

# Sara “Sally” S. Rocks

## Professional Experience

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**Utah Valley University** **Orem, UT**  
*Assistant Professor of Chemistry* *2017-present*

**FLSmith Salt Lake City, Inc.** **Salt Lake City, UT**  
*Senior Research Chemist* *2015-2017*  
*Research Chemist II* *2013-2015*  
*Group Leader, Process Chemistry* *2011-2013*  
*Research Chemist I* *2010- 2011*

**Princeton University** **Princeton, NJ**  
*Research Scholar (Postdoctoral Researcher)* *2009- 2010*

## Doctoral and Undergraduate Education

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**University of Rochester** **Rochester, NY**  
*PhD Chemistry* *September, 2009*  
*MS Chemistry* *2005*

**Bucknell University** **Lewisburg, PA**  
*BS Chemistry, Mathematics Minor* *2004*

## Teaching Experience

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**Utah Valley University** **Orem, UT**  
*Inorganic Chemistry (CHEM 3100)* *Fall 2019*

- Reviews major trends across the periodic table. Surveys basic structure, bonding, and oxidation states of the elements.

*Introduction to Chemistry (CHEM 1010)* *Fall 2017, Fall 2018, Spring and Fall 2019*

- Presents the foundations of chemistry to students who need preparation for further study in chemistry or to students who want to take an introductory course

*Principles of Chemistry I Laboratory (CHEM 1215)* *Spring 2018*

- Accompanies a General Chemistry 1 lecture and teaches laboratory techniques, safety and best practices

*Analytical Chemistry Laboratory (CHEM 3005)* *Fall 2017, Spring 2018, Fall 2018, Fall 2019*

- Accompanies Analytical Chemistry lecture. Involves conducting experiments in quantitative and qualitative analysis, including volumetric and gravimetric analysis

*Instrumental Analysis (CHEM 4000)* *Spring 2019*

- Teaches principles and applications of modern, chemical instrumentation

*Instrumental Analysis Laboratory (CHEM 4005)* *Spring 2018, Spring 2019*

- Accompanies Instrumental Analysis lecture. Explores instrumentation through hands-on experimentation

*Structure Determination (CHEM 4600)* *Fall 2018, Fall 2019*

- Explores methods of determining chemical structure such as NMR, IR, crystallography and MS. (team taught)

**FLSmith Salt Lake City, Inc.** **Midvale, UT**  
*Co-advisor for 2 graduate students at Technical University of Denmark (DTU)* *Fall 2015-2017*  
*Industry Liaison for Projects in Metallurgical Engineering Department, Univ. of Utah* *2010-2011*  
*Instructor, “Chemistry 101” Short Course* *2010*

## Teaching Development

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### Utah Valley University

Orem, UT

#### Learning Circles:

- *Small Teaching: Everyday Lessons from the Science of Learning* Fall 2017
- *Spark of Learning Energizing the College Classroom with the Science of Emotion* Spring 2018
- *Discussion Based Online Teaching to Enhance Student Learning* Fall 2018
- *Improving Student Retention* Spring 2019
- *Small Teaching Online* Fall 2019

#### Workshops and Certifications:

- *FlexStudio Training* Spring 2018
- *Writing Enriched Workshops* Spring 2019
- *Online Teaching Certification* Summer 2019
- *SCULPT Mentorship Academy* Fall 2017

SCOT observation program

Fall 2018

Higher Education Academy Fellow

Spring 2019-present

Great Teachers Summit

Fall 2019

## Research Experience

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### Utah Valley University

Orem, UT

Department of Chemistry

2017-present

#### Projects:

- Synthesis of small molecule mimics of atrazine chlorohydrolase to determine enzyme mechanism and substrate selectivity. Six undergraduate students have worked on this project.
- Quantification of microplastic pollution in air, water and sediment in Utah Valley. Four undergraduate students have worked on this project.

