Laura C. Motta

Assistant Scientist **Theoretical Chemistry and Isotope Biogeochemistry Group** Marine Chemistry and Geochemistry Woods Hole Oceanographic Institution Email: laura.motta@whoi.edu

Current Position

Assistant Scientist/MIT-WHOI Program Faculty Marine Chemistry and Geochemistry

Research Interests

Inspired by environmental processes that challenge our current chemical knowledge, the *Theoretical Chemistry and Isotope Biogeochemistry Group at WHOI* is interested in advancing our fundamental understanding of chemistry through studying non-traditional stable isotopes. *Isotope effects are Nature's guide to chemistry. The question is: how should we interpret them when there is no chemical framework?*

Education

Double Ph D in Farth Sciences and Chemistry	2014 2019
Packham Student Initiated Dectoral Program University of Michigan	2014-2019
Earth Sciences Advisor Professor Ical D. Plum	
Eurin Sciences Advisor. Floressol Joel D. Blull	
"State A Line And Andrew Chemistry Advisor: Professor Paul M. Zimmerman	
which will lead to a single Ph.D. citation for a double/dual PhD (Earth Sciences and Chemistry)."	i two Ph.D. programs,
B.A in Chemistry – Honors	2009–2013
Rutgers University-New Brunswick	
Advisor: Professor John R. Reinfelder	
Professional Experience	
Theoretical Chemistry - Postdoctoral Fellow	2021–2023
The State University of New York at Buffalo	
Advisor: Professor Jochen Autschbach	
Environmental Sciences - Postdoctoral Researcher	2020
Pohang Institute of Science and Technology (POSTECH), Pohang, South Korea	
Advisor: Assistant Professor Sae Yun Kwon	
Theoretical Chemistry - Predoctoral Student International Fellowship	2019
Centre National De La Recherche Scientifique (CNRS) Toulouse, France	
Visiting Scholar to learn Relativistic Quantum Chemistry. Mentor: Dr. Trond Saue	
Ph.D. Student, NSF GRFP Predoctoral Fellow	2014–2019
University of Michigan, Rackham Student Initiated Doctoral Program	
Advisors: Professors Joel D. Blum and Paul M. Zimmerman	
NSF international REU, São Pablo, Brazil, Organic synthesis	2011
Universidade de São Pablo	
Advisor: Professor Luiz F. Silva	



2023–Present

Cruise or Fieldwork Participation

1.	Station ALOHA (22° 45'N, 158° 00'W)	02/2014 (15 days)
2.	Station ALOHA (22° 45'N, 158° 00'W)	09/2014 (15 days)
3.	Central Pacific Ocean (8° and 5° N, 155° W)	09/2015 (28 days)
4.	Eastern Pacific Ocean (Puntarenas – San Diego)	05/2023 (39 days)
5.	Western Antarctic Peninsula	12/2023 (36 days)
6.	Periodic Magi Cicadae Collection (Illinois; Lead Fieldwork)	05/2024 (3 days)
Planne	ed Cruise and Fieldwork Participation	
1.	Periodic Magi Cicadae Collection (Massachusetts; Lead Fieldwork)	05/2025 (3 days)
2.	Atlantic Ocean: Gulf Stream (Chief Scientist)	09/2025 (7 days)
Awai	·ds	
1.	National Academy of Sciences Kavli Fellow (Early Career Recognition).	2025
2.	International Institute Fellowship, U. Michigan (Theoretical Chemistry; Toulouse, Fra	nce) 2019
3.	W. Linfiled Award Fellowship, U. Michigan (Theoretical Chemistry; Toulouse, France	2019
4.	Karle Symposium Best Poster Award, U. Michigan (Physical Chemistry Cluster)	2018
5.	Rackham Graduate Research Award, U. Michigan	2018
6.	National Science Foundation Graduate Research Fellowship	2014
7.	Rackham Graduate School Merit Fellowship, U. Michigan	2014
Parti	cipation in Education	
Teachi	ng:	
Marine	e Isotope Chemistry Co-Lecturer	2025
MII-W	HOI Joint Program	
Guest I	Lecture Marine Bioinorganic	2023
MIT-W	/HOI Joint Program	
Isotope	e Geochemistry Workshop	2020
Mercu	ry isotope group, POSTECH, South Korea	
4 lectu	res on understanding photochemical isotope effects of heavy elements	
Physic	al Chemistry II – Thermodynamics and Kinetics	2018
CHEM	463, Department of Chemistry, University of Michigan	
Future	Faculty Graduate Instructor. Course Head: Paul M. Zimmerman	
Isotope	e Geochemistry	2018
EART	H480, Department of Earth and Environmental Sciences, University of Michigan	
Guest]	Lecturer (2-lectures) Photochemical isotopes effects in the environment and how to inter	rpret them
Superv	vision/Mentoring:	
Techni	cal Staff	
Corinn	e Richard (2024-present)	
Postdo	ctoral Scholar	

