**Madison M. Smith**

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**Education**

**Doctor of Philosophy in Chemistry (Ph.D.)** January 2020 - Present

*Loyola University Chicago, Chicago, IL*

Major: Biochemistry

**Bachelor of Science (BS)** August 2015 – May 2019

*Loyola University Chicago, Chicago, IL*

Major: Biochemistry

**Professional Experience**

**Research Assistant**  January 2021 – Present

*Loyola University Chicago*

A member of Dr. Graham Moran’s Lab

Focus: Mechanistic study of Unusual Redox active enzymes

*Research Responsibilities*

* Deciphering the chemical mechanism of various enzymes of interest using transient-state and steady-state techniques.
* Design and optimization of expression and purification protocols of several enzymes using *E.coli* optimized plasmid vectors
  + included large-scale culture preparation, affinity, charge, and size-based column chromatography, and various buffer exchange techniques
* Development and utilization of methods for analytical and preparative high-pressure liquid chromatography (HPLC) separation
* Utilization of multiple scientific techniques to study the chemical mechanism of spectrophotometrically active enzymes/enzyme reactions
  + Techniques include: UV-Vis spectroscopy, stopped-flow spectroscopy, fluorescence spectroscopy, nuclear magnetic resonance (NMR) spectroscopy, gel electrophoresis, kinetic isotope effects and protein crystallization
* Utilization of previously established anaerobic methods to monitor enzymatic turnover devoid of oxygen
  + Proficiency of various specialized equipment and glassware including: glass tonometer, Schlenk line, Clark type oxygen electrode and anaerobic chambers
* Guided preparation of manuscripts for publications in scientific journals
* General management of lab equipment and materials
* Collaboration with fellow Loyola researchers and external laboratories

*Teaching Responsibilities*

* Aided in the training and development of incoming undergraduate and graduate researchers
* Instructed students from other Loyola laboratories on the use of our instruments and helped to analyze data

**Teaching Assistant** August 2019 – December 2020

*Loyola University Chicago*

* Assisted in teaching fundamental chemistry lab skills and practical knowledge
* Prepared chemicals, solutions, and equipment for particular labs
* Management of 20 – 30 undergraduates performing basic wet lab experiments
* Grading of laboratory notebooks and reports completed throughout the semester
* Aided in development of study resources and participated in one-on-one tutoring sessions with students

**Undergraduate Researcher** August 2017 – May 2019

*Loyola University Chicago*

A member of Dr. Patrick Daubenmire’s Lab

Focus: Chemistry education research

* Qualitative analysis and organization of professor collected data to measure undergraduate chemistry students’ understanding and mastery of certain chemistry concepts as they relate to the teaching techniques used
* Development of an analytical coding system to standardize data being collected
* Collaboration with researchers outside of my institution

**Publications**

1. **Smith MM**, Beaupre BA, Fourozesh DC, Meneely KM, Lamb AL, Moran GR. Finding Ways to Relax: A Revisionistic Analysis of the Chemistry of *E. coli* GTP Cyclohydrolase II. *Biochemistry*. **2021 Oct 12**;60(40):3027-3039. doi: 10.1021/acs.biochem.1c00511. Epub 2021 Sep 27. PMID: 34569786.
2. **Smith MM**, Forouzesh DC, Kaley NE, Liu D, Moran GR. Mammalian dihydropyrimidine dehydrogenase: Added mechanistic details from transient-state analysis of charge transfer complexes. *Arch Biochem Biophys.* **2023 Mar 1**;736:109517. doi: 10.1016/j.abb.2023.109517. Epub 2023 Jan 18. PMID: 36681231.
3. **Smith MM** and Moran GR**.** The Unusual Chemical Sequences of Dihydropyrimidine Dehydrogenase Revealed by Transient-State Analysis.*Methods in Enzymology,* **2023***.* 685, 373-403.
4. **Smith MM**, Alt TB, Williams DL, Moran GR. Descriptive Analysis of Transient-State Observations for Thioredoxin/Glutathione Reductase (Sec597Cys) from *Schistosoma mansoni.*Biochemistry. **2023 Apr 18;** 62 (9), 1497-1508**.** DOI: 10.1021/acs.biochem.3c00051
5. **Smith MM** and Moran GR.Understanding the chemical sequence ofThioredoxin/Glutathione Reductase (Sec597Cys) from *Schistosoma mansoni* usingTransient-State analysis of active site variant forms of Thioredoxin/Glutathione Reductase (Sec597Cys) from *Schistosoma mansoni. (in preparation).*

**Poster/Oral Presentations**

1. Enzyme, Coenzymes, and Metabolic Pathways Gordon Research Conference and Seminar. **July 2023**. A Descriptive Transient-State Analysis of *Schistosoma mansoni* Thioredoxin/glutathione Reductase (SmTGR). *(****poster****)*
2. Midwest Enzyme Chemistry Conference. **October 2022**. Finding Ways to Relax: A Revisionistic Analysis of the Chemistry of *E. coli* GTP Cyclohydrolase II. *(****oral presentation and poster****)*
3. Enzyme, Coenzymes, and Metabolic Pathways Gordon Research Conference and Seminar. **July 2022**. The Riboflavin Biosynthetic Pathway: Probing the Catalytic Mechanism of E. coli GTP Cyclohydrolase II (RibA) and deaminase/reductase RibD. *(****poster****)*
4. Enzyme Mechanism Conference. **January 2022**. Investigation of E. coli GTP Cyclohydrolase II: Pyrophosphate’s role in the catalysis and conformational activation. *(****poster****)*
5. Loyola University Chicago Chemistry and Biochemistry Seminar. **December 2021**. Exploring the Catalytic Mechanism and Conformational Activation of *E. coli* GTP Cyclohydrolase II. *(****oral presentation****)*
6. Midwest Enzyme Chemistry Conference. **October 2021**. Exploring the Catalytic Mechanism and Conformational Activation of *E. coli* GTP Cyclohydrolase II. *(****poster****)*
7. Southeast Enzyme Conference. **April 2021**. Riboflavin Biosynthetic Pathway: Unexpected Catalytic Characteristics of GTP Cyclohydrolase II from *Escherichia coli.* (***poster***)
8. Midwest Enzyme Chemistry Conference. **October 2020**. The Riboflavin Biosynthetic Pathway: Investigation into Bifunctional RibD deaminase/reductase. (***poster***)

**Technical Skills and Experience**

absorbance characterization, fluorescence characterization, Michaelis-Menten kinetics, pre-steady state kinetics, steady state assays, rapid-mixing assays, inhibitor studies, coupled assays, protein quantification, transformation, NMR (1D; static and kinetic), oxygen control, binding titrations, analytical and preparative HPLC, stopped-flow, chemical quench, bacterial cell culture, electrophoresis, microscopy, recombinant enzyme expression and purification, column chromatography, protein crystallography, Microsoft Office, EndNote, KaleidaGraph, KinTek Explorer, TopSpin, ChemDraw, Pymol, MOE

**Teaching Experience**

**Teaching Assistant**  August 2019 – December 2020

*Loyola University Chicago*

Courses: CHEM 111/112, General Chemistry Lab

CHEM 361, Biochemistry

**Research Assistant** January 2021 – Present

*Loyola University Chicago*

Responsible for training and management of new undergraduate and graduate students.