### FLSmidth Salt Lake City, Inc.

Midvale, UT

Research and Development

2010- 2017

#### Projects:

- Development of paradigm changing technology for the extraction of copper from chalcopyrite
- Study of impurities removal from hydrometallurgical systems with a focus on iron and silica
- Development of solvent extraction apparatus that coalesces 2-phase dispersions at higher flow rates and with a smaller footprint than existing technology
- Establishment of successful research collaboration with Boston College on the physical properties of products of metathesis reactions with chalcopyrite
- Field testing for both domestic and international clients in nickel and copper processing

### Princeton University

Princeton, NJ

Department of Geosciences, Research Scholar

2009-2010

Research Advisor: Dr. François M. M. Morel

#### Projects:

- Study of Hg(II) uptake mechanisms and the effects of internal cellular thiol speciation on the methylation of mercury by anaerobic bacteria
- Investigation of the acquisition of trace metals by the model organism *Geobacter sulfurreducens*

### University of Rochester

Rochester, NY

Department of Chemistry Ph.D. Research

2004 - 2009

Research Advisors: Dr. Patrick L. Holland and Dr. Timothy E. Machonkin

### Projects:

- Investigation of extradiol dihydroxybiphenyl dioxygenase and the synthesis of small molecule mimics of catechol cleaving dioxygenases
- Using small molecule mimics of substituted hydroquinone cleaving dioxygenases to determine the basis of enzyme substrate selectivity

### **Bucknell University**

*Department of Chemistry Undergraduate Research*

*Research Advisor: Dr. Thomas T. Shawe*

### *Project:*

- Investigation of Grignard reagent reactivity with cyclic *s-trans* enaminones

**Lewisburg, PA**

*Spring and Summer 2002, Summer 2003*

## **Research Funding**

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### **Utah Valley University**

*Student SAC Grant*

*Faculty Scholarly Activities Committee (SAC) Research Stipend*

*Grants of Research and Engaged Educators and Novices (GREEN)*

*Student SAC Grant*

*Student SAC Grant*

**Orem, UT**

*Fall 2019*

*Summer 2019*

*Fall 2018*

*Fall 2018*

*Spring 2018*

## **Student Presentations**

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M. Rittmanic, C. Carbajal, S. Rocks “Synthesis of substituted trispyrazolylborate ligand-metal complexes as atrazine chlorohydrolase mimics.” (Poster Presentation) 257<sup>th</sup> American Chemical Society National Meeting. Orlando, FL, Spring 2019.

C. Carbajal, S. Rocks “Nuclear magnetic resonance analysis of atrazine chlorohydrolase small molecule mimics” (Poster Presentation) 257<sup>th</sup> American Chemical Society National Meeting. Orlando, FL, Spring 2019.

## **Presentations**

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“Broadening the undergraduate NMR experience: An in-class activity focused on NMR spectra containing NMR-active heteronuclei.” (Oral Presentation) 257<sup>th</sup> American Chemical Society National Meeting. Orlando, FL, Spring 2019.

“Mercury(II) uptake and methylation in anaerobic bacteria: what we know and what we hope to learn.” Invited talk, Utah Valley University Department of Biology Seminar Series, Orem, UT, Fall 2017.

“The FLSmidth<sup>®</sup> Rapid Oxidative Leach (ROL) Process.” 2015 Australian Mineral Industries Research Association Ltd (AMIRA) P705c Annual Meeting, Rolla, MO, Summer 2015.

“Iron precipitation and impurities removal at a nickel laterite operation.” Invited talk, FLSmidth Lunch and Learn, Midvale, UT, Fall 2013.

“Completing the golden puzzle.” Invited talk, FLSmidth Lead Specialists Forum Annual Meeting, Skytop, PA, Fall 2013.

“From milligrams to megatons: Modeling ring cleaving dioxygenases for bioremediation followed by a career in mineral processing.” Invited talk, Bucknell University, Lewisburg, PA, Fall 2013.

“Developing synthetic crud for a better understanding of SX/EW mixer settler performance.” (Oral Presentation) 2012 Society of Mining Engineers Conference, Denver, CO, 2012.

“Modeling extradiol dioxygenases using tridentate ligands: the quest for a mononuclear iron(II)-catecholate complex” (Oral Presentation) 236<sup>th</sup> American Chemical Society National Meeting. Philadelphia, PA, Spring 2008.

“Small molecule mimics of extradiol dioxygenases” (Oral Presentation) University of Rochester Medical Center, Molecular Structure Cluster Seminar Series. Rochester, NY, Winter 2008.

“Modeling ring cleaving dioxygenases” (Poster Presentation) Biological Cluster Retreat Rochester. Letchworth State Park, NY, Summer 2008.

“Investigation of the determinants of suicide inactivation in extradiol dioxygenases” (Poster Presentation) Joint Meeting of the American Chemical Society Younger Chemists and Retired Chemists Committees. Rochester, NY, Fall 2007.

“Investigation of the determinants of suicide inactivation in extradiol dioxygenases” (Poster Presentation) 40th Inorganic Discussion Weekend (IDW). Toronto, Ontario, Fall 2007.

