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Department of Chemistry
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Education and Appointments

06/2023	**Assistant Professor, Department of Chemistry and Biochemistry** *University of Delaware*, Newark, DE *Deferred start date*
9/2019 – present	**NIH/NIGMS MOSAIC K99/R00, UC President's, and Chinook-Berkeley Postdoctoral Fellow, Chemistry** *University of California, Berkeley*, Berkeley, CA Advisor: Christopher J. Chang
2019	**Ph. D., Chemistry, NSF Graduate Research Fellow** *University of California, Los Angeles (UCLA)*, Los Angeles, CA Thesis Title: *Developing Inorganic Approaches to Polymerization and Bioconjugation* Advisors: Heather D. Maynard and Alexander M. Spokoyny
2014	**B. S., Chemistry, NSF LSAMP Research Fellow**, Minor: Philosophy *Texas A&M University, Corpus Christi (TAMUCC)*, Corpus Christi, TX Advisor: Mark A. Olson
6/2013 – 8/2013	**MIT Summer Research Program** *Massachusetts Institute of Technology*, Cambridge, MA Advisor: Jeremiah A. Johnson

Publications

*denotes corresponding author; †denotes equal contribution

1. **Messina, M. S.***; Quargnali, G.; Chang, C. J.* "Activity-Based Sensing for Chemistry-Enabled Biology: Illuminating Principles, Probes, and Prospects for Boronate Reagents for Studying Hydrogen Peroxide" **2022**. *Submitted.*

2. Montgomery, H.; **Messina, M. S.**; Doud, E.; Spokoyny, A. M.*; Maynard, H. D.* "Organometallic S-arylation Reagents for Rapid PEGylation of Biomolecules" *Bioconjugate Chem.* **2022**, *33*, 1536-1542.

3. Hoshi, K. †; **Messina, M.S.** †; Ohata, J.; Chung, C. Y.-S.; Chang, C. J.* "A Puromycin-Dependent Activity-Based Sensing Probe for Histochemical Staining of Hydrogen Peroxide in Cells and Animal Tissues" *Nat. Protoc.* **2022**, *17*, 1691-1710.

4. Iwashita, H.; Castillo, E.; **Messina, M. S.**; Swanson, R. A.; Chang, C. J.* "A Tandem Activity-Based Sensing and Labeling Strategy Enables Imaging of Transcellular Hydrogen Peroxide Signaling" *Proc. Natl. Acad. Sci. USA* **2021**, *118*, e2018513118.

5. **Messina, M. S.**; Maynard, H. D.* "Modification of Biomolecules Using Olefin Metathesis" *Mater. Chem. Front.* **2020**, *4*, 1040-1051. *Special issue in honor of Professor Robert H. Grubbs for his 50-year contributions in metathesis*.

6. **Messina, M.S.**; Messina, K. M. M.; Bhattacharya, A.; Montgomery, H. R.; Maynard, H. D.* "Preparation of Biomolecule-Polymer Conjugates by Grafting-From Using ATRP, RAFT, or ROMP" *Prog. Polym. Sci.* **2020**, *100*, 101186. *Special issue celebrating 100 years of polymer science*.

7. Qian, E. A.; Han, Y.; **Messina, M. S.**; Maynard, H. D.; Král, P.; Spokoyny, A. M.* "Multivalent Cluster Nanomolecules for Inhibiting Protein-Protein Interactions" *Bioconjugate Chem.* **2019**, 30, 2594-2603.

8. Khor, C. M.; Zhu, X.; **Messina, M. S.**; Poon, S.; Lew, X. Y.; Maynard, H. D.; Jassby, D.* "Electrically Responsive Polymer Brush Grafted Ultrafiltration Membranes" *ACS Materials Lett*. **2019**, *1*, 647-654.

9. Axtell, J. C.*; **Messina, M. S.**; Liu, J.-Y.; Galaktionova, D.; Schwan, J.; Porter, T. M.; Savage, M. D.; Wixtrom, A. I.; Rheingold, A. L.; Kubiak, C. P.; Winkler, J. R.; Gray, H. B.*; Král, P.*; Alexandrova, A. N.*; Spokoyny, A. M.* "Photooxidative Generation of Dodecaborate-Based Weakly Coordinating Anions." *Inorg. Chem.* **2019**, *58*, 10516-10526. *Special Issue on Emerging Investigators in Inorganic Chemistry*.

