# 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 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 open-source software packages for the collection, processing, and modeling of multidimensional spectra (see github.com/wright-group)
- Responsible for maintenance and futherance of custom ultrafast laser systems including construction of new optomechanical & electronic hardware, training new users, and troubleshooting hardware & software

**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

**Michael W. Ducey Research Group** 2011 - 2012
*Undergraduate Assistant* Saint Joseph, MO

- Investigated the solvatochromism of room temperature ionic liquids (RTILs) in common solvents
- Demonstrated the solvents can induce order in the alkyl side chains of methylimidazolium RTILs

**Morrow Contracting and Construction LLC** 2011 - 2015
*Skilled Laborer* Saint Joseph, MO

## PUBLICATIONS

*In preparation:* **Morrow, D. J.**; Kohler, D. D.; Zhao, Y.; Jin, S.; Wright, J. C. Ultrafast manipulation of harmonic generation in transition metal dichalcogenide screw dislocations.

*In preparation:* **Morrow, D. J.**; Kohler, D. D.; Zhao, Y.; Jin, S.; Wright, J. C. Ultrafast multidimensional spectroscopy of $WS_2/MoS_2$ monolayer lateral heterostructures.

*In preparation:* Thompson, B. J.; **Morrow, D. J.**; Kain, S.; Sunden, K. F.; Kohler, D. D.; Wright, J. C. Automated OPA tuning and active correction: a case study in enabling multidimensional spectroscopy.

*In preparation:* **Morrow, D. J.**; Dang, L.; Leng, M.; Lafayette, D. P.; Kohler, D. D.; Zhao, Y.; Jin, S.; Wright, J. C. Measuring second and third harmonic generation in 2D lead iodide perovskites with a multiphoton photoluminescence background.

*In preparation:* **Morrow, D. J.**; Kohler, D. D.; Zhao, Y.; Jin, S.; Wright, J. C. Pump- triple sum-frequency probe spectroscopy of transition metal dichalcogenides.

*In preparation:* Hautzinger, M. P.; Pan, D.; Piggs, A. K.; Fu, Y.; **Morrow, D. J.**; Leng, M.; Kuo, M.; Spitha, N., Lafayette, D. P.; Kohler, D. D.; Wright, J. C.; Jin, S. Effects of A-cation composition on 2D perovskite nanocrystals.
· Code repository: DOI 10.17605/OSF.IO/m9dnw.

5. Thompson, B. J.; Sunden, K. F.; **Morrow, D. J.**; Kohler, D. D.; Wright, J.C. WrightTools: a Python package for multidimensional spectroscopy *The Journal of Open Source Software*. DOI: 10.21105/joss.01141. **2019**.

4. **Morrow, D. J.**; Kohler, D. D.; Czech, K. J.; Wright, J. C. 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**.
· Preprint: arXiv:1805.06985.
· Data and code repository: DOI 10.17605/OSF.IO/2WF6G.

3. **Morrow, D. J.**; Kohler, D. D.; Wright, J. C. Group and phase velocity mismatch fringes in triple sum-frequency spectroscopy. *Physical Review A*. DOI: 10.1103/PhysRevA.96.063835. **2017**.
· Preprint: arXiv:1709.10476.
· Data and code repository: DOI 10.17605/OSF.IO/EMGTA.

2. Fu, Y.; Rea, M. T.; Chen, J.; **Morrow, D. J.**; Hautzinger, M. P.; Zhao, Y.; Manger, L. H.; Wright, J. C.; Goldsmith, R. H.; Jin, S. Selective Stabilization and Photophysical Properties of Metastable Perovskite Polymorphs of $CsPbI_3$ in Thin Films. *Chem. Mater.* DOI: 10.1021/acs.chemmater.7b02948. **2017**.

1. Chen, J.; **Morrow, D. J.**; Fu, Y.; Zheng, W.; Zhao, Y.; Dang, L.; Stolt, M. J.; Kohler, D. D.; Wang, X.; Czech, K. J.; Hautzinger, M. P.; Shen, S.; Guo, L.; Pan, A.; Wright, J. C.; Jin, S. 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**.
· Data and code repository: DOI 10.17605/OSF.IO/V5KZN.

