

NEWELL R. WASHBURN, PhD

Department of Chemistry
Department of Biomedical Engineering
Department of Materials Science and Engineering (by courtesy)
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CURRENT POSITIONS

Associate Professor, Departments of Chemistry, Biomedical Engineering, and Materials Science and Engineering (by courtesy), Carnegie Mellon University

Founder and CEO, Ansatz AI, LLC

EDUCATION

1993-1998 PhD, Chemistry, University of California (Berkeley)
1988-1993 BS, Chemistry, University of Illinois at Urbana-Champaign

ACADEMIC AND GOVERNMENT POSITIONS

July 2014-
Present **Associate Professor (with tenure)**, Departments of Chemistry and Biomedical Engineering, Carnegie Mellon University.

July 2011-
June 2014 **Associate Professor**, Departments of Chemistry and Biomedical Engineering, Carnegie Mellon University.

November 2004-
Present **Member Faculty**, McGowan Institute for Regenerative Medicine, University of Pittsburgh.

September 2004-
July 2011 **Assistant Professor**, Departments of Chemistry and Biomedical Engineering, Carnegie Mellon University.

August 2002-
August 2004 **Leader**, Biomaterials Group, Polymers Division, National Institute of Standards and Technology.

August 2002-
August 2004 **Adjunct Professor**, Graduate Program in Biotechnology, Johns Hopkins University.

February 2000-
August 2002 **Research Chemist**, Polymers Division, National Institute of Standards and Technology.

July 1998-
January 2000 **Post-doctoral Associate**, Department of Chemical Engineering and Materials Science, University of Minnesota (Minneapolis).
Advisor: Prof. Frank S. Bates

September 1993-
June 1998 **Research Associate**, Department of Chemistry, University of California (Berkeley). *Advisor*: Prof. Angelica M. Stacy

AWARDS

2019 Covestro Science Award
2010 Coulter Foundation Translational Research Award
2006-2008 3M Non-Tenured Faculty Award
2000 National Research Council Post-doctoral Fellow
1995 Outstanding Graduate Student Instructor

UNIVERSITY AND PROFESSIONAL ACTIVITIES

Conference Organizer, Machine Learning in Science and Engineering, Columbia University, December 14-15, 2020 (<https://mlse2020.splashthat.com/>)
Conference Organizer, Machine Learning in Science and Engineering, Georgia Institute of Technology, June 10-12, 2019 (<http://dsf.ideas.gatech.edu/>)
Founding Conference Organizer, Machine Learning in Science and Engineering, Carnegie Mellon University, June 6-8, 2018 (<https://events.mcs.cmu.edu/mlse/>)
Chair of the Graduate Affairs Committee, CMU Department of Biomedical Engineering (2012-2017)
Member, Graduate Student Recruiting Committee, CMU College of Engineering (2016-2017)

CURRENT FUNDING (CMU)

Integrated Design of Ultradurable, Low CO₂ Alternative Binder Systems via Machine Learning
ARPA-E

PI: Washburn (co-PI: Poczos, co-PI: Kurtis)
9/1/19 – 8/31/21 (\$739,056)

Covestro Science Award
Covestro AG
PI: Washburn
1/1/20 – 12/31/22 (\$345,000)

Machine Learning Algorithms for Advanced Manufacturing of High-Fidelity 3D Printed Biomaterials
UPMC Enterprises
PI: Washburn (co-PI: LeDuc)
7/15/19 – 7/14/20 (\$100,000)

TRIPODS+X: VIS: Creating an Annual Data Science Forum
National Science Foundation (TRIPODS-1839340)
PI: Randall (co-PI: Aluru, Washburn, Wing)
10/1/18 – 9/30/20 (\$200,000)

Post-Processing of 3D-Printed Architectures
CMU Manufacturing Futures Initiative
PI: J. Bard (co-PI: Bourne, Cupkova, Washburn)
6/1/17 – 12/31/19 (\$300,000)

COMPLETED AWARDS

Machine Learning of Admixture Design
BASF
PI: Washburn (co-PI: Poczos)
2/1/18 – 1/31/19 (\$25,000)

SusChEM: Development of polymer-grafted lignin superplasticizers
National Science Foundation (CBET-1510600)
PI: Washburn
7/1/15 – 6/30/19 (\$386,020)

PFI: AIR-TT: Development of Agrochemical Formulations Based on Multi-functional
Lignopolymer Dispersants
National Science Foundation (IIP- 1700950)
PI: Washburn
9/1/17 – 11/30/18 (\$200,000)

Machine Learning in Science and Engineering 2018 conference support
PI: Washburn (co-PI: Randall, Sherrill)
Consortium members: Bristol-Myers Squibb, Citrine, Covestro, ExxonMobil, Geisinger, Google,
IBM, Intel, JCI, Journal of Chemical Physics, NIST, OpenEye, UPMC
4/1/18 – 9/30/18 (\$33,000)