10. **Messina, M. S.***; Graefe, C. T.; Chong, P.; Ebrahim, O. M.; Pathuri, R. S.; Bernier, N. A.; Mills, H. A.; Rheingold, A. L.; Frontiera, R. R.*; Maynard, H. D.*; Spokoyny, A. M.* "Carborane RAFT Agents as Tunable and Functional Molecular Probes for Polymer Materials" *Polym. Chem.* **2019**, *10*, 1660-1667.

11. **Messina, M. S.**[†]; Stauber, J. M.[†]; Waddington, M. A.; Rheingold, A. L.; Maynard, H. D.*; Spokoyny, A. M.* "Organometallic Gold(III) Reagents for Cysteine Arylation" *J. Am. Chem. Soc.* **2018**, 140, 7065-7069.

12. **Messina, M. S.**[†]; Ko, J. H.[†]; Yang, Z.; Strouse, M. J.; Houk, K. N.; Maynard, H. D.* "Effect of Trehalose Polymer Regioisomers on Protein Stabilization" *Polym. Chem.* **2017**, *8*, 4781-4788.
    - Highlighted on the journal front cover.

13. Dziedzic, R. M.; Martin, J. L.; Axtell, J. C.; Saleh, L. M. A.; Ong, T.-C.; Yang, Y.-F.; **Messina, M. S.**; Rheingold, A. L.; Houk, K. N.; Spokoyny, A. M.* "Cage-Walking: Vertex Differentiation by Palladium-Catalyzed Isomerization of B(9)-Bromo-meta-Carborane" *J. Am. Chem. Soc*. **2017**, *139*, 7729-7732.

14. Qian, E. A.; Wixtrom, A. I.; Axtell, J. C.; Saebi, A.; Jung, D.; Rehak, P.; Han, Y.; Moully, E. H.; Mosallaei, D.; Chow, S.; **Messina, M. S.**; Wang, J. Y.; Royappa, A. T.; Rheingold, A. L.; Maynard, H. D.; Král, P.; Spokoyny, A. M.* "Atomically Precise Organomimetic Cluster Nanomolecules (OCNs) Assembled via Perfluoroaryl-thiol S_NAr chemistry" *Nature Chem.* **2017**, *9*, 333-340.

15. **Messina, M. S.**[†]; Axtell, J. C.[†]; Wang, Y.; Chong, P.; Wixtrom, A. I.; Kirlikovali, K. O.; Upton, B. M.; Hunter, B. M.; Shafaat, O. S.; Khan, S. I.; Winkler, J. R.; Gray, H. B.; Alexandrova, A. N.; Maynard, H. D.; Spokoyny, A. M.* "Visible-Light Induced Olefin Activation using 3D Aromatic Boron-Rich Cluster Photooxidants" *J. Am. Chem. Soc*. **2016**, *138*, 6952-6955.
    - Highlighted by Phil Szuromi in *Science* **2016**, *352*, 1422-1423
    - Highlighted by UCLA Chemistry and Biochemistry
    - Highlighted in C&EN Talented 12 article

16. Olson, M. A.*; **Messina, M. S.**; Thompson, J. R.; Dawson, T. J.; Goldner, A.; Gaspar, D.; Vazquez, M.; Lehrman, J. A.; Sue, A. C.-H. "Reversible Morphological Changes of Assembled Supramolecular Amphiphiles Triggered by pH-Modulated Host-Guest Interactions" *Org. Biomol. Chem.* **2016**, *14*, 5714-5720. *New Talent Issue*.

17. Olson, M. A.*; Thompson, J. R.; Dawson, T. J.; Hernandez, C. M.; **Messina, M. S.**; O'Neal, T. "Template-Directed Self-Assembly by way of Molecular Recognition at the Micellar-Solvent Interface: Modulation of the Critical Micelle Concentration" *Org. Biomol. Chem.* **2013**, *11*, 6483-6492.
    - Highlighted on the journal front cover.

Patents and Patent Applications

Spokoyny, A. M.; Maynard, H. D.; Qian, E.; **Messina, M. S.**; Wixtrom, A. I.; Axtell, J. C.; Kirlikovali, K. O.; Gonzalez, A. "Novel Three-Dimensional Boron-Rich Clusters", United States Patent: 20190047871A1; International: WO/2017/143348 A2.