## PATENTS

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

## POSTERS & PRESENTATIONS

7. Poster. **Darien J. Morrow**, Daniel D. Kohler, John C. Wright. Multi-photon pump, multi-photon probe spectroscopies and their application to $MX_2$ nanostructures. CMDS 2018, Seoul, South Korea. June 2018.
6. Poster. **Darien J. Morrow**, Jenna M. Wasylenko, Christopher G. Elles. Kinetics and Dynamics of the Photorearrangement Reactions of Aryl-Substituted Thiophenes. ACS National Meeting, Denver, CO. March 2015.
5. Poster. Michael W. Ducey, **Darien J. Morrow**, Bethany Thornton, Varun Lahoti. Conformational behavior and applications of mixed room temperature ionic liquid solvent systems examined with a panel of solvatochromic probes. ACS Midwest Regional Meeting, Columbia, MO. November 2014.
4. Poster. **Darien J. Morrow**, Jenna M. Wasylenko, Christopher G. Elles. Kinetics and Dynamics of the Photorearrangements of Conjugated Thiophenes. Council on Undergraduate Research, Research Experiences for Undergraduates Symposium, Arlington, VA. October 2014.
3. Poster. **Darien J. Morrow**, Jenna M. Wasylenko, Christopher G. Elles. Kinetics and Dynamics of the Photorearrangements of Conjugated Thiophenes. The University of Kansas, REU Poster Session, Lawrence, KS. July 2014.
2. Poster. Melanie Edlin, David J. Freeman, Nathan Harms, Xu Ho, Torin McKinley, Alexander Moore, **Darien J. Morrow**, Christopher Phillips, Jeffrey N. Woodford, Determination of Dimerization Constant of N-(isoquinolin-3-yl)Benzamide and N-(isoquinolin-2-yl)Benzamide. ACS Midwest Regional Meeting, Springfield, MO. October 2013.
1. Poster. **Darien J. Morrow**, Michael W. Ducey, Solvatochromic Properties of Ionic Liquid: Solvent and Polymer Systems Examined with PRODAN. Missouri Western State University, Multidisciplinary Research Symposium, St. Joseph, MO. May 2012.

## TEACHING EXPERIENCE

**Physical Chemistry: Thermodynamics** — Fall 2016
*Teaching Assistant for Prof. Gilbert M. Nathanson* — Madison, WI

**General Chemistry** — Fall 2015 - spring 2016
*Teaching Assistant for Prof. Ive Herman and Dr. Paul Hooker* — Madison, WI

**Organic Chemistry II** — Fall 2013
*Teaching Assistant for Prof. Steven P. Lorimor* — Saint Joseph, MO

## FELLOWSHIPS & SCHOLARSHIPS

- Link Foundation Energy Fellowship. July 2018 - June 2020.
  Two year full stipend for *Investigation of Coherent Charge Transfer in Transition Metal Dichalcogenide Heterostructures with Multiresonant Coherent Multidimensional Spectroscopy*.
- 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

- Roger Carlson 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.

## 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 hardware into multidimensional spectrometers
  - `attune` (library): tuning/calibrating multidimensional spectrometers

## SERVICE ACTIVITIES & COMMUNITY INVOLVEMENT

- Organized weekly seminar for physical chemistry graduate students to present their research to fellow graduate students. 2018-2019
- Served as a moderator for the annual Wisconsin Middle School Science Bowl (sponsored by the DOE). 2017-present.
- Wisconsin Institute for Discovery volunteer. 2017-present.
- Taught/supervised electronics for a week to high schoolers in the PEOPLE program. Summer 2017.
- Served on panel to talk to REU students about experiences applying to and surviving graduate school. 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.
- Served as vice-president (2014-2015) and member of Missouri Western State University's ACS affiliated Chemistry club. 2011-2015.
- Aided in the organization and implementation of Super Science Saturday and Chemathon at Missouri Western State University. 2011-2015.

## REFERENCES


- Prof. John C. Wright | `wright@chem.wisc.edu` | 608-262-0351
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