High-performance lignopolymer surfactants
US Department of Agriculture (SBIR 2015-33610-23533)
PI: Washburn (through Salix Lignopolymers LLC)
6/1/15 – 1/31/16 (\$100,000)

I-Corps: Polymer-grafted Lignin Surfactants as Agrochemical Adjuvants
National Science Foundation (IIP-1623841)
PI: Washburn
2/1/16 – 6/30/16 (\$50,000)

Chelating Resins for Selective Separation and Recovery of Rare Earth Elements
from Low Temperature Geothermal Water
Department of Energy (DE-EE0006749)
PI: Karamalidis; co-PI: Washburn; co-PI: Dzombak
10/1/14 – 9/30/16 (\$550,000)

Technological validation of lignopolymer superplasticizers
Discovered in Pennsylvania, Developed in Pennsylvania (D2PA) Program
PI: Washburn
9/1/14 – 8/31/15 (\$50,000)

“Reduction of Burn Progression and Scar Contracture with Cytokine-Neutralizing Gels”
W81XWH13C0050 (Washburn PI; SBIR contract through Washburn Therapeutics)
3/18/13 – 9/17/13 (\$150,000)
Department of Defense

“Multi-Functional Bioscaffolds of Scarless Wound Healing”
W81XWH-08-2-0032 (Washburn PI)
06/01/08 – 05/31/13 (\$500,000)
Department of Defense
Armed Forces Institute for Regenerative Medicine

“Improving Burn Outcomes with Cytokine-Neutralizing Gels”

Translational Research Award (Washburn PI)
09/01/10 – 08/31/12 (\$230,000)
Wallace H. Coulter Foundation

“Catalyzing Translational Biotechnology Research at CMU”
Heinz Endowment C1747 (Washburn PI)
06/01/10 – 05/31/11 (\$150,000)

CMU TEACHING

[*Course number prefixes: 09=Chemistry; 27=MSE; 42=BME*]

Advanced Physical Chemistry (09-347; fall 2019)
Machine Learning for Experimentalists (09-699; spring 2018)
Honors Modern Chemistry I (09-107; fall 2013-2017)
Molecular Engineering (09-759/27-759; spring 2016)
Introduction to Biomedical Engineering (42-101; fall 2013/2014/2016)
Modern Organic Chemistry I (09-219; fall 2008-fall 2012)
Chemical Energy Technologies (09-734; spring 2012)
Biomaterials (27-511/42-511; spring 2005-spring 2011)

CURRENT AND FORMER PhD STUDENTS

1. Joseph Pugar (MSE; PhD expected May 2023)
2. Christopher Childs (Chemistry; PhD expected May 2021)
3. Aditya Menon (MSE; PhD expected May 2020)
4. Jennifer Bone (BME; PhD expected August 2019)
5. Kedar Perkins (Chemistry; PhD January 2019; Chemist at Eurofins)
6. Chetali Gupta (Materials Science; PhD January 2017; Engineer at Exponent)
7. Mohamed Ramadan (Chemistry; PhD August 2015; Research Chemist at Lubrizol Corporation)
8. Orsolayo Karacsony (Chemistry; PhD May 2015; post-doctoral associate at Karolinska Institute)
9. Emily Friedrich (BME; PhD December 2014; Research Biologist at US Naval Medical Center)
10. Allison Elder (Chemistry; PhD May 2013; Senior Chemist at L’Oreal)
11. Joseph Prata (Chemistry; PhD May 2012; Research Chemist at Lubrizol)
12. Hoyong Chung (Chemistry; PhD August 2011; Associate Professor, Department of Chemical and Biological Engineering, Florida State University)
13. Liang Tso Sun (BME; PhD May 2010; private industry, Taiwan)
14. Sidi Bencherif (Chemistry, joint with K. Matyjaszewski; PhD May 2009; Assistant Professor, Northeastern University)

REVIEWING EXPERIENCE

Ad hoc Member of NIH BMBI Study Section (2014-2015)
NIH/NIAMS R01, R03, and R21 Grant Programs
NIH SBIR/STTR Grant Program
NSF
NSF CAREER
NIST Advanced Technology Program
ACS Applied Materials & Interfaces
ACS Sustainable Chemistry & Engineering
Biomacromolecules

Biotechnology and Bioengineering
Biomaterials
Green Chemistry
Journal of Applied Polymer Science
Langmuir
Macromolecules
Molecular Design Systems & Engineering
Nature Materials
Nordic Pulp and Paper Research Journal
Progress in Polymer Science
Wood Science and Technology

PATENTS

“DESIGNING A COMPOSITION OF A MATERIAL WITH COMPLEX DATA PROCESSING” Newell R. Washburn, Aditya Menon, Brian DeCost, Barnabas Poczos. PCT application filed February 24, 2018 (PCT/US2018/019736).

