

Dr. Leah C. Frenette

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Qualifications

University of Rochester	Doctor of Philosophy , Chemistry <i>Colloidal Quantum Dot Synthesis, Mechanistic Studies, and Applications in Photocatalysis</i>	2018
	Master of Science , Chemistry	2014
Lake Forest College	Bachelor of Arts , Chemistry and French <i>Cum Laude</i>	2012

Awards

- Elon H. Hooker Graduate Fellowship, 2016-2017
- University of Rochester Department of Chemistry Travel Award, 2016
- Robert and Marian DeRight Graduate Fellowship, 2015-2016
- University of Rochester Researcher Mobility Travel Grant, 2014
- NSF-Integrated Graduate Education Research Traineeship (IGERT), 2013-2015
- ACS Undergraduate Student Award in Inorganic Chemistry, 2012
- Lake Forest College Make-A-Difference Award for Excellence in Community Service, 2012

Employment

Postdoctoral Research Associate Present

Department of Materials, Imperial College London
Principal Investigator: Molly M. Stevens

Exploiting the photochemical reactivity of colloidal quantum dots for enhanced biosensing

- Synthesis and characterization of semiconductor nanocrystals
- Ligand exchange and bioconjugation
- Lateral flow immunoassays
- Project management
- Collaboration with ESPRC IRC iSense: Early Warning Sensing Systems for Infectious Disease

Visiting Researcher 2014

Optical Materials Engineering Laboratory, ETH Zurich
Principal Investigator: David J. Norris

- Developed laboratory methods CdSe nanoplatelet synthesis and doping
- Characterized the nanocrystals using Inductively Coupled Plasma-Optical Emission Spectroscopy (ICP-OES), UV-Vis absorbance and Photoluminescence spectroscopy
- Investigated the mechanism of formation of nanoplatelets, culminating in a publication for the group (*Nature Materials*, DOI: 10.31038/NMAT4889).

Research Methodology and Instrumentation

- Colloidal quantum dot synthesis
- Ligand exchange and phase transfer
- Inert atmosphere technique
- Photocatalysis
- Layer-by-layer thin films
- Prepared metallated protein samples
- Single walled carbon nanotube samples
- Flame-sealing technique
- UV-Vis Absorbance spectroscopy
- Photoluminescence spectroscopy
- Glovebox and vacuum pump maintenance
- NMR Spectroscopy (^1H , ^{13}C , ^{31}P , ^{77}Se and ^{113}Cd)
- Gas Chromatography – Mass Spectrometry
- Transmission Electron Microscopy (TEM)
- Scanning Electron Microscopy (SEM)
- Inductively Coupled Plasma – Mass Spectrometry (ICP-MS)
- FT-IR spectroscopy
- Fluorescence lifetime measurements
- X-ray diffraction experiments
- Spartan and Gaussian

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Presentations

Talks (Selected)

- “Colloidal Quantum Dot Synthesis, Mechanistic Studies, and Applications in Photocatalysis” **Frenette, L.C.**; Krauss, T.D. *Physical Chemistry Seminar, University of Rochester*, Rochester, NY, United States, December 14, **2017**. Oral.
- “Semiconductor Nanocrystals: Studying Mechanisms for Improved Synthetic Design and Photoredox Reactions” **Frenette, L.C.**; Krauss, T.D. *Lake Forest College*, Lake Forest, IL. September 15, **2017**. Oral, Invited.
- “Photoredox Catalysis with Semiconductor Quantum Dots ” **Frenette, L.C.**; Caputo, J. A.; Zhao, N.; Sowers, K. L.; Weix, D.J. Krauss, T.D. *Photochemistry Gordon Research Seminar (GRS)*, Lewiston, ME. July 22, **2017**. Oral, Invited.
- “Rediscovering Active Precursors in CdSe Quantum Dot Synthesis” **Frenette, L.C.**; Krauss, T.D. *Physical Chemistry Seminar, University of Rochester*, Rochester, NY, United States, June 20, **2016**. Oral.
- “Education and implementation of renewable energy-harvesting devices in Swaziland” *Center for Energy and the Environment Symposium*, **Frenette, L.C.**; Sepulveda, M.A.A.; Samuels, M.H.; Garcell, E.; Marnell, M.; Viza, N.; Yates, M. University of Rochester, Rochester, NY, United States, April 29, **2016**. Oral.
- “Back to the Future: Rediscovering Active Precursors in CdSe Quantum Dot Synthesis” **Frenette, L.C.**; Krauss, T.D. *Cornell-Rochester Inorganic Symposium*, University of Rochester, Rochester, NY, United States, April 9, **2016**. Oral.
- “Semiconductor Nanocrystals: Studying Mechanism for Improved Synthetic Design” **Frenette, L.C.**; Krauss, T.D. *University of Swaziland*, Kwaluseni, Swaziland, July 3, **2015**. Oral.

