CHRIS T. MIDDLETON

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EXPERIENCE

PhaseTech Spectroscopy, Inc., Vice-President & CTO, 2012-Present
Officer (Treasurer), Madison Ultimate Frisbee Association, 2023-Present
University of Wisconsin-Madison, Assistant Scientist, 2012-2012
University of Wisconsin-Madison, Postdoctoral Research Associate, 2008-2012
Ohio State University, Ph.D. in Physical Chemistry, 2002-2008
Syracuse University, B.S. in Chemistry, 1998-2002

INDUSTRIAL ACHIEVMENTS

Developed the first commercial AOM-based 4f pulse shapers

Developed the first commercial coherent 2D IR and 2D visible spectrometers

Commercialized two next-generation mid-IR detectors for ultrafast spectroscopy

Developed the first commercial transient absorption and 2D spectrometer for 100 kHz repetition rate femtosecond lasers

Products used in over 90 different research laboratories, at universities, government laboratories, or companies

Products used for over 150 scientific research articles, including articles in Science, PNAS, Nature Chemistry, etc.

Products used in over 20 different states in the U.S. and 19 different countries throughout the world: Australia, China, Czech Republic, Denmark, France, Germany, Hungary, India, Ireland, Israel, Korea, Poland, Portugal, Singapore, Slovenia, Sweden, Switzerland, The Netherlands, United Kingdom

Products used for a number of seminal research achievements: First 2D IR microscope, First 100 kHz 2D spectrometer, First 3D SFG measurements, Biophysical Journal Paper of the Year (2019), First transient 2D visible measurement, First pulse shaping at 12 - 18 μm wavelengths, First 2D IR-Raman measurement, First 2D optical Kerr effect measurement

HONORS

Graduate Student Faculty Liaison Committee Mentor Award, Department of Chemistry, University of Wisconsin-Madison, 2010

John S. Swenton Award for Outstanding Teaching by a Graduate Student, Department of Chemistry, Ohio State University, 2008

GAANN Fellow, Department of Chemistry, Ohio State University, 2003

PUBLICATIONS

24. Paul M. Donaldson, Greg M. Greetham, Chris T. Middleton, Brad M. Luther, Martin T. Zanni, Peter Hamm, Amber T. Krummel, "Breaking Barriers in Ultrafast Spectroscopy and Imaging Using 100 kHz Amplified Yb-Laser Systems" *Accounts of Chemical Research*, 56, 2062 (2023).

23. Kieran M Farrell, Josh S Ostrander, Andrew C Jones, Baichhabi R Yakami, Sidney S Dicke, Chris T. Middleton, Peter Hamm, Martin T Zanni, "Shot-to-shot 2D IR spectroscopy at 100 kHz using a Yb laser and custom-designed electronics" *Optics Express*, 28, 33584 (2020).

22. Andisheh Abedini, Annette Plesner, Ping Cao, Zachary Ridgway, Jinghua Zhang, Ling-Hsien Tu, Chris T. Middleton, Brian Chao, Daniel J Sartori, Fanling Meng, Hui Wang, Amy G Wong, Martin T Zanni, C Bruce Verchere, Daniel P Raleigh, Ann Marie Schmidt, "Time-resolved studies define the nature of toxic IAPP intermediates, providing insight for anti-amyloidosis therapeutics" *eLife*, 5, e12977 (2016).

21. Sudipta S. Mukherjee, David R. Skoff, Chris T. Middleton and Martin T. Zanni, "Fully absorptive 3D IR spectroscopy using a dual mid-infrared pulse shaper" *Journal of Chemical Physics*, 139, 144025 (2013).

20. David R. Skoff, Jennifer E. Laaser, Sudipta S. Mukherjee, Chris T. Middleton and Martin T. Zanni, "Simplified and economical 2D IR spectrometer design using a dual acousto-optic modulator" *Chemical Physics*, 422, 8-15 (2012).

19. Charlene, Su, Chris T. Middleton, Bern Kohler, "Base-Stacking Disorder and Excited-State Dynamics in Single-Stranded Adenine Homo-oligonucleotides" *Journal of Physical Chemistry B*, 116, 10266-10274 (2012).

18. Chris T. Middleton, Peter Marek, Ping Cao, Chi-cheng Chiu, Sadanand Singh, Ann Marie Woys, Juan J. de Pablo, Daniel P. Raleigh & Martin T. Zanni, "Two-dimensional infrared spectroscopy reveals the complex behaviour of an amyloid fibril inhibitor" *Nature Chemistry*, 4, 355-360 (2012)

17. Lu Wang, Chris T. Middleton, Sadanand Singh, Allam S. Reddy, Ann M. Woys, David B. Strasfeld, Peter Marek, Daniel P. Raleigh, Juan J. de Pablo, Martin T. Zanni, James L. Skinner, "2DIR Spectroscopy of Human Amylin Fibrils Reflects Stable β-Sheet Structure" *Journal of the American Chemical Society*, 11, 16062-16071 (2011).