“Lignin-based surfactants” Newell R. Washburn, Chetali Gupta, Kedar Perkins. PCT application filed March 18, 2016 (PCT/US2016/023189).

“Polymer-grafted lignin surfactants” Newell R. Washburn, Chetali Gupta. PCT application filed February 3, 2015 (PCT/US2015/014164).

“Compositions and Methods based on Lignin and Synthetic Polymers for Toughened Materials” Newell R. Washburn, Hoyong Chung. PCT application filed January 22, 2014.

“Method for immobilization of Fe-TAML Catalysts on carbon supports” Terrence J. Collins, Newell R. Washburn, William C. Ellis, Colin Horwitz, Riddhi Roy. (PCT/US2011/34193)

“Micro-fiber arrays with tip coating and transfer method for preparing same” Metin Sitti, Paul Glass, Hoyong Chung, Newell Washburn. (US Patent 9,079,215)

“INFLAMMATION-REGULATING COMPOSITIONS AND METHODS” Newell R. Washburn, Sidi A. Bencherif, Liang Tso Sun. (US Patent 8,529,897)

CONSULTING

Technical Consultant - Kilpatrick, Townsend & Stockton LLP

PROFESSIONAL AFFILIATIONS

American Chemical Society
American Ceramic Society
American Concrete Institute

JOURNAL PUBLICATIONS

1. Childs CM, Canbek O, Kirby TM, Zhang C, Zheng J, Szeto C, Poczos B, Kurtis KE, Washburn NR. Cheminformatics for Accelerated Design of Chemical Admixtures. *Submitted.*

2. Childs CM, Perkins KM, Menon A, Washburn NR. Interplay of Anionic Functionality in Polymer-grafted Lignin Superplasticizers for Portland Cement. *Industrial & Engineering Chemistry Research*. 2019 Oct 4.
3. Optimization of Silicone 3D Printing with Hierarchical Machine Learning. Menon A, Poczós B, Feinberg AW, Washburn NR. *3D Printing and Additive Manufacturing*. 2019.
4. A Hierarchical Machine Learning Model for Mechanical Property Prediction of Polyurethane Elastomers from Small Datasets. Menon A, Thompson-Colón JA, Washburn NR. *Frontiers in Materials*, 6 (2019): 87.
5. Embedding Domain Knowledge for Machine Learning of Complex Material Systems Based on Small Datasets. Childs CM, Washburn NR. *MRS Communications*, (2019) 1-5.
6. Molecular Engineering of Superplasticizers for Metakaolin-Portland Cement Blends with Hierarchical Machine Learning. Menon A, Childs CM, Poczós B, Washburn NR, Kurtis KE. *Advanced Theory and Simulations*. 2019 Apr 1;2(4).
7. Bard J, Cupkova D, Washburn N, Zeglin G. Thermally Informed Robotic Topologies: Profile-3D-Printing for the Robotic Construction of Concrete Panels, Thermally Tuned Through High Resolution Surface Geometry. *Robotic Fabrication in Architecture, Art and Design* 2018 Sep 10, 113-125. Springer, Cham.
8. Callura JC, Perkins KM, Noack CW, Washburn NR, Dzombak DA, Karamalidis AK. Selective adsorption of rare earth elements onto functionalized silica particles. *Green chemistry*. 2018;20(7):1515-26.
9. A printability index for linking the slurry rheology to the geometrical attributes of 3D-printed components. Ketel S, Falzone G, Wang B, Washburn NR, Sant GS. *Cement and Concrete Composites*. 2018.
<https://doi.org/10.1016/j.cemconcomp.2018.03.022>
10. Elucidating Multi-Physics Interactions in Suspensions for the Design of Polymeric Dispersants: A Hierarchical Machine Learning Approach. Menon A, Gupta C, Perkins KM, DeCost BL, Budwal N, Rios RT, Zhang K, Poczós B, Washburn NR. *Molecular Systems Design & Engineering*. 2017; 2: 263-273.
11. Transport patterns of anti-TNF- α in burn wounds: Therapeutic implications of hyaluronic acid conjugation. Friedrich EE, Washburn NR. *Biomaterials*, 2017; 114: 10-22.
12. Poly(ethylene glycol)-grafted lignosulfonate superplasticizers: improving performance by increasing steric interactions. Gupta C, Perkins KM, Rios RT, Washburn NR. *Advances in Cement Research*. 2017; 29: 2-10.
13. Non-fouling hyaluronic acid coatings for improved sandwich ELISA measurements in plasma. Ramadan MH, Sansone NJ, Pendergast LM, Friedrich EE, Washburn NR. *Analytical Methods*. 2016; 8: 1222-1228.

