Darien J. Morrow

Postdoctoral Appointee at Argonne National Laboratory's Center for Nanoscale Materials

darienmorrow@gmail.com | dmorrow@anl.gov | 1-816-752-4270

EDUCATION

University of Wisconsin–Madison 2015 - 2020
PhD: Physical Chemistry. Advised by John C. Wright. GPA: 4.0/4.0 Madison, WI

· Dissertation title: Development of multidimensional spectroscopies to investigate transition metal dichalcogenide and lead halide perovskite semiconductors

Missouri Western State University 2011-2015
BS (Honors): Chemistry; Minors: Mathematics & Physics. GPA: 4.0/4.0 Saint Joseph, MO

RESEARCH & WORK EXPERIENCE

Center for Nanoscale Materials at Argonne National Laboratory 2020 - Present
Postdoctoral Appointee supervised by Xuedan Ma Lemont, IL

· Researching excitonic, polaronic, and electronic properties of doped low-dimensional materials as photonic sources for Quantum Information Science
· Developing cryogenic magneto-optical microscopy techniques

John C. Wright Research Group 2015 - 2020
Graduate Assistant Madison, WI

· Pioneered spectrally resolved harmonic generation as a probe of semiconductor excited state dynamics
· Developed a suite of ultrafast techniques to explore excited state dynamics of thin film semiconductors relevant to photovoltaics (lead halide perovskites and transition metal dichalcogenides)
· Responsible for maintenance and furtherance of custom ultrafast laser systems including construction of new optomechanical & electronic hardware, training new users, and troubleshooting hardware & software

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

PATENTS

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

PUBLICATIONS

- *In preparation:* **Morrow, D. J.**; Ma. X. Understanding interlayer exciton trapping in two-dimensional heterostructures with discrete, random-walk simulations
- *In preparation:* **Morrow, D. J.**; et. al. Ultrafast, multidimensional pump-probe spectroscopy of atomically thin WS_2-MoS_2 lateral heterostructures
- *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

9. **Morrow, D. J.**; Kohler, D. D.; Zhao, Y.; Scheeler, J. M.; Jin, S.; Wright, J. C. Quantum interference between the optical Stark effect and resonant harmonic generation in WS_2. *Physical Review B*. DOI: 10.1103/PhysRevB.102.161401. **2020**.
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.jpclett.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/acsenergylett.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 MoS_2 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 $CsPbI_3$ 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 ($SrTiO_3$). *J. Am. Chem. Soc.* DOI: 10.1021/jacs.7b07506. **2017**.

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.