Awards

- NIH/NIGMS K99/R00 Maximizing Opportunities for Scientific and Academic Independent Careers (MOSAIC) Program (2021-2026)
- Norma Stoddart Prize for Academic Excellence and Outstanding Citizenship (2022)
- Young Scientist Lectureship Award (University of California, Santa Barbara, 2021)
- Lindau Nobel Laureate Fellow (2021)
- University of California President's Postdoctoral Fellowship (2020-2022)
- Chinook-Berkeley Postdoctoral Fellowship (2019-2021)
- NSF- Predoctoral Fellowship (GRFP) (2016-2019)
- Dow Building Engineering and Science Talent Symposium (2019)
- Boehringer-Ingelheim-UCLA Dissertation Award for Excellence in Organic Chemistry (2019)
- John Stauffer Fellowship, UCLA (2019)
- American Peptide Symposium 2019 Travel Award (2019)
- Christopher S. Foote Fellowship, UCLA (2017)
- Glenn T. Seaborg Symposium Poster Session Winner (2017)
- NSF- Bridge-to-Doctorate Fellowship (2014-2016)
- Ford Fellowship Honorable Mention (2015)
- Eugene V. Cota-Robles Fellowship (2014-2019)
- UCLA Competitive Edge (2014)
- SSCC Scholarship (2014)
- NSF-REU Leadership Group Travel Award to ACS (2014)
- Texas A&M University-Corpus Christi Dean's List (2013)
- ABRCMS National Conference Travel Scholarship (2013)
- 3rd Place Oral Presentation, 12th Annual Sigma Xi Undergraduate Research Symposium (2013)
- NSF- LSAMP Research Fellow, National Science Foundation. (2012 – 2014)
- SACNAS National Conference Travel Scholarship (2012)
- NSF- ACE Research Fellow, National Science Foundation (2012 – 2014)
- Welch Research Fellow, Welch Foundation. (2012)
- Texas A&M University-Corpus Christi Honors Program Project of Excellence Scholarship (2012)
- Texas A&M University-Corpus Christi Honors Program Scholar Apprentice Scholarship (2011)

- Texas A&M University-Corpus Christi Honors Program Leadership Scholarship (2010)
- Texas Lutheran University Dean's List (2009)

Invited Presentations

1. "Activity-Based Sensing Approaches to Monitor Chemical Analytes in Biological Systems" University of California, Davis, CAMPOS Research Seminar (May 2022).

2. "Harnessing Chemoselective and Biocompatible Reactivity for Developing New Functional Materials and Biological Probes" Northeastern University (January 2022).

3. "Harnessing Chemoselective and Biocompatible Reactivity for Developing New Functional Materials and Biological Probes" University of Delaware (January 2022).

4. "Harnessing Chemoselective and Biocompatible Reactivity for Developing New Functional Materials and Biological Probes" University of California, Irvine (January 2022).

5. "Harnessing Chemoselective and Biocompatible Reactivity for Developing New Functional Materials and Biological Probes" Michigan State University (December 2021).

6. "Harnessing Chemoselective and Biocompatible Reactivity for Developing New Functional Materials and Biological Probes" University of Utah (December 2021).

7. "Harnessing Chemoselective and Biocompatible Reactivity for Developing New Functional Materials and Biological Probes" University of Maryland, Baltimore County (December 2021).

8. "Harnessing Chemoselective and Biocompatible Reactivity for Developing New Functional Materials and Biological Probes" Texas A&M University (November 2021).

9. "Harnessing Chemoselective and Biocompatible Reactivity for Developing New Functional Materials and Biological Probes" University of Cincinnati (November 2021).

10. "Harnessing Chemoselective and Biocompatible Reactivity for Developing New Functional Materials and Biological Probes" University of Michigan (November 2021).

11. "Harnessing Chemoselective and Biocompatible Reactivity for Developing New Functional Materials and Biological Probes" University of California, Merced (October 2021).

12. "Harnessing Chemoselective and Biocompatible Reactivity for Developing New Functional Materials and Biological Probes" Rice University, Houston, TX (October 2021).

13. "Harnessing Chemoselective and Biocompatible Reactivity for Developing New Functional Materials and Biological Probes" University of California, Santa Barbara (June 2021). Young Scientist Lectureship Award.

14. "A Tandem Activity-Based Sensing and Labeling Strategy Enables Imaging of Transcellular Hydrogen Peroxide Signaling" SOKA University (April 2021).

15. "Activity-Based Sensing/Bioconjugation Platforms for Localized Multiplex Live Cell Analysis" 16th Synthetic Biology Institute Workshop, Agilent Technologies, Santa Clara, CA (December 2019).

16. “Between Two Laboratories: Developing Inorganic Approaches to Polymerization and Bioconjugation” Dow, Collegeville, PA (August 2019).

17. “Between Two Laboratories: Developing Inorganic Approaches to Polymerization and Bioconjugation” Organization for Cultural Diversity Seminar Series, University of California, Los Angeles, Los Angeles, CA (May 2019).