Poster Presentations (Selected)

- “Photoredox Catalysis with Semiconductor Quantum Dots ” **Frenette, L.C.**; Caputo, J. A.; Zhao, N.; Sowers, K. L.; Weix, D.J. Krauss, T.D. *Photochemistry Gordon Research Conference (GRC)*, Lewiston, ME. July 23-26, **2017**. Poster.
- “Quantum Dots for Photocatalytic Water Oxidation Using V_6O_7 Clusters” **Frenette, L.C.**; Hou, Z.; Li, F.; Matson, E. M.; Krauss, T.D. *2016 MRS Fall Meeting and Exhibit*, Boston, MA. December 1, **2016**. Poster.
- “Education and implementation of renewable energy-harvesting devices in Swaziland” Sepulveda, M.A.A.; **Frenette, L.C.**; Samuels, M.H.; Garcell, E.; Marnell, M.; Viza, N.; Yates, M. *The 5th International Seminar on Green Energy Conversion*, Koumi, Nagano, Japan. August 31-September 2, **2016**. Poster.
- “Colloidal quantum dots for water oxidation with vanadium oxide clusters” **Frenette, L.C.**; Li, F.; Matson, E. M.; Krauss, T.D. *The 5th International Seminar on Green Energy Conversion*, Koumi, Nagano, Japan. August 31-September 2, **2016**. Poster.
- “Hydrogen selenide and alkyl cadmium as active precursors in CdSe quantum dot synthesis” **Frenette, L.C.**; Krauss, T.D. *Colloidal Semiconductor Nanocrystals Gordon Research Conference*, Mt. Snow, VT. July 31 – August 1, **2016**. Poster.
- “Hydrogen selenide and alkyl cadmium as active precursors in CdSe quantum dot synthesis” **Frenette, L.C.**; Krauss, T.D. *Center for Energy and the Environment Symposium*, University of Rochester, Rochester, NY, United States, April 29, **2016**. Poster.
- “CdSe Nanoplatelet Synthesis and Doping” **Frenette, L.C.**; Riedinger, A.; Krauss, T.D.; Norris, D.J. *The 5th Energy for the 21st Century Symposium*, University of Rochester, Rochester, NY, United States, May 1, **2015**. Poster.
- “Modeling enantioselectivity in chelate-controlled synthesis of ansa-zirconocenes using a chiral 1,1'-Bi(2-naphthylamine) directing ligand: A DFT study” **Frenette, L.C.**; Wisner, D.C. *243rd ACS National Meeting & Exposition*, San Diego, CA, United States, March 25-29, **2012**. Poster.

Teaching

Mentorship	Undergraduates (4), Ph.D. Students (3)
Spring 2016	Teaching, Researching, and Working in Africa, Instructor, <i>University of Rochester</i>
Fall 2015	Group Theory (CHM 421), Teaching Assistant, <i>University of Rochester</i>
Fall 2015	Basic Organometallics (CHM 415), Teaching Assistant, <i>University of Rochester</i>

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Spring 2013 Physical Chemistry II (CHM 252), Workshop Leader, *University of Rochester*
Fall 2012 General Chemistry Laboratory (CHM 131), Teaching Assistant, *University of Rochester*
Fall 2011 Physical Chemistry Laboratory, Teaching Assistant, *Lake Forest College*
Spring 2012 Microbiology Laboratory, Teaching Assistant, *Lake Forest College*

Outreach

- National Chemistry Week In-School Outreach Coordinator, 2016
- Graduate Student Orientation Volunteer, 2013-2016 & Mentor, 2016
- NSF IGERT renewable energy outreach trip to Swaziland, June 2015 & Trip Leader, May 2016
- NanoDays and National Chemistry Week outreach at the Rochester Museum and Science Center, biannually 2013-2016

Continued Professional Development

Professional Affiliations

- Associate member, Royal Society of Chemistry
- Member, American Chemical Society
- Member, American Association for the Advancement of Science
- Member, Materials Research Society
- Associate Member, Euroscience

Peer Review

- ACS Reviewer Lab Certified Reviewer
- Reviewed for: *Journal of the American Chemical Society*, *ChemSusChem*, *Optics Materials Express*

Service

- MRS Fall Meeting and Exhibit Symposium Assistant, 2016
- 4th Magomedovv-Shcherbinina Research Prize Review Committee, 2016
- Vice-President, LFC Student Affiliates of the American Chemical Society, 2011-2012
- LFC Chemistry Student Academic Advisory Committee, 2010-2012.

