemistry Colloquium for “Michigan Bridges to Baccalaureate”, Wayne State, Detroit, MI
- Advanced Physics Lab in Optics (2001)
Teaching Assistant
Columbia University, New York, NY
- Introductory Physics Labs in Mechanics, E&M, and Optics (1998-2000)
Teaching Assistant
Columbia University, New York, NY

Supervisory Experience

- Overlooked construction of new femtosecond spectroscopy laser system (2010)
J.C. Wright group, University of Wisconsin-Madison, Madison, WI
- Mentoring 2 graduate students (2009-2011)
J.C. Wright group, University of Wisconsin-Madison, Madison, WI
- Supervised research of 4 graduate students and 1 undergraduate student (2006-2009)
A.V. Benderskii group, Wayne State, Detroit, MI

Professional Experience

- Research Associate, the University of Wisconsin-Madison, Madison, WI (2009-2011)
Advisor: Prof. **John C. Wright**, ph. (608) 262-0351, wright@chem.wisc.edu

Femtosecond multidimensional spectroscopy; molecular dynamics at the air/water interface by SFG spectroscopy
- Postdoctoral Scholar, Wayne State University, Detroit, MI (2006-2009)
Advisor: Prof. **Alexander V. Benderskii**, ph. (213) 740-3220, alex.benderskii@usc.edu

Aqueous interfaces: designed highly-sensitive surface-selective heterodyne-detected sum frequency generation (HD-SFG) spectroscopy; studied orientational dynamics aqueous interfaces; probed strength of hydrogen bonds at the top monolayer of the air/water interface with isotope-dilution experiments
- Research Assistant, UC Berkeley, Chemistry Department, Berkeley, CA (2001-2005)
Advisor: Prof. **Graham R. Fleming**, ph. (510) 643-2735, grfleming@lbl.gov

Model photosynthetic complexes in liquids: designed passively phase stabilized 2D optical spectroscopy; conducted extensive theoretical simulations of exciton dynamics and energy transfer in model photosynthetic light harvesting complexes and showed ways how to retrieve new molecular information
- Research Assistant, Columbia University, Physics Department, New York, NY (2000-2001)
Advisor: Prof. **Tony F. Heinz**, ph. (212) 854-6564, tony.heinz@columbia.edu

Surface-selective nonlinear spectroscopy of aqueous interfaces: studied charging properties and determined zero-point charge at single crystal hematite/water interface; determined SFG scattering pattern from dielectric transparent nanoparticles in water

Invited Talks

- Igor Stiopkin, "Hydrogen Bonds at the Air/Water Interface Probed by Heterodyne-Detected SFG Spectroscopy," poster award invited talk, Gordon Research Conference on Vibrational Spectroscopy, University of New England, Biddeford, ME, August 2010
- Igor Stiopkin, "Structure and Dynamics of Proteins and Peptides in Membranes by Surface-Selective Multidimensional Spectroscopy," Workshop on Nonlinear Optics at Interfaces, Telluride Science Research Center, Telluride, CO, June 2010
- I.V. Stiopkin, C. Weeraman, F. Shalhout, and A. V. Benderskii, "Dynamics of Dangling OD Stretch at the Air/Water Interface by Heterodyne-Detected SFG Spectroscopy," Special Postdoc Research Highlight Symposium at the Washington, DC, ACS Meeting in August 2009