Yipeng He (2025-present)

Visiting Students Seung Hyeon Kim (2025) Laura C. Motta

WHOI Summer Students Frank Dorman (2024)

Professional Service & Community Involvement at WHOI

Junior WHOI/MIT JPCO joint program advisor	2024 – Present
Summer Student Fellow Department Representative	2025 – Present
Chemistry Search Committee	2025
Chemistry Seminar Organizer	2023 – Present
Ask A scientist - Outreach	2024
Summer Lecture Series – Undergraduate Lecture	2024
Member of CDEI	2024 – Present
Recruitment at the AISES (American Indian Science and Engineering Society)	2024
ERG Latinx Co-founder	2024 – Present
WHOI Postdoctoral Symposium Presenter/Panel – DEI Statement	2023

Professional Service & Community Involvement outside WHOI

Reviewer for: Environmental Science and Technology, Environmental Science and Technology Letters, Nature Geoscience, Science Advances, Nature Communications, Geophysical Letters, ACS Inorganic Chemistry, ACS Earth and Space Chemistry, Nature Communications, and Water Research.

Reviewer for US NSF (MRI - EAR and GRFP)

Volunteer at the GeoFORCE program at U. of Texas at Austin Career Spotlight. 2021

Session Co-Chair, Mercury Isotopes: The 14th International Conference of Mercury as a Global Pollutant, Krakow, Poland

Grants

Lead PI. NSF-CHEM-Chemical Theory, Model, and Computation Models: Understanding Spin-Forbidden Reactions Mediated by Relativistic Nuclear-Electronic Hyperfine Coupling.

Collaborator: Prof. Jochen Autschbach, SUNY Buffalo. (*Funded* 05/01/25 \$545,607) Development of new stable isotope theory for mass independent isotope fractionation from relativistic quantum mechanisms principals.

Lead PI. Seaver Institute: *Opening the Door to Isotope Trace Gas Analysis in Aquatic Systems*. **Collaborator:** Dr. Alan Seltzer WHOI (Finalist – Pending \$500,000)

Development, and application of a novel system for the quantitative extraction of dissolved gases in the field from large volumes of water for isotope analysis (water column and hydrothermal vents).

Publications

11 First authors papers (2 in revision). High-impact first author papers in the Geosciences and Theoretical Chemistry.

Manuscripts in review

- 22. Ju Hyeon, Lee, Laura C. Motta et al., Isotope analysis reveals new pathway of mercury bioaccumulation in an upwelling ocean. *Nature Communications (In review; 03/29/2025; Impact Factor (IF) 16.6)*
- 21. Laura C. Motta, Joel D. Blum, and Brian Popp. Photoreduction of Inorganic Mercury in Surface Seawater. ACS Earth and Space Chemistry (In revision; 04/01/202; IF 2.9).