14. Korkmaz E, Friedrich EE, Ramadan MH, Erdos G, Mathers AR, Ozdoganlar OB, Washburn NR, Falo LD. Tip-Loaded Dissolvable Microneedle Arrays Effectively Deliver Polymer-Conjugated Antibody Inhibitors of Tumor-Necrosis-Factor-Alpha Into Human Skin. *Journal of Pharmaceutical Sciences*, 2016; 105: 3453-3457.
15. Noack CW, Perkins KM, Callura JC, Washburn NR, Dzombak DA, Karamalidis AK. Effects of ligand chemistry and geometry on rare earth element partitioning from saline solutions to functionalized adsorbents. *ACS Sustainable Chemistry & Engineering*, 2016; 4: 6115-6124.
16. Tunable Pickering Emulsions with Polymer-Grafted Lignin Nanoparticles (PGLNs). Siltmore KS, Gupta C, Washburn NR. *J. Colloid Inter Sci.* 2016; 466: 91-100.
17. Using Polypyrrole Coating to Improve Cycling Stability of $\text{NaTi}_2(\text{PO}_4)_3$ as an Aqueous Na-Ion Anode. Mohamed AI, Sansone NJ, Kuei B, Washburn NR, Whitacre JF. *J. Electrochem. Soc.* 2015; 162: A2201-A2207.
18. Extraordinary Toughening and Strengthening Effect of Lignin-Based Fillers Synthesized by ATRP: Towards a Sustainable Material Platform for High Performance Polymers. Shah T, Gupta C, Ferebee RL, Bockstaller MR, Washburn NR. *Polymer.* 2015; 72: 406-412.
19. Lignopolymers as viscosity-reducing additives in magnesium oxide suspensions. Murray LR, Gupta CG, Washburn NR, Erk KA. *J. Colloid Inter Sci.* 2015; 459: 107-114.
20. Molecular architecture requirements for polymer-grafted lignin superplasticizers. Gupta C, Sverdlove MJ, Washburn NR. *Soft Matter.* 2015; 11: 2691-2699. DOI: 10.1039/C4SM02675F.
21. Local delivery of anti-tumor necrosis factor- α through conjugation to hyaluronic acid: dosing strategies and early healing effects in a rat burn model. Friedrich EE, Azofeifa A, Fisch E, Washburn NR. *J Burn Care Res.* 2015; 36: 90-101.
22. Polymer-Grafted Lignin Surfactants Prepared via Reversible Addition-Fragmentation Chain-Transfer Polymerization. C Gupta, NR Washburn. *Langmuir.* 2014; 30: 9303-9312.
23. Reducing Protein Adsorption with Polymer-Grafted Hyaluronic Acid Coatings. Ramadan MH, Prata JE, Karacsony O, Duner G, Washburn NR. *Langmuir.* 2014; 30:7485-7495.
24. Electrocatalytic oxygen evolution with an immobilized TAML activator. Demeter EL, Hilburg SL, Washburn NR, Collins TJ, Kitchin JR. *J Amer Chem Soc.* 2014; 136:5603-5606.
25. Effects of hyaluronic acid conjugation on anti-TNF- α inhibition of inflammation in burns. Friedrich EE, Sun LT, Natesan S, Zamora DO, Christy RJ, Washburn NR. *J Biomed Mater Res A* 2014; 102: 1527-1536.