Publications

- **I.V. Stiopkin**, C. Weeraman, P.A. Peieniazek, J.L. Skinner, and A.V. Benderskii, "Vibrational Coupling and Hydrogen Bonding at Water Surface Revealed by Isotopic Dilution Spectroscopy," *Nature*, 474, p.192-195, 2011 (*Highlighted in Nature News and Views Editorial*)
- **I.V. Stiopkin**, H.D. Jayathilake, C. Weeraman, and A.V. Benderskii "Temporal effects on spectroscopic line shapes, resolution, and sensitivity of the broad-band sum frequency generation," *J. Chem. Phys.* 132, 234503, 2010
- **I.V. Stiopkin**, H. D. Jayathilake, A. N. Bordenyuk, and A. V. Benderskii "Heterodyne-Detected Vibrational Sum-Frequency Generation Spectroscopy," *J. Am. Chem. Soc.*, 130, 2271, 2008
- A.N. Bordenyuk, C. Weeraman, A. Yatawara, H. D. Jayathilake, **I.V. Stiopkin**, Y.Liu, and A.V. Benderskii, "Vibrational Sum Frequency Generation Spectroscopy of Dodecanethiol on Metal Nanoparticles," *J. Phys. Chem. C*, 111, 8925, 2007 (*Special Issue "Kenneth B. Eisenthal Festschrift"*)
- **I.V. Stiopkin**, T. Brixner, M. Yang and G. R. Fleming, "Heterogeneous Exciton Dynamics Revealed by Two-Dimensional Optical Spectroscopy," *J. Phys. Chem. B*, 110, 20032, 2006, (*Special Issue "C.B. Harris Festschrift"*)
- J. Shan, J. Dadap, **I.V. Stiopkin**, Z. Zang, G. Reider, T. F. Heinz, "Experimental Study of Optical Second-Harmonic Scattering from Spherical Nanoparticles," *Phys. Rev. A*, 73, 023819, 2006
- M. Cho, T. Brixner, **I.V. Stiopkin**, H. Vaswani, G. R. Fleming "Two Dimensional Electronic Spectroscopy of Molecular Complexes," *J. Chinese Chem. Soc.*, 53, 2006 (*Feature Article*)
- **I.V. Stiopkin**, T. Brixner and G. R. Fleming "Two-Dimensional Optical Heterodyne Spectroscopy of Molecular Complexes," *Ultrafast Phenomena XIV*, 2005, edited by T. Kobayashi
- T. Brixner, T. Mancal, **I.V. Stiopkin**, and G. R. Fleming "Phase-stabilized two-dimensional electronic spectroscopy," *J. Chem. Phys.* 121(9), 2004 (*Selected for the Virtual Journal of Ultrafast Science*)
- T. Brixner, **I.V. Stiopkin**, and G. R. Fleming, "Tunable two-dimensional femtosecond spectroscopy," *Optics Letters*, 29(8), 2004
- Q.-H. Xu, Y.-Z. Ma, **I.V. Stiopkin**, and G. R. Fleming, "Wavelength-dependent resonant homodyne and heterodyne transient grating spectroscopy with a diffractive optics method: Solvent effect on the third-order signal," *J. Chem. Phys.* 116(22), p.9333-9340, 2002
- **I.V. Stiopkin**, "Resonant Heterodyne Two-Dimensional Electronic Spectroscopy," Dissertation, Columbia University, 2005

Book

- "Two-Dimensional Electronic Spectroscopy: Applications to Multilevel Molecular Systems and to Excitonic Molecular Aggregates," **I.V. Stiopkin**, VDM Publishing, Germany, 2008

US and International Patent Application

- "Enhanced Surface Selective Spectroscopy Using Broad-Band Heterodyne-Detected Sum Frequency Generation," A. V. Benderskii, **I.V. Stiopkin**, and H. D. Jayathilake

