

Education:

- BA Chemical Engineering, BA Biochemistry, Rice University 1992
- PhD Bioengineering, University of Utah 1998

Current positions:

- *Professor with tenure*, Biomedical Engineering, Case Western Reserve University
- Associate Editor for *Experimental Biology and Medicine*; Guest Editor, issues on Immunoengineering, 2016
- Chair, Gordon Conference on Biomaterials, 2017 Holderness, NH; Vice Chair, 2015 Girona, Spain.

Basic Research:

- 55 peer-reviewed papers, 6 book chapters, 9 manuscripts in press/under review (H-index: 28, i10-index 43).
- 60+ conference proceedings, 37 invited presentations
- Principal Investigator or Shared Co-PI for >20 funded projects, \$8.5 million total costs since 2005
- Co-PI or Co-Investigator on 7 additional funded projects (\$10.4 million total costs)
- *Biomaterials* “**Most Cited Article 2006-2010**”, 2010, **over 1800 Citations**
- An additional publication with 500 citations. 7 more publications with more than 100 citations.
- NIH RC1 “Challenge” Grant, 2009. Awarded to top 1% nationally
- NSF CAREER Award, 2010. Awarded to top 1-2% nationally

Translational Research:

- Patents: 1 with claims awarded. 4 additional patents filed. 28 invention disclosures.
- \$1.8 million total raised for Translational Research through Affinity Therapeutics
- PI of NIH STTR; Co-I of NSF SBIR and 3 NIH SBIRs
- Research Agreements with Sherwin-Williams, Johnson & Johnson, STERIS, and the MDIC.
- Selected for initial cohort of the NSF I-Corps (National level competition)
- Selected for pilot cohort of the NIH I-Corps (National level competition)
- Case School of Engineering Innovation Award, 2013

Service:

- Local:
 - Associate Chair, Graduate Education, BME Department, CWRU 2010-2012; Vice Chair 2008-2010
 - Chair of Research, Department of Biomedical Engineering, 2014-2016
 - CSE Executive Committee, 2015-2017
 - Faculty Senate, CWRU, 2014-2017
 - CSE Representative to the Faculty Senate Executive Committee 2015-2017
 - Faculty Senate Research Committee 2015-2016
 - Undergraduate Committee on Academic Standing, 2013-2019
- National:
 - Ad Hoc, NIH and NSF Study Sections for unsolicited proposals
 - 30 additional review panels since 2006 at national and international levels
 - Society for Biomaterials Member-at-Large and Board of Directors member 2014-2015
 - Membership Chair and Executive Council member, 2011-2015

Teaching:

- Average evaluations for 2012-13 (typical): Excellent (60%), Very Good (40%), Good (0%), Fair (0%), Poor (0%)
- UCITE Glennan Fellow, 2009; UCITE Learning Fellow, 2007, 2016; UCITE Mentoring Fellow, 2012
- Case School of Engineering Graduate Teaching Award, 2008, 2011
- Biomedical Engineering Graduate Student Association Mentoring Award, 2010
- Biomedical Engineering Society (CWRU chapter) Undergraduate Teaching Award, 2011

Mentoring:

- Graduated: 7 Ph.D. graduate, 8 M.S. graduates, 11 post-doctoral fellows
- Current: 4 PhD Students (1 with Agata Exner), 3 MS Students, 4 Postdocs (1 with Danny Manor)
- CWRU graduate students: 9 additional advisees, 55 Ph.D. committees, 32 M.S. committees (66 students total)
- CWRU undergraduates: 33 research advisees, (5 current), 102 academic advisees (25 current)
- Other: 11 external REU/visiting students, 4 international student internships, 6 high school students.

HORST A. VON RECUM

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EDUCATION

- Ph.D. (1998)** in Bioengineering from University of Utah, Salt Lake City, UT
M.Ch.E. (1993) in Chemical Engineering from Rice University, Houston, TX
B.A. (1992) in Chemical Engineering from Rice University, Houston, TX
B.A. (1992) in Biochemistry from Rice University, Houston, TX