16. Chris T. Middleton, Lauren E. Buchanan, Emily B. Dunkelberger, Martin T. Zanni, "Utilizing Lifetimes to Suppress Random Coil Features in 2D IR Spectra of Peptides" *Journal of Physical Chemistry Letters*, 2, 2357-2361 (2011).

15. Lu Wang, Chris T. Middleton, Martin T. Zanni, and James L. Skinner, "Development and Validation of Transferable Amide I Vibrational Frequency Maps for Peptides" *Journal of Physical Chemistry B*, 115, 3713 (2011).

14. Chris T. Middleton, Ann M. Woys, Sudipta Mukerhjee, Martin T. Zanni, "Residue-specific structural kinetics of proteins through the union of isotope labeling, mid-IR pulse shaping, and coherent 2D IR spectroscopy" *Methods*, 52, 12-22 (2010).
Invited article in thematic issue "Protein Folding".

13. Fanling Meng, Andisheh Abedini, Annette Plesner, Chris T. Middleton, Kathryn J. Potter, Martin T. Zanni, C. Bruce Verchere, and Daniel P. Raleigh, "The Sulfated Triphenyl Methane Derivative Acid Fuchsin is a Potent Inhibitor of Amyloid Formation by Human Islet Amyloid Polypeptide and Protects against the Toxic Effects of Amyloid Formation" *Journal of Molecular Biology*, 400, 555-566 (2010).

12. David B. Strasfeld, Chris T. Middleton, Martin T. Zanni, “Mode Selectivity with Polarization Shaping in the Mid-IR” *New Journal of Physics*, 11, 105046 (2009).
In special issue “Focus on Quantum Control”.

11. Chris T. Middleton, David B. Strasfeld, Martin T. Zanni, “Polarization shaping in the mid-IR and polarization-based balanced heterodyne detection with application to 2D IR spectroscopy” *Optics Express*, 17, 14526–14533 (2009).

10. Chris T. Middleton, Kimberly de La Harpe, Charlene Su, Yu Kay Law, Carlos E. Crespo-Hernández, and Bern Kohler, “DNA Excited-State Dynamics: From Single Bases to the Double Helix” *Annual Review of Physical Chemistry*, 60, 217-239 (2009).

9. Patrick M. Hare, Chris T. Middleton, Kristin I. Mertel, John M. Herbert, and Bern Kohler, “Time-resolved infrared spectroscopy of the lowest triplet state of thymine and thymidine” *Chemical Physics*, 347, 383-392 (2008).
In special issue “Ultrafast Photoinduced Processes in Polyatomic Molecules - Electronic Structure, Dynamics and Spectroscopy”.

8. Chris T. Middleton, Boiko Cohen, and Bern Kohler, “Solvent and Solvent Isotope Effects on the Vibrational Cooling Dynamics of a DNA Base Derivative” *Journal of Physical Chemistry A*, 111, 10460-10467 (2007).

7. Gotard T. Burdzinski, Chris T. Middleton, Terry L. Gustafson, and Matthew S. Platz, “Solution Phase Isomerization of Vibrationally Excited Singlet Nitrenes to Vibrationally Excited 1,2-Didehydroazepine” *Journal of the American Chemical Society*, 128, 14804-14805 (2006).

6. Bruce S. Hudson, Dale A. Braden, Damian G. Allis, Tim Jenkins, Sergey Baronov, Chris Middleton, Robert Withnall, and Craig M. Brown, “The Crystalline Enol of 1,3-Cyclohexanedione and Its Complex with Benzene: Vibrational Spectra, Simulation of Structure and Dynamics and Evidence for Cooperative Hydrogen Bonding” *Journal of Physical Chemistry A*, 108, 7356-7363 (2004).

5. Deepak Singh, Bruce S. Hudson, Chris Middleton, and Robert R. Birge, “The Conformation and Orientation of the Retinyl Chromophore in Rhodopsin: A Critical Evaluation of Recent NMR Data on the Basis of Theoretical Calculations Results in a Minimum Energy Structure Consistent with all Experimental Data” *Biochemistry*, 40, 4201-4204 (2001).

4. Bruce S. Hudson, John Tse, Marek Z. Zgierski, Stewart Parker, Dale A. Braden, and Chris Middleton, “The Inelastic Incoherent Neutron Spectrum of Crystalline Oxamide” *Chemical Physics*, 261, 249-260 (2000).
In special issue “Condensed phase structure and dynamics: a combined neutron scattering and numerical modeling approach”.

3. Sergei Tretiak, Chris Middleton, Vladimir Chernyak, and Shaul Mukamel, “Bacteriochlorophyll and Carotenoid Excitonic Couplings in the LH2 System of Purple Bacteria” *Journal of Physical Chemistry B*, 104, 9540-9553 (2000).

2. Sergei Tretiak, Chris Middleton, Vladimir Chernyak, and Shaul Mukamel, “Exciton Hamiltonian for the Bacteriochlorophyll System in the LH2 Antenna Complex of Purple Bacteria” *Journal of Physical Chemistry B*, 104, 4519-4528 (2000).