“Selenoenzymes and oxidative stress” (Oral Presentation) University of Rochester, Department of Chemistry Seminar. Rochester, NY, Summer 2007.

“Investigation of the determinants of suicide inactivation in extradiol dioxygenases” (Poster Presentation) International Conference of Biological Inorganic Chemistry. Vienna, Austria, Summer 2007.

“Suicide inactivation of DbfB: Inactivation of an extradiol dihydroxybiphenyl dioxygenase by PCBs” (Poster Presentation) Synthesis Catalysis and Mechanism (SYCAM) Retreat. Bristol, NY, Winter 2007.

“Using synthetic model compounds and NMR to determine the mechanism of extradiol catechol dioxygenase” (Poster Presentation) Synthesis Catalysis and Mechanism (SYCAM) Retreat. Bristol, NY, Fall 2005.

## **Publications**

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**S. S. Rocks**, R. A. Stockland Jr. “NMR structure elucidation in the presence of heteroatoms: an in-class activity.” *J. Chem. Ed.* [online early access]. DOI 10.1021/acs.jchemed.9b00730. Published online: Jan. 8, 2020. <https://pubs.acs.org/doi/full/10.1021/acs.jchemed.9b00730>

A. P. Karcz, A. J. Damoe, J. B. Illerup, **S. S. Rocks**, K. Dam-Johansen, D. Chaiko. “Electron microscope investigations of activated chalcopyrite particles via the FLSmidth<sup>®</sup> ROL process.” *J. Mater. Sci.* **2017**, *20*, 12044-12053.

**S. S. Rocks**, P. Keyser, F. Baczek, M. Mulligan, D. Chaiko. “Enhancing electrorefinery and smelter operations using hydrometallurgical processes,” *Copper2016*, Kobe, Japan, Nov. 14-17 2016.

M. Mulligan, D. Chaiko, F. Baczek, **S. Rocks**, C. Eyzaguirre, C. Dickinson, R. Klepper. “The FLSmidth<sup>®</sup> Rapid Oxidative Leach (ROL) Process: A Mechano-chemical approach and industry applications for rapid metal sulphide dissolution,” SAIMM **2016**, Cape Town, South Africa, S89, 1-11.

D. Chaiko, F. Baczek, **S. S. Rocks**, T. Walters, S. Asihene, C. Eyzaguirre, R. Klepper, G. McMahon. “The FLS Rapid Oxidative Leach (ROL) Process. Part II: A new chemical activation process for chalcopyrite,” *COM 2015*, ISBN 978-1-926872-32-2.

D. Chaiko, F. Baczek, **S. S. Rocks**, T. Walters, R. Klepper. "The FLSmidth<sup>®</sup> Rapid Oxidative Leach (ROL) process. Part I: Mechano-chemical process for treating chalcopyrite," *COM* **2015**, ISBN 978-926872-32-2.

C. Eyzaguirre, **S. S. Rocks**, R. Klepper, F. Baczek, D. Chaiko. "The FLSmidth<sup>®</sup> Rapid Oxidative Leach (ROL) process: a mechano-chemical approach for rapid metal sulfide dissolution." In *7<sup>th</sup> International Seminar on Process Hydrometallurgy*, Proceedings of Hydroprocess 2015, Antofagasta, Chile, July 22-24 2015; Teofila Graber, Maria Elisa Tobaada, Fernando Valenzuela, Eds.; Gecamin Publications, **2015**.

J. K. Schaefer, **S. S. Rocks**, B. Gu, L. Liang, F. M. M. Morel. "Active transport, substrate specificity and methylation of Hg(II) in anaerobic bacteria," *PNAS*, **2011**, *108*, 8714-8719.

**S. S. Rocks**, T. E. Machonkin, W. W. Brennessel, P. L. Holland. "Solution and structural characterization of iron(II) complexes with ortho-halogenated phenolates: insights into potential substrate binding modes in hydroquinone dioxygenases," *Inorg. Chem.* **2010**, *49*, 10914-10929.

T. E. Machonkin, P. L. Holland, K. N. Smith, J. S. Liberman, A. Dinescu, T. R. Cundari, **S. S. Rocks**, "Determination of the active site of *Sphingomonas chlorophenolica* 2,6-dichloro-p-hydroquinone dioxygenase (PcpA)," *J. Biol. Inorg. Chem.*, **2010**, *15*, 291-301.