PROFESSIONAL EXPERIENCE

- 07/2016 to present:** **Professor with tenure**, Department of Biomedical Engineering, Case Western Reserve University, Cleveland, OH
- 07/2016 to present:** **Professor (secondary)**, Department of Macromolecular Science and Engineering, Case Western Reserve University, Cleveland, OH
- 07/2011 to 07/2016:** **Associate Professor with tenure**, Department of Biomedical Engineering, Case Western Reserve University, Cleveland, OH
- 07/2011 to 07/2016:** **Associate Professor (secondary)**, Department of Macromolecular Science and Engineering, Case Western Reserve University, Cleveland, OH
- 07/2014 to 07/2016:** **Associate Chair for Research**, Department of Biomedical Engineering, Case Western Reserve University, Cleveland, OH
- 02/2010 to 02/2012:** **Associate Chair, Director of Graduate Education**, Department of Biomedical Engineering, Case Western Reserve University, Cleveland, OH
- 07/2012 to present:** **Co-Director**, Image Guided Therapeutics Subgroup, Cancer Imaging Program, Case Comprehensive Cancer Center, CWRU, Cleveland, OH
- 07/2010 to present:** **Investigator**, Advanced Platforms Technology Center, Louis Stokes Veterans Hospital, Cleveland, OH
- 06/2008 to present:** **Co-Director**, Pluripotent Stem Cell Facility, National Center for Regenerative Medicine, CWRU, Cleveland, OH
- 02/2008 to 02/2010:** **Vice Chair for Graduate Education**, Department of Biomedical Engineering, Case Western Reserve University, Cleveland, OH
- 07/2007 to present:** **Member**, Center for AIDS Research, CWRU, Cleveland, OH
- 07/2005 to present:** **Member**, Case Comprehensive Cancer Center, CWRU, Cleveland, OH
- 01/2005 to 7/2011:** **Assistant Professor**, Department of Biomedical Engineering, Case Western Reserve University, Cleveland, OH
- 9/2001 to 01/2005:** **Senior Post-doctoral Fellow**, Departments of Hematology and Bioengineering, University of Washington, Seattle, WA
- 12/1998 to 9/2001:** **Post-doctoral fellow**, Departments of Chemical Engineering, MIT, Cambridge, MA; and Department of Human Genetics, Harvard Medical School, Boston, MA

AWARDS AND FELLOWSHIPS

2017:	<i>Nord Fellowship</i>
2017:	<i>Featured Article: Experimental Biology and Medicine</i>
2017:	<i>Page Morton Hunter Distinguished Seminar, Clemson University</i>
2016:	<i>UCITE Learning Fellow 2.0</i>
2016:	<i>AIMBE College of Fellows</i>
2013:	<i>Case School of Engineering Innovation Award</i>
2012:	<i>UCITE Mentoring Fellow</i>
2012:	<i>Nominated for John S. Diekhoff Graduate Mentoring Award</i>
2011:	<i>BMES Society (CWRU Chapter) Undergraduate Teaching Award</i>
2011:	<i>Case School of Engineering Graduate Teaching Award</i>
2011:	<i><u>Biomaterials</u> "Most Cited Article 2006-2010"</i>
2010:	<i>Biomedical Engineering Graduate Student Association Mentoring Award</i>
2010:	<i>NSF CAREER Award</i>
2010:	<i>Singular Sensations Award, Ohio Cancer Research Associates</i>
2009:	<i>Glennan Fellowship</i>
2009:	<i>NIH RC1 "Challenge" Grant</i>
2008:	<i>Case School of Engineering Graduate Teaching Award</i>
2008:	<i>Robert Trombly Research Award, Ohio Cancer Research Associates</i>
2008:	<i>Cuyahoga Pilot Award, American Cancer Society</i>
2007:	<i>UCITE Learning Fellow</i>
2007:	<i>Nominated for Srinivasa P. Gutti Memorial Engineering Teaching Award</i>
2007:	<i>Nominated for Carl F. Wittke Undergraduate Teaching Award</i>
2006:	<i>Nominated, and Finalist for Carl F. Wittke Undergraduate Teaching Award</i>
2005-2006:	<i>Case School of Engineering Outstanding Teacher</i>
2002-2003:	<i>NIH Hematology Fellowship (T32)</i>
1998-2001:	<i>NIH NRSA Postdoctoral Fellowship (F32)</i>

PUBLICATIONS AND PRESENTATIONS

* Supervised students and fellows

† Shared authorship

Senior/corresponding authorship

Articles in Refereed Journals:

1. *E.L. Cyphert, *S.T. Zuckerman, *J.N. Korley, **H.A. von Recum** "Affinity interactions drive post-implantation drug filling, even in the presence of bacterial biofilm" *Acta Biomater.* 2017 Apr 13. pii: S1742-7061(17)30242-8. doi: 10.1016/j.actbio.2017.04.015. [Epub ahead of print] PMID: 28414173
2. *E.L. Cyphert, , J.D. Wallat JD, J.K. Pokorski, **H.A von Recum**. "Erythromycin modification that improves its acidic stability while optimizing it for local drug delivery." *Antibiotics [MDPI]*, doi:10.3390/antibiotics6020011 [Epub ahead of print].
3. *E. Rivera-Delgado, **H.A. von Recum**, "Using affinity to provide long-term delivery of anti-angiogenic drugs in cancer therapy", *Mol Pharm.* 2017 Feb 9. doi: 10.1021/acs.molpharmaceut.6b01109. [Epub ahead of print] PMID: 28128564
4. *E.L. Cyphert, **H.A. von Recum**, "Emerging technologies for long-term antimicrobial device coatings: advantages and limitations". *Exp Biol Med (Maywood)*. 2017 Jan 1:1535370216688572. doi: 10.1177/1535370216688572. [Epub ahead of print] PMID: 28110543

5. *E.L. Cyphert, *A.S. Fu, **H.A. von Recum** "Featured Article: Chemotherapeutic Delivery Using pH-Responsive, Affinity-based Release". *Exp Biol Med* (Maywood). 2017 Jan 1:1535370217693115. doi: 10.1177/1535370217693115. [Epub ahead of print] PMID: 28178856
6. *T.R. Thatiparti, *D. Juric, **H.A. von Recum** "Pseudopolyrotaxane Formation in the Synthesis of Cyclodextrin Polymers: Effects on Drug Delivery, Mechanics, and Cell Compatibility". *Bioconj Chem*. 2017 Feb 8. doi: 10.1021/acs.bioconjchem.6b00721. [Epub ahead of print] PMID: 28117991
7. K.T. Grafmiller, S.T. Zuckerman, C. Petro, L. Liu, **H.A. von Recum**, M.J. Rosen, J.N. Korley, "Antibiotic-releasing microspheres prevent mesh infection *in vivo*", *Journal of Surgical Research* (2016) 206(1): 41-47
8. K.M. Kovach, D.W. Kumsa, V. Srivastava, E.M. Hudak, D.F. Untereker, S.C. Kelley, **H.A. von Recum**, **J.R. Capadona**, "High-throughput in vitro assay to evaluate the cytotoxicity of liberated platinum compounds for stimulating neural electrodes", *J Neurosci Methods* (2016) Nov 1; 273: 1-9. PMID: 27485087.
9. *E. Rivera-Delgado, *E. Ward, **H.A. von Recum**, "Providing sustained transgene induction through affinity-based drug delivery", *J Biomed Mater Res A*. (2016) May; 104(5): 1135-42. PMID: 26749453.
10. **H.A. von Recum**, "From biocompatibility to immune engineering", *Exp Biol Med* (Maywood). (2016) May; 241(9): 889-90. PMID: 27188512
11. *E. Rivera-Delgado, Z. Sadeghi, *N.X. Wang, J. Kenyon, S. Satyanaran, M. Kavran, C. Flask, A.Z. Hijaz, **H.A. von Recum**, "Local release from affinity-based polymers increases urethral concentration of the stem cell chemokine CCL7 in rats", *Biomed Mater*. (2016) Apr 21; 11(2): 025022. PMID: 27097800
12. *T.J. Sill, **H.A. von Recum** "Electrospun materials for affinity-based tissue engineering and drug delivery", *J. Phys.: Conf. Ser.* (2015) 646: 102060.
13. *D.R. Jones, R.E. Marchant, **H.A. von Recum**, A.S. Gupta, **K. Kottke-Marchant**, "Photoinitiator-free synthesis of endothelial cell-adhesive and enzymatically degradable hydrogels", *Acta Biomaterialia* (2015) 13: 52-60. PMID: 25462848
14. J.W. Cheng, Z. Sadeghi, A.D. Levine, M.S. Penn, **H.A. von Recum**, A.I. Caplan, **A. Hijaz**, "The role of CXCL12 and CCL7 chemokines in immune regulation, embryonic development, and tissue regeneration", *Cytokine* (2014) 69(2): 277-283. PMID: 25034237
15. *J.M. Halpern, R. Urbanski, A.K. Weinstock, D.F. Iwig, R.T. Mathers, **H.A. von Recum**, "A biodegradable thermoset polymer made by esterification of citric acid and glycerol. *J Biomed Mater Res A*. (2014) May;102(5): 1467-77. PMID: 23737239
16. A.E. Way, A.B. Korpusik, T.B. Dorsey, L.E. Buerkle, **H.A. von Recum**, **S.J. Rowan**, "Enhancing the mechanical properties of guanosine-based supramolecular hydrogels with guanosine-containing polymers" *Macromolecules* (2014) 47(5): 1810-1818.
17. C.C. Petro, E.H. Nehabet, C.N. Criss, S.B. Orenstein, **H.A. von Recum**, Y.W. Novitsky, **M.J. Rosen**, "Central failures of lightweight monofilament polyester mesh causing hernia recurrence: a cautionary note", *Hernia*. (2015) Feb;19(1): 155-9. PMID: 24659227
18. *J.M. Halpern, *C.A. Gormley, *M. Keech, **H.A. von Recum**, "Thermomechanical Properties, Antibiotic Release, and Bioactivity of a Sterilized Cyclodextrin Drug Delivery System", *J Mater Chem B Mater Biol Med*. (2014) May 14;2(18): 2764-2772. PMID: 24949201
19. *S.R. Merritt, *G. Velasquez, **H.A. von Recum**, "Adjustable release of mitomycin C for inhibition of scar tissue formation after filtration surgery", *Exp Eye Res*. (2013) Nov;116: 9-16. PMID: 23911951