20. Laura C. Motta, Seung Hyeon Lim et al., Pathway of anthropogenic mercury to Marine Biota. *Communications Earth and Environment (In revision; 03/05/2025; IF 8.1)*

Referred Publications

2024

- 19. Seung Hyeon Lim, Younggwang Kim, Laura C. Motta, Eun Jin Yang, Tae Siek Rhee, Jong Kuk Hong, Seunghee Han, Sae Yun Kwon. Near surface oxidation of gaseous elemental mercury explains high mercury levels in the Arctic Ocean food web. *Nature Communications.* 2024 (*IF* 16.6 *Citations* 2)
- 18. Blaire Umhau, Laura C. Motta, Hilary Close et al., Particulate Mercury Export in the Central Pacific Ocean Using 234Th-238U Disequilibria. *Marine Chemistry* 2024 (*IF* 3 *Citations* 0)

2023

17. Laura C. Motta, Jochen Autschbach. Actinide inverse trans influence versus cooperative pushing from below and multi-center bonding. *Nature Communications* 14, 4307 2023. (*IF* 16.6 – *Citations* 20)

2022

- Laura C. Motta, Joel D. Blum, Brian Popp, Blaire Umhau, Claudia Benitez-Nelson, Spencer Washburn, Hilary Close, and Jeffrey Drazen. "Mercury Isotopic Evidence for Importance of Particles as a Source of Mercury to Marine Organisms". *Proceeding of the National Academy of Sciences* 2022 (*IF* 11.1 – *Citations* 20)
- 15. Laura C. Motta and Jochen Autschbach. "Theoretical evaluation of Metal-Ligand Bonding in Neptunium Compounds in Relation to 237Np Mössbauer spectroscopy". *Inorganic Chemistry* 2022 (*IF* 4.3 *Citations* 5)
- 14. Yo Han Yang, Sae Yun Kwon, Martin Tsui, Laura C. Motta, Spencer Washburn, Jaeseon Park, Kim Minseob, and Shin Kyung-Hoon. "Ecological traits of fish for mercury biomonitoring: Insights from compound specific nitrogen and stable mercury isotopes". *Environmental Science and Technology* **2022**. (*IF* 11.4 *Citations* 13)
- 13 Miling Li, Sae Yun Kown, Martin T. K. Tsui, Brett Poulin, Laura C. Motta, Moonkyoung Cho. "Internal dynamics and metabolism of mercury in biota: a review of insights from mercury stable isotopes". *Environmental Science and Technology.* 2022 (*IF* 11.4 *Citations* 51)
- 12. Laura C. Motta and Jochen Autschbach. "²³⁷Np Mössbauer Isomer Shift: A Lesson About the Balance of Static and Dynamic Electron Correlation in Heavy Element Complexes". *Journal of Chemical Theory and Computation*. 2022 (*IF* 5.5 *Citations* 2)

2021

- 11. Laura C. Motta and Jochen Autschbach. "Theoretical prediction and interpretation of ²³⁷Np Mössbauer isomer shifts". *Journal of Chemical Theory and Computation*. 2021 (*IF* 5.5 *Citations* 4)
- Ju Hyeon Lee, Sae Yun Kwon, Runsheng Yin, Aaron Y. Kurz, Laura C. Motta, Seung-Il Nam. "Spatiotemporal characterization of mercury isotope baselines and anthropogenic influences in sediment cores". *Global Biogeochemical Cycles*, 2021 (IF 5.2 – *Citations* 20)
- Saebom, Jung, Sae Yun Kown, Yongseok Hong, Runsheng Yin, Laura C. Motta. "Isotope investigation of mercury sources in a creek impacted by multiple anthropogenic activities". *Chemosphere*. 2021 (IF 8 – Citations 19)

2020

Spencer J. Washburn, Joel D. Blum, Laura C. Motta, Bridget Bergquist, Peter Weiss-Penzias. "Isotopic composition of Hg in Fog Waters of Coastal California, USA". *Environmental Science and Technology Letters*. 2020 (IF 10.9 – Citations 16)

