

Amanda R. Murphy

Summer 2019

Associate Professor
Department of Chemistry
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Education

University of California, Berkeley, CA 2001-2006
Ph.D. Organic Chemistry

Western Washington University, Bellingham, WA 1996-2001
B.S. Plastics Engineering Technology and B.A. Chemistry

Experience

Visiting Professor, UC Irvine, Prescher Group, Irvine, CA Winter 2019

Associate Professor, Western Washington University, Bellingham, WA. 2016-present
Member of the Chemistry Department and Advanced Materials Science and Engineering Center

Assistant Professor, Western Washington University, Bellingham, WA. 2010-2016
Member of the Chemistry Department and Advanced Materials Science and Engineering Center

Postdoctoral Fellow, Tufts University, Department of Biomedical Engineering, Medford, MA 2006-2009
Advisor: Prof. David Kaplan

Graduate Research Assistant, University of California, Berkeley, CA. 2001-2006
Advisor: Prof. Jean Fréchet

Undergraduate Research Assistant, IBM Almaden Research Center, San Jose, CA. 2000/2001 (summer)
Advisor: Dr. Robert Miller

Teaching Experience

Western Washington University, Bellingham, WA. 2010-present
Courses taught: Organic Chemistry Lecture (Chem 351, 352, 353); Organic Chemistry Lab (Chem 354, 355, 356), Chemistry of Macromolecules (Chem 497/597), Polymer Chemistry (Chem 308); Materials Characterization Laboratory (Mat. Sci. 410)

Tufts University, *Organic Chemistry Co-Instructor*, Medford, MA 2008 Fall

Bunker Hill Community College, *Gen. Chem. Study Group Leader*, Charleston, MA 2008 Summer

Community Resources for Science, *Teaching Volunteer*, Berkeley, CA 2004-2005

University of California, *Graduate Teaching Assistant*, Berkeley, CA. 2001-2004

Western Washington University, *Undergraduate Teaching Assistant*, Bellingham, WA. 1999-2001

Awards

2007-2009 NIH Ruth L. Kirschstein National Service Research Award Postdoctoral Fellowship

2006-2007 NIH Teaching Education and Critical Research Skills Postdoctoral Fellowship

2005 UC Berkeley, Outstanding Graduate Student Instructor Award

Selected Outreach, Training and Service

2014-present	Participated in annual Compass to Campus outreach program for 5 th grade students
Spring 2015-present	Faculty sponsor for Associated Women in Science club at WWU
Summer 2016	Participated in NSF-funded workshop "Change at the Core: A Collaborative Model for Undergraduate STEM Education Reform" at WWU
2016-2017	Completed 4-part STEM-specific Equity and Inclusion forum workshop at WWU
F2016-S2018	Member of the Faculty Senate
F2017	Completed an AAAS: Communicating Science Workshop
F2017-present	Faculty mentor for the first cohort of students in our HHMI-funded Advancing Excellence and Equity in Science (AEES) program at WWU
F2017-F2018	Chair of the Executive Committee for the Materials Science Program at WWU
W2018-present	Director of the NSF-funded REU Program in the Chemistry Department that provides in-depth research experiences to underrepresented students with limited access to research at their home institutions (mainly community college students).

Peer-Reviewed Research Publications

*WWU undergraduate co-authors, #WWU M.S. co-author, †NSF-REU undergraduate co-authors