26. A universal route towards thermoplastic lignin composites with improved mechanical properties. Hilburg SL, Elder AN, Ferebee R, Chung H, Bockstaller MR, Washburn NR. *Polymer*. 2014; 55:995-1003.
27. Polymer-conjugated inhibitors of tumor necrosis factor- α for local control of inflammation. Washburn NR, Prata JE, Friedrich EE, Ramadan MH, Elder AN, Sun LT. *Biomatter*. 2013; 3(3).
28. Effects on peptide binding affinity for TNF α by PEGylation and conjugation to hyaluronic acid. Elder AN, Hannes SK, Atoyebi SF, Washburn NR. *European Polymer Journal* 2013; 49(10).
29. Chemistry of lignin-based materials. Chung H, Washburn NR. *Green Materials* 2012; 1:137-162.
30. Reduction of burn progression with topical delivery of (anti-tumor necrosis factor- α)-hyaluronic acid conjugates. Sun LT, Friedrich E, Heuslein JL, Pferdehirt RE, Dangelo NM, Natesan S, Christy RJ, Washburn NR. *Wound Repair Regen* 2012; 20:563-72.
31. Improved Lignin Polyurethane Properties with Lewis Acid Treatment. Chung H, Washburn NR. *ACS Appl Mater Interfaces*. 2012; 4: 2840-2846.
32. Conjugation of beta-Sheet Peptides to Modify the Rheological Properties of Hyaluronic Acid. Elder AN, Dangelo N, Kim SC, Washburn NR. *Biomacromolecules*. 2011; 12:2610-2616.
33. Enhanced Adhesion of Dopamine Methacrylamide Elastomers via Viscoelasticity Tuning. Chung C, Glass P, Pothen JM, Sitti M, Washburn NR. *Biomacromolecules*. 2011; 12: 342-347.
34. Cytokine binding by polysaccharide-antibody conjugates. Sun LT, Buchholz KS, Lotze MT, Washburn NR. *Mol Pharm*. 2010; 7: 1769–1777.
35. Teaching technological innovation and entrepreneurship in polymeric biomaterials. Washburn NR. *J Biomed Mater Res A*. 2011; 96:58-65.
36. Design principles for cytokine-neutralizing gels: Cross-linking effects. Sun LT, Bencherif SA, Gilbert TA, Lotze MT, Washburn NR. *Acta Biomater*. 2010; 12: 4708-15.
37. Enhanced wet adhesion and shear of elastomeric micro-fiber arrays with mushroom tip geometry and a photopolymerized p(DMA-co-MEA) tip coating. Glass P, Chung H, Washburn NR, Sitti M. *Langmuir*. 2010; 26: 17357-62.
38. Biological activities of cytokine-neutralizing hyaluronic acid-antibody conjugates. Sun LT, Bencherif SA, Gilbert TA, Farkas AM, Lotze MT, Washburn NR. *Wound Repair & Regeneration*, 2010, 18: 302-10.
39. Complex fluids based on methacrylated hyaluronic acid. Prata JE, Barth TA, Bencherif SA, Washburn NR. *Biomacromolecules*, 2010, 11, 769-775.

40. Synthesis by AGET ATRP of degradable nanogel precursors for in situ formation of nanostructured hyaluronic acid hydrogel. Bencherif SA, Washburn NR, Matyjaszewski K. *Biomacromolecules*. 2009; 10: 2499-507.
41. Nanostructured hybrid hydrogels prepared by a combination of atom transfer radical polymerization and free radical polymerization. Bencherif SA, Siegwart DJ, Srinivasan A, Horkay F, Hollinger JO, Washburn NR, Matyjaszewski K. *Biomaterials*. 2009 Oct;30(29):5270-8.
42. Cell-Adhesive Star Polymers Prepared by ATRP. Bencherif SA, Gao H, Srinivasan A, Siegwart DJ, Hollinger JO, Washburn NR, Matyjaszewski K. *Biomacromolecules*. 2009 Jun 11.
43. Enhanced reversible adhesion of dopamine methacrylamide-coated elastomer microfibrillar structures under wet conditions. Glass P, Chung H, Washburn NR, Sitti M. *Langmuir*. 2009 Jun 16;25(12):6607-12.
44. End-group effects on the properties of PEG-co-PGA hydrogels. Bencherif SA, Srinivasan A, Sheehan JA, Walker LM, Gayathri C, Gil R, Hollinger JO, Matyjaszewski K, Washburn NR. *Acta Biomater*. 2009 Jul;5(6):1872-83.
45. Bencherif SA, Srinivasan A, Horkay F, Hollinger JO, Matyjaszewski K, Washburn NR. Influence of the degree of methacrylation on hyaluronic acid hydrogels properties. *Biomaterials*. 2008 Apr;29(12):1739-49.
46. Lotze MT, Zeh HJ, Rubartelli A, Sparvero LJ, Amoscato AA, Washburn NR, DeVera ME, Liang X, Tor M, Billiar T. The grateful dead: damage-associated molecular pattern molecules and reduction/oxidation regulate immunity. *Immunol Rev* 2007 Dec; 220:60-81.
47. Bencherif SA, Sheehan JA, Walker LM, Hollinger JO, Washburn NR. Influence of cross-linker chemistry on DNA release from poly(ethylene glycol)-poly(glycolic acid) hydrogels. *J Biomed Mater Res A*, 2009 Jul;90(1):142-53.
48. Lin NJ, Bailey LO, Becker ML, Washburn NR, Henderson LA. Macrophage response to methacrylate conversion using a gradient approach. *Acta Biomater*. 2007 Mar;3(2):163-173.
49. Wilson KS, Allen AJ, Washburn NR, Antonucci JM. Interphase effects in dental nanocomposites investigated by small-angle neutron scattering. *J Biomed Mater Res A*. 2007 Apr;81(1):113-123.
50. Quinn TP, Oreskovic TL, Landis FA, Washburn NR. Material model measurements and predictions for a random pore poly(epsilon-caprolactone) scaffold. *J Biomed Mater Res B Appl Biomater*. 2007 Jul;82(1):205-209.
51. Nishizuka S, Washburn NR, Munson PJ. Evaluation method of ordinary flatbed scanners for quantitative density analysis. *Biotechniques*. 2006 Apr;40(4):442, 444, 446.

