Blaise J Thompson

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EDUCATION

University of Wisconsin-Madison 2011 - Present
PhD, Analytical Chemistry Madison WI

→ Researcher in John C. Wright group.
→ Focus on ultrafast materials spectroscopy and instrument development.

Bates College 2007 - 2011
BS, Chemistry; Minor, Philosophy; Concentration: Applying Mathematical Methods Lewiston ME

→ Senior thesis completed in lab of Matthew J. Cote:
Investigations of Plasmon Polaritions with Total Internal Reflection & Atomic Force Microscopy.

EXPERIENCE

John C. Wright Group - ultrafast materials spectroscopy 2011 - Present
Graduate Assistant Madison WI

→ Designed and constructed software tools to collect and process multidimensional spectra
→ Developed novel tools to streamline OPA tuning procedures.
→ Worked in collaboration with Physical and Materials chemists to address challenges in solar energy generation.

Matthew J. Cote Group - microscopy and plasmonics 2009 - 2011
Undergraduate Researcher Lewiston ME

→ Contiguous work for two academic years and intervening summer.
→ Designed and constructed a combined total internal reflection / atomic force microscope.
→ Worked independently and in groups leading other students.
→ Coordinated work with my advisor and other staff and faculty.
→ Wrote a comprehensive thesis on my work.

Michael Dailey Group - neuroscience 2008
Undergraduate Researcher Iowa City IA

→ Dissected and prepared mouse brain samples for in-vivo microglial imaging studies.
→ Trained to utilize confocal microscopy setup.

Peter L. Nagy Group - epigenetics 2007
High School Researcher Iowa City IA

→ Designed and created plasmid, teaching myself from reference materials.
→ Inserted plasmid into yeast.

PROJECTS (SEE MY GITHUB)

Creator: WrightTools 2014 - Present

Tools for loading, processing, and plotting multidimensional spectroscopy data.

→ Single processing toolkit for wide variety of instrumental data, built to be extensible as more data-types become relevant

→ Offers specialized interactions, such as transformations, that are particularly suited to multidimensional spectroscopy

→ Online documentation through Sphinx and ReadTheDocs

→ Project managed with several graduate student and undergraduate contributors, active issue tracking, version control and an extensive testing suite

→ Central package used as a data management pipeline by other packages simulating and acquiring multidimensional spectra

Creator: PyCMDS 2015 - Present

Unified software for controlling hardware and collecting data in the Wright group.

→ Supplies modular hardware control, calibration, and orchestration during complex, long-lasting CMDS experiments.

→ Provides interface to optomechanical hardware from a variety of manufacturers, including National Instruments, Thorlabs, Horiba, Newport, and Aerotech. Also controls hardware built and customized in-house.

→ Delights users with advanced features such as automatic data backup and notification via Slack.

→ In conjunction with contemporaneous hardware improvements, algorithmic improvements in acquisition strategy **increased scan rate by up to two orders of magnitude** over previous software.

Creator: automated filter wheel assembly 2017

Custom filter wheel hardware, electronics and firmware.

→ Allows for new experimental degrees of freedom within the Wright group.

→ Designed and constructed custom chases in collaboration with the department machine shop.

→ Designed custom circuit board using KiCad, ordered supplies from appropriate online retailers

→ Designed and implemented serial interface and Arduino firmware, including semi-syncronus motion, low-level C++ string processing, and microstepping control for enhanced acquisition time efficiency

Creator: tidy_headers 2017

Rapidly write data from python to plain text, and back again.

→ Dependency of larger projects like WrightTools, and used directly for custom applications.

Founder: WrightSim 2017 - Present

Efficient, flexable simulation package for multidimensional spectroscopy.

→ Uses Liouville's theorem to numerically simulate nonlinear spectroscopy.

→ I was also a principle contributor to the predecessor of WrightSim, NISE.

Contributor: InGaAs array 2015 - 2016

Quickly and cheaply acquire near-infrared pulse spectra.

→ Purchased bare array and specialty ADC chip from Hamamatsu, without purchasing expensive control and timing box. Designed and produced custom circuit board and enclosure for device.

→ Wrote firmware to handle serial communication between ADC, acquisition software.

→ Used advanced features such as watchdog timers to handle unexpected timing and communication problems.

Contributor: osfclient 2017

A python library and command-line client for file storage on OSF

→ Added Windows functionality, assisted in various debugging efforts in early version of osfcli

PUBLICATIONS

5. Horak, Erik H., Rea, Morgan T. Heylman, Kevin D. Gelbwaser-Klimovsky, David, Saikin, Semion K., **Thompson, Blaise J.**, Kohler, Daniel D., Knapper, Kassandra A., Wei, Wei; Pan, Feng; Gopalan, Padama; Wright, John C.; Aspuru-Guzik, Alan; & Goldsmith, Randall H. (2018). Exploring Electronic Structure and Order i Polymers via Single-Particle Microresonator Spectroscopy. *Nano Letters*, in press

4. Kohler, D. D., **Thompson, B. J.**, & Wright, J. C. (2017). Frequency-domain coherent multidimensional spectroscopy when dephasing rivals pulsewidth: Disentangling material and instrument response. *The Journal of Chemical Physics*, 147(8), 84202. doi:10.1063/1.4986069

3. Czech, K. J., **Thompson, B. J.**, Kain, S., Ding, Q., Shearer, M. J., Hamers, R. J., Jin, S., & Wright, J. C. (2015). Measurement of Ultrafast Excitonic Dynamics of Few-Layer MoS_2 Using State-Selective Coherent Multidimensional Spectroscopy. *ACS Nano*, 9(12), 12146–12157. doi:10.1021/acsnano.5b05198