Publications from WWU

- 33) *James, E.I.; †Jenkins, L.D.; Murphy, A.R. "Peptide-Thiophene Hybrids as Self-Assembling Conductive Hydrogels," *Macromol. Mater. Eng.*, **2019**, Early View July 30th.
- 32) *Hagler, J.R.; *Peterson, B.; Murphy, A.R.; Leger, J.M. "Performance of biocompatible silk-polypyrrole actuators under biologically relevant conditions." *J. Appl. Polym. Sci.*, **2018**, 135, 46922.
- 31) Tsui, J.H.; #Ostrovsky-Snider, N.A.; Yama, D.M.P.; *Donohue, J.D.; Choi, J.S.; Chavanachat, R.; *Larson, J.D.; Murphy, A.R.; Kim, D.H. "Conductive Silk-Polypyrrole Composite Scaffolds with Bioinspired Nanotopographic Cues for Cardiac Tissue Engineering" *J. Mater. Chem. B*, **2018**, 6, 7185-7196 (cover article).
- 30) #Severt, S.Y.; *Maxwell, S.; *Bontrager, J.; Leger, J.M.; Murphy, A.R. "Mimicking Muscle Fiber Structure and Function Through Electromechanical Actuation of Electrospun Silk Fiber Bundles," *J. Mater. Chem. B*, **2017**, 5, 8105-8114.
- 29) *Blatz, T.J.; *Fry, M.M.; *James, E.I.; *Albin, T.J.; *Pollard, Z.; Kowalczyk, T.; Murphy, A.R. "Templating the 3D structure of conducting polymers with self-assembling peptides," *J. Mater. Chem. B*, **2017**, 5, 4690-4696.
- 28) *Fengel, C.V.; *Bradshaw, N.P.; #Severt, S.Y.; Murphy, A.R.; Leger, J.M. "Biocompatible Silk-Conducting Polymer Composite Trilayer Actuators," *Smart Mater. Struct.*, **2017**, 26 (5), 055004.
- 27) *Larson, J.D.; *Fengel, C.V.; *Bradshaw, N.P.; #Romero, I.S.; Leger, J.M.; Murphy, A.R. "Enhanced actuation performance of silk-polypyrrole composites," *Mat. Chem. Phys.*, **2016**, 186, 67-74.
- 26) #Severt, S.Y.; *Ostrovsky-Snider, N.A.; Leger, J.M.; Murphy, A.R. "Versatile Method for Producing 2D and 3D Conductive Biomaterial Composites Using Sequential Chemical and Electrochemical Polymerization," *ACS Appl. Mater. Interfaces*, **2015**, 7 (45), 25281-25288.
- 25) *Bradshaw, N.P.; #Severt, S.Y.; Wang, Z.; *Fengel, C.V.; *Larson, J.D.; Zhu, Z.; Murphy, A.R.; Leger, J.M. "ToF-SIMS Characterization of Silk Fibroin and Polypyrrole Composite Actuators," *Synthetic Metals*, **2015**, 209, 490-495.
- 24) *Atterberry, P.N.; *Roark, T.J.; #Severt, S.Y.; *Schiller, M.L.; Antos, J.M.; Murphy, A.R. "Sustained Delivery of the Chemokine CXCL12 from Chemically Modified Silk Hydrogels." *Biomacromolecules*, **2015**, 16 (5), 1582-1589.

- 23) *Albin, T.J.; *Fry, M.M.; Murphy, A.R. "Synthesis, Characterization and Secondary Structure Determination of a Silk-Inspired Self-Assembling Peptide: A Laboratory Exercise for Organic and Biochemistry Courses." *J. Chem. Educ.* **2014**, 91 (11), 1981–1984.
- 22) #Romero, I.; *Bradshaw, N.; *Larson, J.; *Severt, S.; *Schiller, M.; #Roberts, S.; Leger, J.M.; Murphy, A.R. "Biocompatible Electromechanical Actuators Composed of Silk-Conducting Polymer Composites." *Adv. Funct. Mater.* **2014**, 24 (25), 3866–3873.
- 21) #Romero, I.; *Schurr, M.; *Kotlik, M.; *Lally, J.; Murphy, A.R. "Enhancing the Interface in Silk-Polypyrrole Composites Through Chemical Modification of Silk Fibroin." *ACS Appl. Mater. Interfaces*, **2013**, 5 (3), 553-564.