52. Kennedy SB, Washburn NR, Simon CG Jr, Amis EJ. Combinatorial screen of the effect of surface energy on fibronectin-mediated osteoblast adhesion, spreading and proliferation. *Biomaterials*. 2006 Jul;27(20):3817-24.
53. Mei Y, Wu T, Xu C, Langenbach KJ, Elliott JT, Vogt BD, Beers KL, Amis EJ, Washburn NR. Tuning cell adhesion on gradient poly(2-hydroxyethyl methacrylate)-grafted surfaces. *Langmuir*. 2005 Dec 20;21(26):12309-14.
54. Bailey LO, Becker ML, Stephens JS, Gallant ND, Mahoney CM, Washburn NR, Rege A, Kohn J, Amis EJ. Cellular response to phase-separated blends of tyrosine-derived polycarbonates. *J Biomed Mater Res A*. 2005.
55. Zhang K, Simon CG Jr, Washburn NR, Antonucci JM, Lin-Gibson S. In situ formation of blends by photopolymerization of poly(ethylene glycol) dimethacrylate and polylactide. *Biomacromolecules*. 2005 May-Jun;6(3):1615-22.
56. Simon CG Jr, Eidelman N, Kennedy SB, Sehgal A, Khatri CA, Washburn NR. Combinatorial screening of cell proliferation on poly(L-lactic acid)/poly(D,L-lactic acid) blends. *Biomaterials*. 2005 Dec;26(34):6906-15.
57. Lin-Gibson S, Jones RL, Washburn NR, Horkay F. Structure-Property Relationships of Photopolymerizable Poly(ethylene glycol) Dimethacrylate Hydrogels. *Macromolecules*. 2005;38 (7): 2897-2902.
58. Bailey LO, Lippiatt S, Biancanello FS, Ridder SD, Washburn NR. The quantification of cellular viability and inflammatory response to stainless steel alloys. *Biomaterials*. 2005;26(26):5296-5302.
59. Zhang K, Washburn NR, Simon CG Jr. Cytotoxicity of three-dimensionally ordered macroporous sol-gel bioactive glass (3DOM-BG). *Biomaterials*. 2005;26(22):4532-4539.
60. Washburn NR, Weir M, Anderson P, Potter K. Non-invasive characterization of bone formation in polymeric scaffolds by proton magnetic resonance microscopy and X-ray microtomography. *J Biomed Mater Res*. 2004;69A(4):738-747.
61. Dunkers J, Cicerone MT, Washburn NR. Collinear optical coherence and confocal fluorescence microscopies for tissue engineering. *Opt Express* 2003;11(23):3074-3079.
62. Lin-Gibson S, Bencherif S, Cooper JA, Wetzel SJ, Antonucci JM, Vogel BM, Horkay F, Washburn NR. Synthesis and characterization of PEG dimethacrylates and their hydrogels. *Biomacromolecules*. 2004 Jul-Aug;5(4):1280-7.
63. Bailey LO, Washburn NR, Simon CG Jr, Chan ES, Wang FW. Quantification of inflammatory cellular responses using real-time polymerase chain reaction. *J Biomed Mater Res*. 2004 May 1;69A(2):305-13.
64. Mei Y, Kumar A, Gao W, Gross R, Kennedy SB, Washburn NR, Amis EJ, Elliott JT. Compatibility of sorbitol-containing polyesters. Part I: Synthesis, surface analysis and cell response in vitro. *Biomaterials*. 2004 Aug;25(18):4195-201.

65. Mei Y, Beers KL, Byrd HC, VanderHart DL, Washburn NR. Solid-phase ATRP synthesis of peptide-polymer hybrids. *J Am Chem Soc.* 2004 Mar 24;126(11):3472-6.
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67. Broz M, VanderHart DL, Washburn NR. Structure and mechanical properties of poly(lactic acid)/poly(ϵ -caprolactone) blends. *Biomaterials* 2003; 24:4181-4190.
68. Washburn NR, Simon CG, Tona A, Elgendy HM, Karim A, Amis EJ. Co-extrusion of Biocompatible Polymers for Scaffolds with Co-continuous Morphology. *J Biomed Mater Res*, 2002; 60: 20-29.
69. Washburn NR, Lodge TP, Bates FS. Ternary Polymer Blends as Model Surfactant Systems. *J Phys Chem B* 2000; 104: 6987-6997.
70. Washburn NR, Stacy AM, Portis AM. Magnetic and Transport Properties of $\text{LaMn}_{0.8}\text{Na}_{0.2}\text{O}_3$. *J Phys Chem B*, 2000; 104: 1447-1453.
71. Washburn NR, Stacy AM, Portis AM. Low-temperature, Flux-grown, Na-doped LaMnO_3 : Magnetic Properties. *Appl. Phys. Lett.*, 1997; 70: 1622-1624.
72. Chen CH, Washburn N, Gewirth AA. In situ Atomic Force Microscope Study of Pb Underpotential Deposition on Au(111)- Structural Properties of the Catalytically Active Phase *J. Phys. Chem.*, 1993; 97: 9754-9760.