Conferences

- I.V. Stiopkin, C. Weeraman, P.A. Peieniazek, J.L. Skinner, and A.V. Benderskii, "Dynamics at the Deuterated Air/Water Interface: Theory and Experiment," 240th ACS meeting, Boston, MA, August 2010
- I.V. Stiopkin, C. Weeraman, P.A. Peieniazek, J.L. Skinner, and A.V. Benderskii, "Dynamics at the Deuterated Air/Water Interface: Theory and Experiment," 5th International Conference on Coherent Multidimensional Spectroscopy, Minneapolis, MN, August, 2010
- I.V. Stiopkin, C. N. Weeraman, F. Shalhout, and A. V. Benderskii, "Dynamics of Dangling OD Stretch at the Air/Water Interface by Heterodyne-Detected SFG Spectroscopy," Gordon Research Conference on Dynamics at Surfaces, NH, August 2009
- I.V. Stiopkin, C. N. Weeraman, F. Shalhout, and A. V. Benderskii, "Dynamics of Dangling OD Stretch at the Air/Water Interface by Heterodyne-Detected SFG Spectroscopy," OSU International Symposium on Molecular Spectroscopy, Columbus, OH, June 2009
- I.V. Stiopkin, C. Weeraman, H. D. Jayathilake, and A. V. Benderskii "Dangling OD-Stretch Dynamics at the Air/Water Interface Studied with Heterodyne-Detected SFG Spectroscopy," Gordon Research Conference on Vibrational Spectroscopy, MA, August 2008
- I.V. Stiopkin, A. Yatawara, H. Jayathilake, C. Weeraman, and A.V. Benderskii "Orientational Dynamics at the Air/Water Interface Studied with SFG Spectroscopy," 63 International Molecular Symposium on Molecular Spectroscopy, Columbus, OH, June 2008
- I.V. Stiopkin, H. D. Jayathilake, A. N. Bordenyuk, and A. V. Benderskii "Heterodyne-detected Vibrational Sum-Frequency Generation Spectroscopy," Gordon Research Conference on Dynamics at Surfaces, RI, August 2007
- I.V. Stiopkin, T. Brixner, M. Yang and G. R. Fleming, "Heterogeneous Exciton Dynamics Revealed by Two-Dimensional Optical Spectroscopy," Gordon Research Conference on Liquids, RI, August 2007
- I.V. Stiopkin, H. D. Jayathilake, A. N. Bordenyuk, and A. V. Benderskii "Heterodyne-Detected Vibrational Sum-Frequency Generation as a Novel Tool to Measure Adsorbant Concentrations at Interfaces," 62 International Molecular Symposium on Molecular Spectroscopy, Columbus, OH June, 2007
- I.V. Stiopkin, T. Brixner, M. Yang and G. R. Fleming, "Ultrafast heterogeneous dynamics of molecular aggregates revealed by 2D optical spectroscopy," ACS National Meeting, Chicago, IL, March 2007
- T. Brixner, I.V. Stiopkin, G.R. Fleming, "Phase-Stabilized Two-Dimensional Femtosecond Spectroscopy," FACSS Annual Meeting, October 2004
- I.V. Stiopkin, T. Brixner, G.R. Fleming, "Two-dimensional Electronic Spectroscopy of Molecular Complexes," 2nd international Conference on Coherent Multidimensional Vibrational Spectroscopy, August 2004
- T. Brixner, I.V. Stiopkin, M. Yang, and G. R. Fleming, "Tunable two-dimensional femtosecond spectroscopy," ACS National Meeting, Anaheim, CA, March, 2004
- I.V. Stiopkin, T. Brixner, M. Yang and G. R. Fleming, "2D Electronic Spectroscopy of J-aggregates: Theory and Experiment," Gordon Conference on Liquids, RI, August 2003
- I.V. Stiopkin, T. Brixner, M. Yang and G. R. Fleming, "2D Electronic Spectroscopy of J-aggregates: Theory and Experiment," Excited State Processes in Electronic and Bio Nano-Materials, Los Alamos, NM, August 2003
- Chemical Physics Summer School, Roger Williams University, RI, June 2002, organizer: Shaul Mukamel

Conferences (Continued)

- J. P. Fitts, J. Dadap, I.V. Stiopkin, Z. Zang, G. W. Flynn, T. F. Heinz, K. B. Eisenthal, "Second harmonic studies of the hematite/aqueous interface," 420, ACS National Meeting Orlando, Florida April 2002
- J. Shan, I. Stiopkin, J. Dadap, G. Reider, T.F. Heinz , "Experimental Investigation of Second-Harmonic Generation from Nanoparticles," APS March Meeting 2002
- J. P. Fitts, J. Dadap, I.V. Stiopkin, Z. Zang, G. W. Flynn, T. F. Heinz, K. B. Eisenthal, "Second harmonic studies of the hematite/aqueous interface," 223, ACS National Meeting Orlando, Florida, April 2002
- I.V. Stiopkin, Z.-H. Zhang, K. B. Eisenthal, T. F. Heinz, "Determination of the Zero Point Charge of the Hematite/Water Interface," APS March Meeting 2001
- I.V. Stiopkin, Z. Zhang, J. Fitts, K. B. Eisenthal, T .F. Heinz, "Probing Acid-Base Equilibria at Liquid/Solid Interfaces by Optical Second Harmonic Generation," Gordon Conference on Liquids, RI, August 2001