2. Fu, Y., Meng, F., Rowley, M. B., **Thompson, B. J.**, Shearer, M. J., Ma, D., Hamers, R. J., Wright J., & Jin, S. (2015). Solution Growth of Single Crystal Methylammonium Lead Halide Perovskite Nanostructures for Optoelectronic and Photovoltaic Applications. *Journal of the American Chemical Society*, 137(17), 5810–5818. doi:10.1021/jacs.5b02651

1. Cabán-Acevedo, M., Kaiser, N. S., English, C. R., Liang, D., **Thompson, B. J.**, Chen, H.-E., Czech, K. C., Wright, J. C., Hamers, R. J., & Jin, S. (2014). Ionization of High-Density Deep Donor Defect States Explains the Low Photovoltage of Iron Pyrite Single Crystals. *Journal of the American Chemical Society*, 136(49), 17163–17179. 10.1021/ja509142w

PRESENTATIONS

4. Presentation, Chaos and Complexity Seminar: "Nonlinear Multidimensional Spectroscopy" 2017. Madison, WI USA PDF

3. Poster, Coherent Multidimensional Spectroscopy": "A Robust, Fully Automated Algorithm to Collect High Quality OPA Tuning Curves" 2016. Groningen, the Netherlands PDF

2. Poster, Midwest Universities Analytical Chemistry Conference": "Utilizing Coherent Multidimensional Spectroscopy to Investigate Nanomaterials for Solar Energy Generation." 2012. Madison, WI USA

1. Poster, Mount David Summit": "Spectroscopic Investigation of Plasmonic Nanoparticles." 2011. Bates College; Lewiston, ME USA

AWARDS & HONORS

Roger Carlson Award 2017

→ Awarded by the University of Wisconsin Chemistry department for excellence in research.

Taylor Teaching Award 2016

→ Selected by University of Wisconsin Chemistry students and Faculty as one of the most outstanding Teaching Assistants of the 2015-2016 School Year.

Rodney F. Johonnot Graduate Award 2011

→ Selected by Bates Faculty as most deserving of aid in furthering his or her studies in professional or postgraduate work.

Bates College Key 2011

→ Awarded by Bates Faculty and staff to 20 students in each graduating class based on academic standing, character, campus and community service, leadership, and future promise.

TEACHING EXPERIENCE

Fundamentals of Analytical Science 2018
Teaching Assistant, 1 semester UW-Madison

→ Led laboratory and discussion sections.

Graduate Chemical Instrumentation: Design & Control (Electronics) 2017
Teaching Assistant, 1 semester UW-Madison

→ Led laboratory section of course.
→ Assisted students during extended independent instrument design and construction.

Graduate Instrumental Analysis 2012, 2015
Teaching Assistant, 2 semesters UW-Madison

→ Led laboratory section of course.
→ Prepared homeworks (using Jupyter notebooks for the first time) and led homework review sessions.
→ Lectured in professor's absence.
→ Received competitive departmental Teaching Assistant award.

Undergraduate mentor 2012 - 2013, 2015 - 2017
6 semesters UW-Madison

→ Designed appropriate experiments that were complementary to my own research.
→ Introduced undergraduates to spectroscopy, programming, and instrument design

General Chemistry II 2011, 2012
Teaching Assistant, 2 semesters UW-Madison

→ Coordinated two sections—total of ≈ 50 students in each semester.
→ Led labs.
→ Designed and led discussion sections.

General Chemistry 2010, 2011
Peer Science Leader, 2 semesters Bates College

→ Designed and led class-wide review sessions for General Chemistry.
→ Assisted in first trials of new peer leadership program at Bates College.
→ Attended regular meetings to share teaching strategies with other peer leaders.

SKILLS & SPECIALTIES

Analytical Techniques

→ Spectroscopy: Raman / IR / UV-VIS / NMR
→ Ultrafast Spectroscopy: Pump Probe / CMDS
→ Optomechanical design and construction

Computer Programs & Programming Languages

→ Python (SciPy, PyQT4, PyPI, micropython)
→ git
→ KiCad
→ Anaconda, conda-forge
→ Arduino (Extended C++)
→ LaTeX
→ LabView

SERVICE ACTIVITES & COMMUNITY INVOLVEMENT

Plasma Group Python Introduction 2017
Assistant UW-Madison

→ Helped introduce a group of Faculty and Graduate Students in Physics to Python.
→ Group was switching to Python from IDL.
→ Introduction consisted of weekly meetings across several months.

Pre-college Enrichment Opportunity Program for Learning Excellence (PEOPLE) 2017
Volunteer Madison WI

→ Taught disadvantaged high school students about electronics, science and what it is like to be an analytical chemist.

Wisconsin Middle School Science Bowl 2017
Scientific Judge Madison WI

→ Judged middle school students in statewide science-knowledge competition.
→ Winning team proceeded to national competition.

McElvain Committee 2013 - 2014
Committee Member UW-Madison

→ Graduate student committee to choose seminar speakers.

Freewill Folk Society 2008 - 2011
President Bates College

→ Reorganized club structure, recruited other students to new club positions.
→ Organized monthly folk dances, bringing in bands and callers.

OutFront 2009 - 2010
President Bates College

→ Held weekly meetings, organized social and political events.
→ For the first time, organized and executed collaborative events with other local LGBTQ groups in Lewiston ME.