- Joel D. Blum, Jeffrey C. Drazen, Marcus W. Johnson, Brian N. Popp, Laura C. Motta, Alan J. Jamieson. "Mercury Isotope Identify Near-Surface Marine Mercury in Deep Sea Trench Biota". Proceeding of the National Academy of Sciences. 2020 (IF 11.1 – Citations 64)
- 6. Laura C. Motta, Alan D. Chien, Alan Rask, and Paul Zimmerman. "Mercury Magnetic Isotope Effect: A Plausible Photochemical Mechanism". J. Phys. Chem. A. 2020 (IF 3.3 Citations 18)
- Laura C. Motta, Kritee, K, Joel D. Blum, Martin Tsui, John R. Reinfelder. "Mercury Isotope Fractionation During the Photochemical Reduction of Hg(II) Coordinated With Organic Ligands". J. Phys. Chem. A 2020 (IF 3.3 – Citations 67)
- Laura C. Motta, Joel D. Blum, Brian N. Popp, Jeffrey C. Drazen, and Hilary G. Close. "Mercury Stable Isotopes in Flying Fish as a Monitor of Photochemical Degradation of Methylmercury in the Atlantic and Pacific Oceans". *Marine Chemistry* 2020 (IF 3 – Citations 23)

2019

- Blaire P. Umhau, Claudia R. Benitez-Nelson, Hilary G. Close, Cecelia C. S. Hannides, Laura C. Motta, Brian N. Popp, Joel Blum, and Jeffrey C. Drazen. "Seasonal and spatial changes in estimates of Carbon flux using 234Th:238U disequilibria in the North Pacific Subtropical Gyre". *Marine Chemistry*, 2019 (IF 3 Citations 24)
- Laura C. Motta, Joel D. Blum, Marcus W. Johnson, Blaire P. Umhau, Brian N. Popp, Spencer J. Washburn, Jeffrey C. Drazen, Claudia R. Benitez-Nelson, Cecelia C.C.S. Hannides, Hilary G. Close, and Carl Lamborg. "Mercury cycling in the North Pacific Subtropical Gyre as reveled by mercury stable isotope ratios". *Global Biogeochemical Cycle*, 2019 (IF 5.2 – Citations 75)
- 2017
 - 1. K. Kritee, Laura C. Motta, Joel D. Blum, Martin T. K. Tsui, and John R. Reinfelder. "Photomicrobial Visible Light-Induced Magnetic Mass Independent Fractionation of Mercury in a Marine Microalga". *ACS Earth and Space Chemistry*, 2017 (*IF* 2.9 *Citations* 81)

Other Publications (Media)

- 1. WCVB Interview CityLine: Breaking the "green ceiling": women at the waterfront (01-19-2025) https://www.wcvb.com/article/cityline-breaking-the-green-ceiling-women-at-the-waterfront/63462861
- 2. Voices of the Sea (2-14 Episode: Science Journalists at Sea; 2016) Highlight of our research on board of the R/V Kilo Moana

Invited Presentations

2025

- 1. Laura C. Motta. Isotope Effects: Nature's Guide to Chemistry. National Academy of Sciences Kavli Frontiers of Science Symposium (Flask Poster Talk and Poster) 2025
- 2. Laura C. Motta. Isotope Effects: Nature's Guide to Chemistry. Washington State University Chemistry Department Seminar. 2025
- 2024
 - 3. Laura C. Motta. Actinide inverse trans influence: Cooperative 'Pushing from Below' and multi-center bonding. Angular Momentum Virtual Symposium. 2024
 - 4. Laura C. Motta. Electronic Structure and Covalency of Actinide Complexes. Pacific Northwest National Laboratory Heavy Element/Energy. 2024
 - 5. Laura C. Motta. Unraveling Marine Mysteries and Global Mercury Pollution using Mercury Stable Isotopes. Department Seminar at Marine Sciences UConn. 2024
 - 6. Laura C. Motta. The Journey of Anthropogenic Mercury to Marine Biota. ASLO 2024