1. Sergei Tretiak, Chris Middleton, Vladimir Chernyak, and Shaul Mukamel, “Localized and Delocalized Electronic Excitations in Biological and Artificial Antenna Complexes” *Photoinduced Charge Transfer*, Lewis Rothberg, Editor (World Scientific, Singapore), 116-127, (2000).

PRESENTATIONS

"Commercialization of Ultrafast 2D Spectroscopy: How a Spectroscopy Startup Grew from the Basement into a Company" Apr 2023
Invited Talk, Ellis R. Lippincott Award Symposium, SciX, Covington, KY

"Faster, easier and more accurate: 2D IR and 2D SFG spectroscopy with mid-IR pulse shaping" Aug 2012
Invited Talk, 5th Pulse Shaping Workshop, Michigan State University, East Lansing, MI

"New Techniques Bring New Insights: Coherent 2D IR Spectroscopy Reveals How Drugs Alter Protein Aggregation" Jan 2012
Talk, Michigan State University, Department of Physics, East Lansing, MI

"Using mid-IR Pulse Shaping and Quantum Control to Optimize 2D IR Spectroscopy" Aug 2011
Talk, Gordon Research Conferences, Quantum Control of Light & Matter, South Hadley, MA

"Aggregation and Drug Binding of the Diabetes Amyloid Peptide Revealed by 2D IR Spectroscopy" Jan 2011
Talk, Syracuse University, Department of Chemistry, Syracuse, NY

"Binding of an Aggregation Inhibitor to the Diabetes Amyloid Peptide: Residue-Level Structural Characterization via 2D IR Spectroscopy" Aug 2010
Poster, 5th International Conference on Coherent Multidimensional Spectroscopy, Minneapolis, MN

"Drug Binding to the Diabetes Amyloid Peptide Revealed by 2D IR Spectroscopy" Jul 2010
Talk, 17th International Conference on Ultrafast Phenomena, Snowmass, CO

"Automation of 2D IR spectroscopy for analytical and research purposes" Oct 2009
Talk, Federation of Analytical Chemistry and Spectroscopy Societies Conference, Louisville, KY

"Polarization Shaping of Femtosecond mid-IR Pulses, Polarization-Based Balanced Heterodyne Detection, and Their Application to 2D IR Spectroscopy" May 2009
Invited Talk, Ludwig-Maximilians-Universität (University of Munich), Department of Biomolecular Optics, Munich, Germany

"Femtosecond mid-Infrared Spectroscopy of Pyrimidine DNA Bases: Intramolecular Vibrational Redistribution, Vibrational Cooling and Excited State Photophysics" Jul 2007
Poster, Gordon Research Conferences, Photochemistry, Smithfield, RI

"Femtosecond mid-Infrared Spectroscopy of Pyrimidine DNA Bases: Intramolecular Vibrational Redistribution, Vibrational Cooling and Excited State Photophysics" Jun 2007
Talk, 62nd International Symposium on Molecular Spectroscopy, Columbus, OH

"Ultrafast Vibrational Cooling Dynamics in 9-Methyladenine Observed with UV Pump/UV Probe and UV Pump/mid-IR Probe Transient Absorption Spectroscopy" Jul 2006
Poster, Gordon Research Conferences, Vibrational Spectroscopy: Probing Structure and Dynamics, Biddeford, MA

"Ultrafast Vibrational Cooling Dynamics In 9-Methyladenine Observed With UV Pump/UV Probe Transient Absorption Spectroscopy" Jun 2006
Talk, 61st International Symposium on Molecular Spectroscopy, Columbus, OH

"Inelastic Neutron Scattering Studies of Hydrocarbons" Jun 2002
Poster, American Conference on Neutron Scattering, Knoxville, TN

SERVICE

Peer review for *Chemical Physics Letters*, *Journal of the American Chemical Society, Journal of Physical Chemistry, Optics Express, ACS Food Science & Technology*

Poster Judge, Inter-American Photochemical Society, Winter Meeting 2024

Member, American Chemical Society since 2003

Member, Optical Society of America since 2010

UW-Madison Chemistry Careers Day 2019

Invited Speaker, *Preparing For Life After Graduate School*, Madison, WI 2011
A Workshop Presented by the American Chemical Society Office of Graduate Education and Department of Career Services

Co-Founder and Co-Organizer, *Physical Chemistry Student Lecture Series* 2003 – 2007
Including speakers from Iowa State U., Stanford U., U. of California, Irvine, U. of Illinois at Urbana-Champaign, U. of Southern California and Wayne State U. Annual budget of $2000, sponsored by OSU Department of Chemistry, Physical Division, Coherent, Inc. and Elsevier B.V.

Sponsored Award Judge, American Chemical Society Columbus Section – Chemical Sciences Award, *State Science Day*, Columbus, OH 2004 – 2006

Event Supervisor, *Ohio Science Olympiad*, Columbus, OH 2003 – 2005

Event Supervisor, *National Science Olympiad*, Columbus, OH 2003

Committee Member, *The Edward Mack Award and Lecture* (Recipient: Dr. Alan Marshall) 2003