18. “My Experience at MIT— Getting into an REU program and making the most out of it,” Louis Stokes Alliance for Minority Participation Fall Seminar, Corpus Christi, Texas (Sept. 2013).

Conference Presentations

1. “A Tandem Activity-Based Sensing and Labeling Strategy Enables Imaging of Transcellular Hydrogen Peroxide Signaling,” American Society for Biochemistry and Molecular Biology (ASBMB) Annual Meeting, Philadelphia, PA (April 2022).

2. “Organometallic Gold(III) Reagents for Cysteine Arylation and Protein-Polymer Conjugation,” University of Chicago Future Faculty Conference (May 2021).

3. “Harnessing Chemoselective and Biocompatible Reactivity for Developing New Functional Materials and Biological Probes,” UC President’s Academic Retreat (April 2021).

4. “Organometallic Gold(III) Reagents for Cysteine Arylation of Polymer Initiators” 26th American Peptide Symposium, The Portola Hotel, Monterey, CA (June 2019).

5. “Organometallic Gold(III) Reagents for Cysteine Arylation of Polymer Initiators” 2019 Polymers Gordon Research Conference, Mount Holyoke College, South Hadley, MA (June 2019).

6. “Organometallic Gold(III) Reagents for Cysteine Bioconjugation” 2018 Organometallics Gordon Research Conference, Salve Regina University, Newport, RI (July 2018).

7. “Molecular Readout Probes Based on Carborane Clusters” 2017 Glenn T. Seaborg Symposium, University of California, Los Angeles, Los Angeles, CA (Nov. 2017).

8. “Mechanistic Investigation of Styrene Polymerization Photoinitiated by $B_{12}(OR)_{12}$ Cluster Compounds” 2017 Glenn T. Seaborg Symposium, University of California, Los Angeles, Los Angeles, CA (Nov. 2017).

9. “$B_{12}(OR)_{12}$ Reagents as Strong One-Electron Oxidants” 32nd William S. Johnson Symposium, Stanford University, Stanford, CA. (Oct. 2017).

10. “Effect of Trehalose Polymer Regioisomers on Protein Stabilization” 253rd ACS National Meeting and Exposition, San Francisco, CA. (Apr. 2017).

11. “Visible-Light Induced Olefin Activation using 3D Aromatic Boron-Rich Cluster Photooxidants” 4th Annual California Alliance Retreat, California NanoSystems Institute (CNSI), Los Angeles, CA. (Feb. 2017).

12. “Visible-Light Induced Olefin Activation using 3D Aromatic Boron-Rich Cluster Photooxidants” 2016 Louis Stokes Midwest Center of Excellence (LSMCE) Annual Conference, Hyatt Regency Lisle, Lisle, IL. (Oct. 2016).

13. “Protein Stabilization by Trehalose Polymer Regioisomers,” 2016 International Symposium on Nanobiotechnology, University of California, Los Angeles, Los Angeles, CA. (Feb. 2016).

14. “Trehalose Glycopolymers for use in Protein Stabilization,” 2015 SACNAS National Conference, Gaylord Opryland Convention Center, Washington, D. C. (Oct. 2015).

15. “Cationic Polymerization of Styrene Utilizing Metal-Free, Boron-Rich Cluster Photocatalysts,” 2015 Louis Stokes Midwest Center of Excellence (LSMCE) Annual Conference, Wyndham Indianapolis West, Indianapolis, IN (Oct. 2015).

16. “Metal-Free Boron-Rich Cationic Styrene Polymerization Photocatalysts,” 2015 Glenn T. Seaborg Symposium, University of California, Los Angeles, Los Angeles, CA (Oct. 2015).

17. “Synthesis, Characterization, and Experimentation of Novel Bipyridinium-based Surfactants,” Spring 2014 Honors Program Symposium, Texas A&M University- Corpus Christi, Corpus Christi, Texas (May 2014).

18. “Synthesis of Toroidal Polymer by way of UV Initiated Ring Expansion Polymerization,” Spring 2014 Honors Program Symposium, Texas A&M University- Corpus Christi, Corpus Christi, Texas (May 2014).

19. “Template-Directed Self-Assembly by way of Molecular Recognition at the Micellar-Solvent Interface: Modulation of the Critical Micelle Concentration,” 2nd Annual Science Innovation Panel Discussion and Poster Session, Texas A&M University-Corpus Christi, Corpus Christi, Texas (Apr. 2014).