7. Laura C. Motta A Theoretical Investigation of Actinide Covalency. International Conference on Coordination Chemistry. 2024

2023

8. Laura C. Motta. "Reveling the Mysteries of Marine Mercury with Non-Traditional Stable Isotopes". *Invited presentation,* Gordon Research Conference – Chemical Oceanography. July 18, **2023**

2022

- 9. Laura C. Motta. "Reveling the Mysteries of Marine Mercury with Non-Traditional Stable Isotopes". *Invited presentation,* Arizona State University. Oct 15, 2022
- Laura C. Motta. "Unraveling the Secrets of the Marine Biogeochemical Mercury Cycle Using Stable Isotopes". Texas A&M, seminar. 2022
- 11. Laura C. Motta. "Unraveling the Secrets of the Marine Biogeochemical Mercury Cycle Using Stable Isotopes". POSTECH, South Korea, seminar. May 10, 2022
- 12. Laura C. Motta. "Unraveling the Secrets of the Marine Biogeochemical Mercury Cycle Using Stable Isotopes". WHOI, Marine Chemistry and Geochemistry seminar. May 4, 2022
- 13. Laura C. Motta. "The Marine Mercury Cycle in a Changing Climate". University at Buffalo, MEETS (Materials, Energy, EnvironmenT) Seminar, Feb 22, 2022

2020

14. Laura C. Motta. "Mercury cycling in the ocean". POSTECH, South Korea, July 23, 2020

Contributed Presentations and Abstracts

- 1. Laura C. Motta, Joel D. Blum, Paul. M. Zimmerman. "Mechanisms for Mercury Stable Isotope Fractionation during Aqueous Photodecomposition". Goldschmidt. Barcelona, Spain 2019
- Laura C. Motta, Joel D. Blum, Alan D. Chain, Paul M. Zimmerman. "Magnetic Isotope Effect: Anomalous Case Study of Mercury Stable Isotopes". The 16th International Spin Chemistry Meeting, Schluchsee, Germany 2017. *Limited number of graduate student oral presentations*
- 3. Laura C. Motta, Joel D. Blum, Hilary Close, Brian Popp, Jeff Drazen. "Mercury Isotopes in Flying Fish as a Monitor of Photodemethylation in the Atlantic and Pacific Oceans". The 13th International Conference of Mercury as a Global Pollutant, Providence, RI, USA 2017
- 4. Laura C. Motta, Joel D. Blum, Marcus W. Johnson, Brian N. Popp, Blaire Umhau, Hilary Close, Cecilia Hannides, Clauida Benitez-Nelson. "Mercury Stable Isotopes Reveal Deep Methylation of Mercury and its Uptake into the Open Ocean Food Web". Ocean Science Meeting, New Orleans, LA, USA 2016
- 5. Laura C. Motta, Joel D. Blum, John Reinfelder, Brian Popp, Hilary Close. "Photochemical Transformations of Inorganic Mercury and Methylmercury in the Oceans revealed through Stable Isotope Fractionation of Mercury". The 12th International Conference of Mercury as a Global Pollutant, Jeju, Korea 2015
- 6. Reinfelder, J.R., Kritee, Laura C. Motta. "Photomicrobial reduction and dark oxidation of mercury in marine surface waters". Goldschmidt, Sacramento, CA, 2014.
- 7. Laura C. Motta, K. Kritee, Joel D. Blum, Martin Tsui, John Reinfelder. "Mercury Stable Isotope Biogeochemistry – Effects of pH, dissolved oxygen, and wavelength of light on Hg stable isotope fractionation during photochemical reduction of organically complexed Hg(II)". The 11th International Conference of Mercury as a Global Pollutant, Edinburg, Scotland 2013