

Samuel Shepard – Curriculum Vitae

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SUMMARY OF EXPERIENCE

- Visiting Assistant Professor**, Haverford College **2022-Present**
Taught upper-level coursework in physical and inorganic chemistry and mentored undergraduate research on photocatalytic synthesis of pharmaceutical motifs.
- Postdoctoral Scholar**, North Carolina State University **2019-2022**
Performed transient spectroscopy on inorganic chromophores for solar energy and catalysis.
Research Advisor: Professor Felix N. Castellano
- Ph.D., Physical Chemistry**, University of Colorado – Boulder **August 2019**
Doctoral Thesis: “Excited State Dynamics in Charge Transfer States of Iron and Chromium Complexes for Light Harvesting and Inner Sphere Photocatalysis.”
Research Advisor: Professor Niels H. Damrauer
- B.A., Chemistry, *Cum Laude***, Amherst College **May 2011**
Honors Thesis: “Tailoring the Surface Properties of Magnesium Organo-Silicates for the Creation of Polymer – Clay Nanocomposites from Polycaprolactone.”
Research Advisor: Professor Sandra Burkett

TEACHING EXPERIENCE

- Visiting Assistant Professor**, Haverford College **2022 – Present**
- Courses taught: Photochemistry, Advanced Laboratory in Spectroscopy and Synthesis, Concepts of Inorganic Chemistry, Quantum Chemistry, Organometallic Catalysis, Research in Physical Chemistry (Thesis Research), Independent Study.
 - Developed special topics classes on photochemistry and organometallic catalysis.
 - Introduced metrics to track student-faculty interactions in my Quantum Chemistry class with a teaching partnership through Byrn Mawr’s Teaching and Learning Institute.
 - Trained undergraduates on the operation of instrumentation including UV-Vis and NMR spectrometers, fluorimeters, and electrochemical analyzers in Advanced Laboratory.
- Subgroup Lead – Castellano Lab**, North Carolina State University **2021 – 2022**
- Lectured on advanced topics in electronic spectroscopy, for instance: “A Boltzmann statistics understanding of thermally-activated delayed photoluminescence”
 - Taught presentation skills for conferences, poster sessions, and research meetings.
 - Developed an eight-week course for graduate students on code development in MATLAB.
 - Organized monthly meetings to discuss current topics in scientific literature and lab techniques.
 - Navigated sensitive conversations about COVID precautions to find equitable safety protocols.
- Research Supervisor**, CU-Boulder and NCSU **2016 – 2022**
- Directed independent research for two undergraduates and a high school student.
 - Mentored an undergraduate to prepare a public research presentation.
 - Taught undergraduate and graduate researchers various chemical techniques of relevance to their research and the underpinning chemical principles (e.g. Stern-Volmer analysis, quantitative NMR, actinometry)
- Graduate Teaching Assistant**, University of Colorado – Boulder **2012 – 2019**
- Instructed general chemistry lab and recitation sections.
 - Graded and tutored for an advanced undergraduate and graduate inorganic chemistry course.

RESEARCH EXPERIENCE

Visiting Assistant Professor, Haverford College

2022-Present

- Directed summer research for 3 rising juniors on the synthesis, characterization, and screening of catalytic activity of inorganic chromophores.
- Developed microwave synthetic methods for more efficient generation of ruthenium polypyridyl complexes.
- Mentored one undergraduate thesis student on the merger of flow chemistry and photocatalysis.
- Instructed 13 students on the pursuit of a 14-week independent research project of our own devising, focused on uncovering the mechanisms of important but poorly understood photoredox catalytic transformations.

Postdoctoral Scholar – Castellano Lab, North Carolina State University

2019 – 2022

- Investigated the use of two-photon processes (two-photon absorption, triplet-triplet annihilation) for photoredox catalysis.
- Developed new, strongly-absorbing chromium(III) complexes for photooxidation reactions
- Constructed a two-pump-probe transient absorption spectrometer for multiphoton dynamics.
- Built a laser-based photoreactor to study high intensity illumination photocatalysis.
- Trained graduate students on the use of transient absorption spectrometers.
- Coded research group website using WordPress (<https://castellano.sciences.ncsu.edu/>)
- Provided spectroscopic and mechanistic expertise to BioLEC, a Dept. of Energy EFRC
- Directed independent research for two undergraduates

Graduate Research Assistant – Damrauer Lab, University of Colorado – Boulder

2012 – 2019

- Studied the properties of inorganic chromophores through transient spectroscopic techniques for their use in solar energy harvesting applications.
- Designed, assembled, maintained, and operated laser systems for femtosecond and nanosecond transient absorption experiments.
- Trained graduate students in the use of these laser systems.
- Coded LabVIEW GUI for operating the above experiments.
- Wrote MATLAB scripts for data workup, analysis, and fitting.
- Mastered other analysis software, including Igor, Mathematica, MestReNova.
- Simulated molecular properties in Gaussian and Q-Chem.
- Performed spectroelectrochemical measurements and data analysis on inorganic chromophores.

Research and Development, Honeywell, Specialty Additives Division

2011 – 2012

- Assessed the mechanical and chemical effects of polymer-based additives to asphalt.
- Developed a program for using fluorescence microscopy to characterize the asphalt–wax system microstructure.
- Performed rheology studies on treated and untreated asphalt.
- Used chemical cross-linking agents to stabilize asphalt–polymer matrix.

Chemistry Thesis Researcher, Amherst College Chemistry Dept.

2010 – 2011

- Researched the synthesis and material properties of polymer–clay nanocomposites.
- Synthesized nanostructured organosilicate clays.
- Developed procedures for the polymerization of covalently linked polycaprolactone–clay systems via air-free, living polymerization.