Publications Prior to WWU

- 20) Li, C.; Luo, T.; Zheng, Z.; Murphy, A.R.; Wang, X.; Kaplan, D.L. "Curcumin-functionalized silk materials for enhancing adipogenic differentiation of bone marrow-derived human mesenchymal stem cells" *Acta Biomaterialia* **2014**, 11, 222-232.
- 19) Cronin-Golomb, M.; Murphy, A.R.; Mondia, J.P.; Kaplan, D.L.; Omenetto, F.G. "Optically induced birefringence and holography in silk." *J. Poly. Sci. B: Poly. Phys.* **2012**, 50 (4), 257-262.
- 18) Tsioris, K.; Tilburey, G.E.; Murphy, A.R.; Domachuk, P.; Kaplan, D.L.; Omenetto, F.G. "Functionalized-Silk-Based Active Optofluidic Devices." *Adv. Funct. Mater.* **2010**, 20 (7), 1083-1089.
- 17) Murphy, A.R.; Kaplan, D.L. "Biomedical applications of chemically-modified silk fibroin." *J. Mater. Chem.* **2009**, 19 (36), 6443-6450.
- 16) Wenk, E.; Murphy, A.R.; Kaplan, D.L.; Meinel, L.; Merkle, H.P.; Uebersax, L. "The use of sulfonated silk fibroin derivatives to control binding, delivery and potency of FGF-2 in tissue regeneration." *Biomaterials* **2009**, 31 (6), 1403-1413.
- 15) Mauldin, C.E.; Puntambekar, K.; Murphy, A.R.; Liao, F.; Subramanian, V.; Fréchet, J.M.J.; DeLongchamp, D.M.; Fischer, D.A.; Toney, M.F. "Solution Processible α,ω -Distyryl Oligothiophene Semiconductors with Enhanced Environmental Stability" *Chem. Mater.* **2009**, 21 (9), 1927-1938.
- 14) Murphy, A. R.; St. John, P.; Kaplan, D. L. "Modification of Silk Fibroin Using Diazonium Coupling Chemistry and the Effects on hMSC Proliferation and Differentiation." *Biomaterials* **2008**, 29 (19), 2829-2838.
- 13) Murphy, A. R.; Fréchet, J.M.J. "Organic Semiconducting Oligomers for Use in Field-Effect Transistors." *Chem. Rev.* **2007**, 107 (4), 1066-1096.
- 12) Chang, P.C.; Molesa, S.E.; Murphy, A.R.; Fréchet, J.M.J.; Subramanian, V. "Inkjetted crystalline single monolayer oligothiophene OTFTs." *IEEE Trans. Elect. Dev.* **2006**, 53 (4), 594-600.
- 11) Chang, J.B.; Liu, V.; Sivula, K.; Luscombe, C.; Murphy, A.R.; Liu, J.; Fréchet, J.M.J.; Subramanian, V. "Printable polythiophene gas sensor array for low-cost electronic noses." *J. Appl. Phys.* **2006**, 100 (1), 014506/1-014506/7.
- 10) Chen, J.; Ratera, I.; Murphy, A.R.; Ogletree, D.F.; Fréchet, J.M.J.; Salmeron, M. "Friction-Anisotropy Dependence in Organic Self-Assembled Monolayers." *Surf. Sci.* **2006**, 600 (18), 4008-4012.
- 9) DeLongchamp, D. M.; Jung, Y.; Fischer, D. A.; Lin, E. K.; Chang, P.; Subramanian, V.; Murphy, A. R.; Fréchet, J. M. J. "Correlating Molecular Design to Microstructure in Thermally Convertible Oligothiophenes: The Effect of Branched vs. Linear Solubilizing Groups." *J. Phys. Chem. B* **2006**, 110 (22), 10645-10650.
- 8) Murphy, A.R.; VanDyke, P.; Liu, J.; Fréchet, J.M.J.; Chang, C.; Subramanian, V.; DeLongchamp, D.M.; Sambasivan, S.; Fischer, D.A.; Lin, E.K. "Self-assembly, Molecular Ordering and Charge Mobility in Solution-Processed Ultrathin Oligothiophene Films." *Chem. Mater.* **2005**, 17 (24), 6033-6041.
- 7) Murphy, A.R.; Liu, J.; Luscombe C.; Kavulak, D.; Fréchet, J.M.J.; Kline, J.R.; McGehee, M.D. "Synthesis, Characterization, and Field-Effect Transistor Performance of Carboxylate Functionalized Polythiophenes with Increased Air Stability." *Chem. Mater.* **2005**, 17 (20), 4892-4899.

- 6) DeLongchamp, D.M.; Sambasivan, S.; Fischer, D.A.; Lin, E.K.; Chang, P.; Murphy, A.R.; Fréchet, J.M.J.; Subramanian, V. "Direct Correlation of Organic Semiconductor Film Structure to Field-Effect Mobility." *Adv. Mater.* **2005**, *17*, 2340-2344. (cover article).
- 5) Ratera, I.; Chen, J.; Murphy, A.; Ogletree, D. F.; Fréchet, J. M. J.; Salmeron, M. "Atomic force microscopy nanotribology study of oligothiophene self-assembled films." *Nanotechnology* **2005**, *16*, S235-S239.
- 4) Chen, J.; Ratera, I.; Ogletree, D. F.; Salmeron, M.; Murphy, A. R.; Fréchet, J. M. J. "Atomic Force Microscopy Study of β -Substituted-T7 Oligothiophene Films on Mica: Mechanical Properties and Humidity-Dependent Phases." *Langmuir* **2005**, *21* (3), 1080-1085.
- 3) Chen, J.; Murphy, A.R.; Esteve, J.; Ogletree, D. F.; Salmeron, M.; Fréchet, J.M.J. "Preparation and Nanoscale Mechanical Properties of Self-Assembled Carboxylic Acid Functionalized Pentathiophene on Mica." *Langmuir* **2004**, *20* (18), 7703-7710.
- 2) Chang, P.C.; Lee, J.; Huang, D.; Subramanian, V.; Murphy, A.R.; Fréchet, J.M.J. "Film Morphology and Thin Film Transistor Performance of Solution-Processed Oligothiophenes." *Chem. Mater.* **2004**, *16* (23), 4783-4789.
- 1) Murphy, A.R.; Fréchet, J.M.J.; Chang, P.; Lee, J.; Subramanian, V. "Organic Thin Film Transistors from a Soluble Oligothiophene Derivative Containing Thermally Removable Solubilizing Groups." *J. Am. Chem. Soc.* **2004**, *126* (6), 1596-1597.