INVITED SEMINARS

“Design of Sustainable Infrastructure Materials by Machine Learning” Strategic Research Initiatives seminar series, College of Engineering, University of Miami, March 2, 2020

“Embedding Domain Knowledge for Machine Learning of Complex Materials Systems” in the webinar “The Machine Learning Revolution in Materials Research” hosted by the Materials Research Society, September 24, 2019

“Hierarchical Machine Learning of Superplasticizer Design” Department of Civil and Environmental Engineering, UCLA, February 12, 2018

“Artificial Intelligence for Materials, Process, and Product Innovation: The CMU Ecosystem” National Materials and Manufacturing Board, National Academy of Engineering, Washington, DC, October 2, 2017

“Learning from Small Data: Integrating Physical and Statistical Modeling with Hierarchical Machine Learning” Materials Genome Initiative Seminar, National Institute of Standards and Technology, Gaithersburg, MD, September 28, 2017

“Machine Learning of Admixture Design” Plenary Seminar, 8th Advances in Cement-Based Materials Conference, American Ceramic Society Cements Division, Georgia Tech, June 27, 2017.

“Hierarchical Machine Learning of Complex Physical Systems” Solvay USA, Bristol, PA, April 6, 2017.

“Polymer-grafted lignin surfactants” Lubrizol Corporation, Cleveland CA, August 11, 2016.

“Polymer-grafted lignin surfactants” Department of Biobased Products and Biosystems, School of Chemical Engineering of Aalto University (Finland), July 25, 2016.

“Biomaterials and Materials Chemistry” Department of Chemistry, St. Francis University, September 21, 2012.

“Local Control of Inflammation with Antibody-Hyaluronic Acid Conjugates” Pfizer Symposium on "Therapeutic Innovation: The Next Generation of Discovery", Boston University, April 30, 2012.

“Local Control of Inflammation with Antibody-Hyaluronic Acid Conjugates” Department of Biomedical Engineering, Duke University, April 7, 2011.

“Local Control of Inflammation with Antibody-Polysaccharide Conjugates” Department of Bioengineering, University of Pittsburgh, November 13, 2010.

“Biomaterials Chemistry: Anti-Inflammatories, Complex Fluids, and Adhesives” Department of Chemistry, SUNY – Stony Brook, November 4, 2010.

“Biomaterials Chemistry: Anti-Inflammatories, Complex Fluids, and Adhesives” Department of Chemistry, Carnegie Mellon University, April 13, 2010.

“Design Principles for Cytokine-Neutralizing Gels” Department of Bioengineering, University of Utah, January 24, 2010.

“Design Principles for Cytokine-Regulating Biomaterials” Department of Materials Science and Engineering, University of Delaware, September 2, 2009.

“Design Principles for Cytokine-Regulating Biomaterials” Department of Chemical Engineering, University of Colorado, April 28, 2009.

“Design Principles for Cytokine-Regulating Biomaterials” Department of Biomedical Engineering, Tufts University, November 24, 2008.

“Design Principles for Cytokine-Regulating Biomaterials” Department of Chemistry, Rutgers University, October 28, 2008.

“Design Principles for Cytokine-Regulating Biomaterials” Surfaces in Biomaterials Foundation, October 27, 2008.

“Polymeric Materials for Regenerative Medicine” PPG Incorporated, August 5, 2008.

“Polymeric Materials for Regenerative Medicine” Department of Chemistry, Duquesne University, March 7, 2008.

“Hyaluronan-Based Hydrogels for Regenerative Medicine” Genzyme Corporation, Waltham, MA. August 17, 2007.

“Adventures in Biomaterials” Department of Biological Sciences, Carnegie Mellon University, Pittsburgh, PA. March 21, 2007.

“Growth Factor Dynamics in Three-Dimensional Extracellular Matrices” Department of Materials Science, University of Delaware, October 26, 2004.

“Growth Factor Dynamics in Three-Dimensional Extracellular Matrices” 2004 Polymer Networks Meeting, Bethesda, MD, August 18, 2004.

CONTRIBUTED SEMINARS

“Hierarchical Machine Learning of Superplasticizer Design” 2nd International Conference on Calcined Clays for Sustainable Concrete, Havana, Cuba, December 6, 2017.