OUTREACH AND SERVICE

Research Mentorship Faculty Learning Community, Haverford College Summer, 2023

- Instituted evidence-based techniques for improving DEI in research labs as a participant in a research mentorship discussion and reading group.
- Constructed a semi-structured interview framework for measuring research mentees progress towards their research goals.

Chemistry Student Group, Haverford College 2022-2023

- Acted as a faculty advocate with the chemistry student group on issues pertaining to general chemistry placement exams.

Colorado Collaboratory for Light Activated Earth Abundant Reagents Summer, 2016

- Facilitated discussion sections for area high school teachers on how to incorporate green chemistry and environmental chemistry concepts in high school science classes.
- Helped two high school teachers develop green chemistry labs for their classrooms.

AWARDS

Sci-athon Competition, First Prize, University of North Carolina System May 2021

Graduate Teaching Excellence Award, University of Colorado – Boulder 2018 – 2019

Joseph Addison Sewall Award, University of Colorado – Boulder May 2018

- A research assistantship grant awarded to an outstanding chemistry graduate student.

Graduate Teaching Excellence Award, University of Colorado – Boulder 2015 – 2016

PUBLISHED WORK

“A Biohybrid Strategy for Enabling Photoredox Catalysis with Low-Energy Light.” Cesana, P. T.; Li, B. X.; **Shepard, S. G.**; Ting, S. I.; Hart, S. M.; Olson, C. M.; Martinez Alvarado, J. I.; Son, M.; Steiman, T. J.; Castellano, F. N.; Doyle, A. G.; MacMillan, D. W. C.; Schlau-Cohen, G. S. *Chem* **2021**, 1-12

“Long-Lived Mixed 2MLCT/MC States in Antiferromagnetically Coupled d³ Vanadium(II) Bipyridine and Phenanthroline Complexes.” Dill, R. D.; Portillo, R. I.; **Shepard, S. G.**; Shores, M. P.; Rappé, A. K.; Damrauer, N. H. *Inorg. Chem.* **2020**, 59 (20), 14706-14715

“Photochemical Upconversion in Water Using Cu(I) MLCT Excited States: Role of Energy Shuttling at the Micellar/Water Interface.” Fayad, R.; Bui, A. T.; **Shepard, S. G.**; Castellano, F. N. *ACS Appl. Energy Mater.* **2020**, 3 (12), 12557-12564

“A Synthetically Tunable System to Control MLCT Excited-State Lifetimes and Spin States in Iron(II) Polypyridines.” Fatur, S.F.*; **Shepard, S.G.***; Higgins, R.F.; Shores, M.P.; Damrauer, N.H. *Journal of the American Chemical Society* **2017**, 139, 4493-4505

“Uncovering the Roles of Oxygen in Cr(III) Photoredox Catalysis.” Higgins, R.F.; Fatur, S.F.; **Shepard, S.G.**; Stevenson, S.M.; Boston, D.J.; Ferreira, E.M.; Damrauer, N.H.; Rappé, A.K.; Shores, M.P. *Journal of the American Chemical Society* **2016**, 138, 5451-5464

“Highly Strained Iron(II) Polypyridines: Exploiting the Quintet Manifold to Extend the Lifetime of MLCT Excited States.” **Shepard, S.G.***; Fatur, S.F.*; Rappé, A.K.; Damrauer, N.H. *Journal of the American Chemical Society* **2016**, 138, 2949-2952

* indicates joint primary authorship

PRESENTATIONS

Poster Presentation, *The KINSC Undergraduate Science Research Symposium* September 2023

“Regioselectivity of Photocatalytic Cycloaddition Reactions.” Gottesfeld, A.R.; **Shepard, S.G.**‡

Poster Presentation, *The KINSC Undergraduate Science Research Symposium* September 2023

“Visible light catalysis for the synthesis of isoxazoles in continuous flow.” Jackson, K.;
Shepard, S.G.‡

Poster Presentation, *The KINSC Undergraduate Science Research Symposium* September 2023

“Microwave Synthesis of Heteroleptic Ruthenium (II) Polypyridine Complexes for Photoredox Catalysis.” Oster, T.M.; **Shepard, S.G.**‡

Oral Presentation, *Northeast Regional Meeting of the American Chemical Society* June 2023

“Improving the synthesis of GSK-183390A with flow chemistry.” Surgenor, J.; Carlin, T.; Spoor, P.G.; **Shepard, S.G.**‡

Oral Presentation, *American Chemical Society National Meeting* March 2022

“Pushing the visible envelope: Broadly absorbing chromium(III) photooxidant interrogated by transient absorption and luminescence quenching.” **Shepard, S.G.**; Hauke, C.E.; Wheeler, J.N.; Castellano, F.N.

Poster Presentation, *Inter-American Photochemical Society Winter Conference* January 2020

“Towards the Use of Triplet-Triplet Annihilation for Photoredox Catalysis with Pyrene.”
Shepard, S.G.; Castellano, F.N.

Oral Presentation, *International Conference on Photochemistry* July 2019

“Salen Complexes as Candidates for Stereoselective Photocatalysis.” **Shepard, S.G.**

Poster Presentation, *Gordon Research Conference Photochemistry* July 2017

“First-row transition metal complexes for outer- and inner-sphere photoredox catalysis: bipyridine and salen complexes as two case studies.” **Shepard, S.G.**; Dill, R.D.; Portillo, R.; Boston, D.J.; Shores, M.P.; Damrauer, N.H.

Poster Presentation, *UNC Chapel Hill Solar Energy Research Center Conference* October 2015

“Highly-strained iron(II) polypyridines: a structural motif for exploring the excited state quintet manifold.” **Shepard, S.G.**; Fatur, S.F.; Damrauer, N.H.

‡ indicates a poster or presentation given by a student mentee