

Darien J. Morrow

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EDUCATION

University of Wisconsin–Madison

2015 - summer 2020 [anticipated]

PhD: Physical Chemistry. GPA: 4.0/4.0

Madison, WI

- Adviser: John C. Wright.
- Dissertation title [anticipated]: Multidimensional Spectroscopy of Transition Metal Dichalcogenide Nanostructures and Heterostructures

Missouri Western State University

2011-2015

BS (Honors): Chemistry; Minors: Mathematics & Physics. GPA: 4.0/4.0

Saint Joseph, MO

RESEARCH & WORK EXPERIENCE

John C. Wright Research Group

2015 - Present

Graduate Assistant

Madison, WI

- Pioneering spectrally resolved harmonic generation as a probe of semiconductor excited state dynamics
- Using and developing a suite of ultrafast techniques to explore excited state dynamics of thin film semiconductors relevant to photovoltaics (lead halide perovskites and transition metal dichalcogenides)
- Developing software packages for the collection, processing, and modeling of multidimensional spectra
- Aiding solid-state synthetic chemists in interpretation and modeling of absorption (UV/Vis), Raman, fluorescence, and their confocal microscopy variants
- Responsible for maintenance and furtherance of custom ultrafast laser systems including construction of new optomechanical & electronic hardware, training new users, and troubleshooting hardware & software
- Taught General Chemistry (honors), General Chemistry II, and Physical Chemistry: Thermodynamics

Christopher G. Elles Research Group

2014

REU Fellow

Lawrence, KS

- Investigated the excited state dynamics of substituted thiophene photo-rearrangement reactions
- Developed and implemented reaction quantum yield measurement technique
- Used ultrafast transient absorption spectroscopy to probe singlet and triplet excited state manifolds

SOFTWARE SKILLS

- Python and the scientific Python software stack (numpy, matplotlib, scipy, h5py)
- Working knowledge: Arduino, Git, Latex, Autodesk Inventor
- Active contributor/maintainer of open source projects:
 - WrightTools (library): loading, processing, and plotting of multidimensional spectroscopy data
 - PyCMDS (application): orchestrating many pieces of hardware into multidimensional spectrometers
 - attune (library): tuning/calibrating multidimensional spectrometers

PUBLICATIONS

- *In preparation:* Morrow, D. J.; et. al. Ultrafast, multidimensional pump-probe spectroscopy of atomically thin WS₂-MoS₂ lateral heterostructures
- *Submitted:* Morrow, D. J.; et. al. Quantum interference between the optical Stark effect and resonant harmonic generation in WS₂. arXiv:2006.01183.

- *Submitted*: Pan, D.; Fu, Y.; Luo, Z.; Zhao, Y.; **Morrow, D. J.**; et. al. Deterministic fabrication of arbitrary 2D Ruddlesden-Popper halide perovskite heterostructures with emergent interlayer properties
- 8. **Morrow, D. J.**; et. al. Disentangling Second Harmonic Generation from Multiphoton Photoluminescence in Halide Perovskites using Multidimensional Harmonic Generation. *Journal of Physical Chemistry Letters*. DOI:10.1021/acs.jpcllett.0c01720. **2020**
- 7. Hautzinger, M. P.; Pan, D.; Piggs, A. K.; Fu, Y.; **Morrow, D. J.**; et. al. Band Edge Tuning of 2D Ruddlesden-Popper Perovskites by A Cation Size Revealed through Nanoplates. *ACS Energy Letters*. DOI:10.1021/acsenenergylett.0c00450. **2020**.
- 6. **Morrow, D. J.**; et. al. Triple sum frequency pump-probe spectroscopy of transition metal dichalcogenides. *Physical Review B*. DOI: 10.1103/PhysRevB.100.235303. **2019**.
- 5. Thompson, B. J.; Sunden, K. F.; **Morrow, D. J.**; et. al. WrightTools: a Python package for multidimensional spectroscopy *The Journal of Open Source Software*. DOI: 10.21105/joss.01141. **2019**.
- 4. **Morrow, D. J.**; et. al. Communication: Multidimensional Triple Sum-Frequency Spectroscopy of MoS₂ and Comparisons with Absorption and Second Harmonic Generation Spectroscopies. *Journal of Chemical Physics*. DOI: 10.1063/1.5047802. **2018**.
- 3. **Morrow, D. J.**; et. al. Group and phase velocity mismatch fringes in triple sum-frequency spectroscopy. *Physical Review A*. DOI: 10.1103/PhysRevA.96.063835. **2017**.
- 2. Fu, Y.; Rea, M. T.; Chen, J.; **Morrow, D. J.**; et. al. Metastable Perovskite Polymorphs of CsPbI₃ in Thin Films. *Chem. Mater.* DOI: 10.1021/acs.chemmater.7b02948. **2017**.
- 1. Chen, J.; **Morrow, D. J.**; et. al. Single-Crystal Thin Films of Cesium Lead Bromide Perovskite Epitaxially Grown on Metal Oxide Perovskite (SrTiO₃). *J. Am. Chem. Soc.* DOI: 10.1021/jacs.7b07506. **2017**.

PATENTS

- U.S. Patent Pending, filed 2019-06-20 **Morrow, D. J.**; Kohler, D. D.; Wright, J. C. Ultrafast, multiphoton-pump, multiphoton-probe spectroscopy.

FELLOWSHIPS & SCHOLARSHIPS

- Link Foundation Energy Fellowship (full graduate school stipend). July 2018 - June 2020.
- Pei Wang Fellowship. Fall 2015 - spring 2016.
- Golden Griffon Honors scholarship. Fall 2011 - spring 2015.
- NSF funded Midwest Apex Project scholarship. Fall 2011 - spring 2015.
- Missouri Bright Flight scholarship. Fall 2011 - spring 2015.

AWARDS & HONORS

- Richard and Joan Hartl Award for Research Excellence in Physical Chemistry. 2020.
- Roger Carlson Memorial Award for Excellence in Analytical Chemistry. 2018.
- NSF Graduate Research Fellowship Program, Honorable mention. 2017.
- MWSU Department of Chemistry, Edgar C. Little Outstanding Student Award. 2015.
- ACS Division of Analytical Chemistry, Undergraduate Award in Analytical Chemistry. 2015.
- ACS Division of Inorganic Chemistry, Undergraduate Award in Inorganic Chemistry. 2013.
- MWSU President's Honor's List. Fall 2011 - spring 2015.

SERVICE ACTIVITIES & COMMUNITY INVOLVEMENT

- Hosted "Detector Building" competition at the Science Olympiad Regional Tournament. Winter 2020
- Organized weekly seminar series physical chemistry graduate students. 2018-2019
- Served as a moderator for the annual Wisconsin Middle School Science Bowl. 2017-present.
- Taught/supervised electronics for a week to high schoolers in the PEOPLE program. Summer 2017.
- Talked and demonstrated to Institute of Chemical Education summer camp attendees about my research, renewable energy, and how solar cells work. Summer 2017.
- Vice-president (2014-2015) and member of MWSU's ACS affiliated Chemistry club. 2011-2015.
- Aided in the organization of Super Science Saturday and Chemathon at MWSU. 2011-2015.