Languages: English (Native), French (Limited working proficiency)

References

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Publications

ORCID ID: 0000 0002 0703 783X

- **Frenette, L. C.**; Krauss, T. D. "Uncovering Active Precursors in Colloidal Quantum Dot Synthesis". *Nat. Commun.* 2017. 8, 2082. DOI: 10.1038/s41467-017-01936-z [Featured by the Electrochemical Society]
- Caputo, J. A.; **Frenette, L. C.**; Zhao, N.; Sowers, K. L.; Krauss, T. D.; Weix, D. J. "General and Efficient C-C Bond Forming Photoredox Catalysis With Semiconductor Quantum Dots" *J. Am. Chem. Soc.*, 2017, 139 (12), 4250-4253. DOI: 10.1021/jacs.6b13379 [Editor's Choice in Science] [Featured in C&EN News] [Featured in RSC-Chemistry World]
- Durney, A.; **Frenette, L.C.**; Hodvedt, E.C.; Krauss, T.D.; Mukaibo, H. "Fabrication of Tapered Microtube Arrays and Their Application as a Microalgal Injection Platform" *ACS Appl. Mater. Interfaces*, 2016, 8 (50), 34198–34208. DOI: 10.1021/acsami.6b11062

To be submitted:

- **Frenette, L. C.**; Krauss, T. D. "Mechanisms in Colloidal Semiconducting Quantum Dot Formation" *Acc. Chem. Res.* 2018. *In Preparation.*
- Peterson, J. J.; Smith, B. S.; Fiegl, J. E.; **Frenette, L. C.**; Freyer, A. R.; Rizzo, R. J.; Brighton, C.A.; Krauss, T. D. "Sizing Curve and Extinction Coefficient Measurements of CdSe/CdS Core/Shell Quantum Dots". *J. Phys. Chem. C.* 2018. *In Preparation.*

Media Mentions

- "Discovery could take guesswork out of making quantum dots" Amanda Staller. The Electrochemical Society. December 29, 2017. <https://www.electrochem.org/redcat-blog/discovery-take-guesswork-making-quantum-dots/>
- "Chemists go 'back to the future' to untangle quantum dot mystery" Bob Marcotte. University of Rochester newscenter. December 12, 2017. <http://www.rochester.edu/newscenter/frenette-krauss-quantum-dots-286592/>
 - Phys.org (December 19, 2017)
 - Futurity (December 27, 2017)
 - Technology.org (December 13, 2017)
 - Nanowerk Nanotechnology News (December 19, 2017)
 - N+1 (Russian) (December 21, 2017)
- "Quantum dots visibly forge carbon bonds" Jake Yeston. Editor's Choice, Organic Chemistry. Science. May 12, 2017. <http://science.sciencemag.org/content/356/6338/twil>
- "Quantum dots offer a brighter future for photocatalysis" Stephen K. Ritter. Chemical & Engineering News. American Chemical Society. April 3, 2017. <https://cen.acs.org/articles/95/i14/Quantum-dots-offer-brighter-future.html>
- "Quantum dot first for carbon-carbon bond photocatalysis" Katrina Kramer. Chemistry World. Royal Society of Chemistry. March 27, 2017. <https://www.chemistryworld.com/news/quantum-dot-first-for-carbon-carbon-bond-photocatalysis/3007017.article>
- "Light emitting quantum dots could ease synthesis of novel compounds" Bob Marcotte. University of Rochester newscenter. March 26, 2017. <http://www.rochester.edu/newscenter/light-emitting-quantum-dots-could-ease-synthesis-of-novel-compounds-249662/>
 - Technology.org (May 30, 2017)
 - Nano-magazine.com (May 29, 2017)
 - Phys.org (May 29, 2017)
 - Neuroroboticsmagazine.com (May 31, 2017)
 - Science and technology research news (May 29, 2017)
 - Chem-station (Chinese) (April 16, 2017)
 - Electronic specifier (May 30, 2017)
 - Organometallic Chemistry (March 17, 2017)