Book Chapters

Murphy, A.R.; Romero, I.S. "Biochemical and biophysical properties of native *Bombyx mori* silk for tissue engineering applications," *Silk biomaterials for tissue engineering and regenerative medicine*. Ed. S.C Kundu, Woodhead Publishing, Cambridge, United Kingdom, **2014** (ISBN: 9780857096999).

Funded External Grants

2018-2021	NSF-RUI: Division of Materials Research, Biomaterials Title: "Protein Bioconjugation Strategies for Next Generation Silk Biomaterials"	\$388,946
2018-2021	NSF: REU Site – "Undergraduate Research in Chemistry at WWU" PI: Amanda Murphy, Co-PI: P. Clint Spiegel	\$290,000
2015-2018	Jean Dreyfus Boissevain Lectureship for Undergraduate Institutions	\$18,500
2014-2019	NSF-RUI: Division of Materials Research, Biomaterials Title: "Biocompatible Electromechanical Actuators Based on Silk-Conducting Polymer Composites" PI: Amanda Murphy, Co-PI: Dr. Leger, WWU Physics	\$420,000
2014-2016	Research Corporation - Cottrell College Science Award Title: "Silk-based Biomaterials for Neural Stimulation and Repair"	\$47,736
2013-2016	ACS Petroleum Research Fund- Undergraduate New Investigator Award Title: "Tailoring the Chemical Structure of Conducting Polymers and Dopants to Enhance Electromechanical Actuation"	\$50,000

Selected Presentations

- 1) Oral Presentation: "Mimicking Muscle Fiber Structure and Function Through Electromechanical Actuation of Nanofiber Bundles." *American Chemical Society National Meeting*, San Francisco, CA. April 2-6, **2017**.

- 2) Oral Presentation: "Biocompatible Electromechanical Actuators Based on Silk-Conducting Polymer Composites." 12th Functional Pi Materials Conference, Seattle, WA. July 19-24, **2015**.
- 3) Invited Seminar: "Conductive Silk-Based Biomaterials." *University of Washington, Bioengineering Department seminar series*, Seattle, WA. April 23, **2015**.
- 4) Invited Seminar: "Conductive Silk-Based Biomaterials." *College of Charleston, Chemistry Department seminar series*, Charleston, SC. September 18, **2014**.
- 5) Poster Presentation: "Biocompatible Electromechanical Actuators Based on Silk-Conducting Polymer Composites." *248th American Chemical Society National Meeting*, San Francisco, CA. August 10-14, **2014**.
- 6) Oral Presentation: "Conductive Biomaterials Based on Chemically-Modified Silk." *Materials Research Society Symposia on Bioelectronics*, San Francisco, CA. April 21-24, **2014**.
- 7) Invited Talk: "Conductive Biomaterials Based on Chemically-Modified Silk." *Pacific Northwest American Vacuum Society Symposium*, Troutdale, OR, September 19, **2013**.
- 8) Invited Talk: "Conductive Silk-Based Biomaterials." *UMass MRSEC Symposium Series: Young Investigators in Materials Research*, Amherst, MA, March 20, **2013**.
- 9) Poster Presentation: "Selective deposition of conducting polymers on modified polypeptide scaffolds to form flexible, biocompatible electrodes and actuators." *IUPAC World Polymer Congress*, Blacksburg, VA. June 24-29, **2012**.

Students Mentored

To date, I have mentored 41 WWU Chemistry/Biochemistry undergraduates and 4 WWU Chemistry master's students. Thirty-two of these students have graduated with B.S. degrees and three with M.S. degrees. Eighteen enrolled in graduate programs (11 M.S., 7 Ph.D.), two went to medical school, two to law school and 5 obtained industrial research positions directly following graduation. In addition to chemistry students, I have also mentored 5 Engineering Technology students, and 8 summer REU students (two were co-advised). Four of my research students have completed Honors Theses for the chemistry department.

Student Master's Theses

Nicholas Ostrovsky-Snider, "Modeling, Design and Fabrication of Biocompatible Silk-Based Electronics and Actuators." Western Washington University, 2017.

Sean Y. Severt, "Development of 2D and 3D Conductive Biomaterial Composites for Use as Electromechanical Actuators." Western Washington University, 2016.

Isabella Romero, "Silk Fibroin-Based Conducting Polymer Composite Electrodes and Their Use as Electromechanical Actuators" Western Washington University, 2013. (*Finalist for the Western Association of Graduate Schools Distinguished Master's Thesis Award*)

Student Research Presentations

My students have contributed to >60 different poster presentations on their work at both regional and national conferences (American Chemical Society, Materials Research Society, World Polymer Congress, Tissue Engineering and Regenerative Medicine International Society). Seven students have given oral presentations at regional and national conferences.