20. “Reversible Docking at the Micellar-Solvent Interface,” 247th ACS National Meeting and Exposition, Dallas, Texas (Mar. 2014).

21. “Reversible Docking at the Micellar-Solvent Interface,” 2014 Louis Stokes Alliance for Minority Participation Conference, Westin Hotel, Houston, Texas (Feb. 2014). (Oral)

22. “From the Micellar Cradle to the Crystalline Grave: Surfactant Aggregation from Dilute Solutions to Pure Crystals,” 2013 Annual Biomedical Research Conference for Minority Students, Gaylord Opryland Hotel & Convention Center, Nashville, Tennessee (Nov. 2013).

23. “Synthesis of Cyclic Polymers by a Novel UV Initiated Ring Expansion Polymerization,” Massachusetts Institute of Technology MSRP seminar day, Cambridge, MA (Aug. 2013).

24. “Reversible Docking at the Micellar-Solvent Interface,” 12th Annual Sigma Xi Undergraduate Research Symposium, Texas A&M University Corpus Christi, Corpus Christi, Texas (Mar. 2013).

25. “Supramolecular Switching at the Micellar-Solvent Interface,” 2013 Louis Stokes Alliance for Minority Participation Conference, Texas A&M University, College Station, Texas (Feb. 2013).

26. “Reversible Docking at the Micellar-Solvent Interface,” 2012 SACNAS National Conference, Washington State Convention Center, Seattle, Washington (Oct. 2012).
27. “Moral Issues of Universal Healthcare,” Spring 2012 Honors Program Symposium, Texas A&M University- Corpus Christi, Corpus Christi, Texas (April 2012).

28. "Mechanostereochemistry: Topologies, Synthesis, Utilizations, and Future Outlooks," Fall 2011 Honors Program Symposium, Texas A&M University- Corpus Christi, Corpus Christi, Texas (Dec. 2011).

Teaching and Mentoring

12/2021	Culturally Aware Mentoring (CAM) Workshop
1/2020 – present	Undergraduate Student Mentees: Kaede Hoshi (Chemistry); Michelle Zhao (Chemistry); Yumeng Wu (Chemical Biology); Erin Li (Chemistry)
1/2017 – 3/2017	UCLA Entering Mentoring Program Certificate (Funded by NIH and HHMI)
8/2016 – 9/2016	Graduate Teaching Assistant for CHEM 30BL (Organic Chemistry Laboratory), UCLA (TA Avg. Evaluation: 8.93/9.00)
8/2015 – 8/2019	Graduate Student Mentees: Hayden Montgomery (Organic Chemistry); Yareslie Cruz Rivera (Chemistry, University of Wisconsin-Madison) Undergraduate Student Mentees: Alejandra Montano (Chemistry, current graduate student at the University of Minnesota), Paul Chong (Chemistry and Materials Science, current graduate student at Stanford University), Omar Ebrahim (Chemistry and Materials Science, current graduate student at Northwestern University), Ramya Pathuri (Chemistry)
6/2012 – 7/2014	Teaching Assistant for Organic Chemistry I and II and General Chemistry I and II, TAMUCC
1/2011 – 5/2012	Teaching Assistant for Anatomy and Physiology I, Del-Mar College

Synergistic Activities and Outreach

2021 – present	Member, American Society for Biochemistry and Molecular Biology (ASBMB)
2022	Judge, 2021-2022 ENVISION Research Competition (Women in STEM initiative)
2021 – present	American Society for Biochemistry and Molecular Biology (ASBMB), Member
2020 – present	Científico Latino Graduate School Mentorship Initiative (CL-GSMI), Mentor
2019 – 2020	ChemRxiv Associate
2018 – 2019	Social Media Chair, Organization for Cultural Diversity in Science (OCDS)
2016 – 2018	Scientific Excellence through Diversity Seminar (SEDS) Series Committee Member
2016 – 2017	MIT Summer Research Program Application Review Committee
2016	Historically Black Colleges and Universities (HBCU) Summer Program at UCLA, Mentor
2014 – 2018	Lecture Series Representative, Organization for Cultural Diversity in Science (OCDS)
2012 – present	American Chemical Society, Member
2012 – 2018	SACNAS (Society for the Advancement of Chicanos and Native Americans in Science) Chapter Member
2012 – 2016	Sigma Xi, Member
2013 – 2014	TAMUCC Chemistry Club
2012 – 2014	Committee Member, Texas A&M University Corpus Christi Honors Program, Student Admissions Committee
2011 – 2012	President, TAMUCC Honors Student Association
2010 – 2011	College Head of Education, Honors Student Association