M. M. Melzer, E. Kogut, M. S. Varonka, S. Wiese, T. H. Warren, **S. S. Rocks**, P.L. Holland, "Beta-Diketiminato supported nickel(II) and nickel(I) complexes of L<sup>Me,Me3</sup>," *Inorg. Synth.* **2010**, *35*. 45-48.

**S. S. Rocks**, W. W. Brennessel, T. E. Machonkin, P. L. Holland, "Solid-State and proton NMR characterization of an iron(II) complex of a tridentate, facially coordinating N,N,O donor ligand," *Inorg. Chim. Acta* **2009**, *362*, 1387-1390.

## Patent Applications

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Chaiko, D. J.; Dickinson, C.; Rocks, S. Methods of rapidly leaching metallic copper in sulfate systems. PCT Int. Appl., WO2018/037305, Aug. 2, 2017.

Chaiko, D. J.; Baczek, F.; Rocks, S. S. Methods for Controlling Iron via Magnetite Formation in Hydrometallurgical Processes. PCT Int. Appl., WO 2018/100539 A1 20180607, Nov. 30, 2017.

Chaiko, D. J.; Baczek, F.; Rocks, S.; Eyzaguirre, C. Activation system and method for enhanced metal recovery during atmospheric leaching of metal sulfides. PCT Int. Appl., PCT/US15/62000, May 17, 2017.

Chaiko, D. J.; Rocks, S. S. Process for Flotation Leaching Copper Sulfide Minerals. Int. Appl. US 2014/070354, June 25, 2015.

Chaiko, D. J.; Rocks, S. S. Methods for rapidly leaching chalcopyrite. Int. Appl. PCT/US2015/067188, Jun. 9, 2017.

Chaiko, D. J.; Rocks, S. S. Process for the enhanced bioleaching of ores. Int. Appl. US 2013/077815, July 10, 2014.

Chaiko, D. J.; Rocks, S. S. Composition and Methods for the Leaching of Ores. Int. Appl. US2013/076826, July 3, 2014.

Rocks, S. S.; Chaiko, D. J. Antioxidants for Use in Solvent Extraction Systems. Int. Appl. US2013/073859, July 3, 2014.

Chaiko, D. J.; Rocks, S. S. Systems and Processes for the Enhanced Leaching of Ores through Particle Size Segregation. Int. Appl. US 2013/074589, June 19, 2014.

Shah, I.; Rocks, S. S.; Chaiko, D. J. Solvent Extraction Mixer Settler Coalescing Media Placement. Int. Appl. US2012/071944, July 4, 2013.

## Patents

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Chaiko, D. J.; Baczek, F.; Walters, T.; Rocks, S.; Eyzaguirre, C. System and Method for Enhanced Metal Recovery during Atmospheric Leaching of Metal Sulfides. United States Patent, US 10,023,935. Jul. 17, 2018.

Chaiko, D. J.; Baczek, F.; Walters, T.; Rocks, S.; Roy, G.; Eyzaguirre, C. System and Method for Controlling Frothing during Atmospheric Leaching of Metal Sulphides using Silicates. United States Patent, US 10,000,389. Jun. 19, 2018.

Chaiko, D. J.; Rocks, S. S. Activated Semiconductor Compounds Having Increased Electrochemical Reactivity and Associated Methods Thereof. United States Patent, US 9,422,601. Aug. 23, 2016.

## Service Activities

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### Utah Valley University

Orem, UT

#### Department

- Faculty Hiring Committee Spring 2018
- Faculty Hiring Committee Fall 2018
- Chemistry Club Faculty Mentor Fall 2018-present
- Chemistry Representative, UVU Department Day Fall 2018, 2019
- “Mole Day” Event Planning Fall 2018
- National Science Foundation Scholarship Selection Committee Fall 2017

#### College

- Curriculum Committee Fall 2017- present
- Faculty Excellence Award Committee Spring 2018, Spring 2019
- Dean’s Day Chemistry Demonstrations Fall 2017, Fall 2018

#### Community

- STEMfest Fall 2017, 2018, 2019
- Empowering your Tomorrow Fall 2017, 2019, 2019
- SheTech Spring 2018, 2019
- Expanding your Horizons Spring 2018, 2019
- Research advisor to high-school visiting researcher Summer 2019
- UVU Prep Career Speaker Summer 2019
- UVU Prep Chemistry Demonstration Summer 2019

#### Profession

- American Chemical Society Central Utah Section, Secretary Spring 2018
- American Chemical Society Central Utah Section, Chair-elect Fall 2018
- American Chemical Society Central Utah Section, Chair Spring 2020- present