Washburn NR “Lignopolymer Superplasticizers for Alternative Supplementary Cementitious Materials” IGCMat: Grand Challenges in Construction Materials, University of California, Los Angeles, CA, March 17, 2016.

Washburn NR “Polymer-grafted lignin surfactants” American Chemical Society Meeting, San Diego, CA, March 14, 2016.

Washburn NR “Lignin-based Nanocomposites” Materials Research Society Fall Meeting, Boston, MA, December 3, 2013.

Washburn NR “Engineering the Biosynthesis of Styrene in Yeast” IUMACRO Meeting, Brooklyn, NY. June 27, 2007.

Washburn NR “Adventures in Biomaterials” Department of Physics, Indiana University of Pennsylvania, Indiana, PA. April 13, 2007.

Washburn NR “Polymeric Materials for Bone Tissue Engineering” Department of Chemistry, Prairie View A&M University, Homestead, TX February 23, 2007.

Washburn NR “Polymeric Materials for Bone Tissue Engineering” Department of Chemistry, Shippensburg University, Shippensburg, PA January 26, 2007.

Washburn NR “Toward the Development of Interactive Biomaterials” Department of Materials Science, Johns Hopkins University, Baltimore, MD February 15, 2006.

Washburn NR “Measurements of Scaffold Structure and Mechanical Properties” ASTM International Symposium on TEMPs, Miami Beach, FL, November 4, 2002.

Washburn NR “Three-Dimensional Imaging of Scaffold Structure” Knowledge Foundation Meeting on Tissue and Genetic Engineering for Treatment of Arthritis, Providence, RI, October 10, 2002.

Washburn NR “High-Throughput Investigations of Cell-Material Interactions”, Department of Chemistry, University of Virginia, March 26, 2002.

Washburn NR “Hyaluronic Acid-Based Hydrogels for Regenerative Medicine” American Chemical Society Meeting, Boston, MA. August 22, 2007.

Washburn NR “Development of Highly Crosslinked Hyaluronic Acid for Tissue Engineering Applications” American Chemical Society Meeting, San Francisco, CA September 12, 2006.

Washburn NR, Fitzpatrick JAJ “Cytokine Dynamics in Extracellular Matrices” presented at the Society for Biomaterials Meeting, Pittsburgh, PA, April 29, 2006.

Washburn NR, Weir MD, Bailey LO “Combinatorial Screening of Chondrocyte Responses to Growth Factors” Poster presentation at the World Biomaterials Congress, Sydney, Australia, June 2004.

Washburn NR, Bailey LO, Weir MD, Mei Y, Beers KL “Synthesis, Inflammatory Responses, and Combinatorial Screening of Biomaterials” Poster presentation at the *Biomaterials: Biocompatibility and Tissue Engineering* Gordon Research Conference, Plymouth, NH, July 2003.

Washburn NR, Yamada KM, Simon CG, Kennedy SB, Amis EJ “High-throughput investigation of osteoblast response to polymer crystallinity: influence of nanometer-scale roughness on proliferation” Poster presentation at the Society for Biomaterials Annual Meeting, Reno, NV, May 2003.

Washburn NR, Kennedy SB, Sehgal A, Amis EJ “High-Throughput Investigations of Cell-Material Interactions” Poster presentation at the *Signal Transduction by Engineered Extracellular Matrices* Gordon Research Conference, New London, CT, June 2002.

Washburn NR, Karim A, Amis EJ “Polymer Processing and Tissue Engineering” Poster presentation at the *Biomaterials: Biocompatibility and Tissue Engineering* Gordon Research Conference, Plymouth, NH, July 2001.

Washburn NR, Karim A, Amis EJ “Polymer Processing and Tissue Engineering” Oral presentation at the Society for Biomaterials Annual Meeting, St. Paul, MN, April 2001.

Washburn NR, Simon CG, Karim A, Amis EJ “Development of biodegradable polymer scaffolds using co-extrusion techniques” Oral presentation at the National Meeting of the Materials Research Society, Boston, MA, November 2000.

Washburn NR, Lodge TP, Bates FS “Ternary polymer blends as model surfactant systems” Poster presentation at the *Chemistry of Supramolecules and Assemblies* Gordon Research Conference, New England College, NH, July 1999.

Washburn NR, Morkved TL, Lodge TP, Bates FS “Phase Equilibria in Low Molecular Weight Ternary Polymer Blends” Oral presentation at the National Meeting of the American Physical Society, Atlanta, GA, March 1999.

Washburn NR, Stacy AM “Low-temperature, Flux-grown, Na-doped LaMnO_3 : Magnetic and Transport Properties” Oral presentation at the National Meeting of the American Chemical Society, San Francisco, CA, April 1997.