20. *N.X. Wang, S.F. Sieg, M.M. Lederman, R.E. Offord, O. Hartley, **H.A. von Recum**, "Using glycosaminoglycan/chemokine interactions for the long-term delivery of 5P12-RANTES in HIV prevention." *Mol Pharm.* (2013) Oct 7;10(10): 3564-73. PMID: 23859720
21. **H.A. von Recum**, **J. Pokorski**, "Peptide and protein-based inhibitors of HIV-1 co-receptors", *Exp Biol Med* (Maywood). (2013) May;238(5): 442-9. PMID: 23856897
22. *E.L. Lee, *K.C. Watson, **H.A. von Recum**, "Contractile Protein and Extracellular Matrix Secretion of Cell Monolayer Sheets Following Cyclic Stretch", *Cadiovascular Engineering and Technology* (2012) Sep;3(3): 302-310
23. *N.X. Wang, D.A. Bazdar, S.F. Sieg, **H.A. von Recum**, "Microparticle delivery of Interleukin-7 to boost T-cell proliferation and survival", *Biotechnol Bioeng.* (2012) Jul;109(7): 1835-43.PMID: 22275058
24. *S.R. Merritt, A.A. Exner, Z. Lee, **H.A. von Recum**, "Electrospinning and Imaging", *Advanced Engineering Materials*, (2012) 14(5): B266–B278.
25. L.E. Buerkle , **H.A. von Recum**, **S.J. Rowan**, "Toward potential supramolecular tissue engineering scaffolds based on guanosine derivatives" *Chem. Sci.* (2012) 3: 564-572
26. *T.R. Thatiparti, *N. Averell, *D. Overstreet, **H.A. von Recum**, "Multiplexing interactions to control antibiotic release from cyclodextrin hydrogels", *Macromol Biosci* (2011) Nov 10;11(11): 1544-52. PMID: 22167873
27. **M.S. Penn**, **H.A. von Recum**, "A tale of 2 biologies: stem cell patch: myocardial interactions are critical for myocardial regeneration." *J Am Coll Cardiol.* (2011) Nov 8;58(20): 2128-9.
28. *A.S. Fu, *T.R. Thatiparti, G.M. Saidel, **H.A. von Recum**, "Experimental Studies and Modeling of Drug Release from a Tunable Affinity-Based Drug Delivery Platform", *Ann Biomed Eng* (2011) Sep;39(9): 2466-75. PMID: 21678091
29. E. Lavik, **H.A. von Recum**, "The role of nanomaterials in translational medicine", *ACS Nano.* (2011) May 24;5(5): 3419-24 PMID: 21604811
30. *N.X. Wang, **H.A. von Recum**, "Affinity-based drug delivery", *Macromol Biosci.* (2011) Mar 10;11(3): 321-32. PMID: 21108454
31. T.J. Robilotto, *D.S. Alt, **H.A. von Recum**, T. Gray "Cytotoxic gold(I)-bearing dendrimers from alkyne precursors", *Dalton Transactions* (2011) 40(32): 8083-8085
32. K. Harth, M.J. Rosen, *T.R. Thatiparti, **H.A. von Recum**, "Antibiotic-Releasing Mesh Coating To Reduce Prosthetic Sepsis: An In Vivo Study", *J Surgical Research* (2010) 163(2): 337-343 PMID: 20538302
33. *E.L. Lee, **H.A. von Recum**, "Cell Culture Platform with Mechanical Conditioning and Non-damaging Cellular Detachment", *J Biomed Mater Res A.* (2010) May;93(2): 411-8 PMID: 20358641
34. *T.R. Thatiparti, *A.J. Shoffstall, **H.A. von Recum**, "Cyclodextrin-based device coatings for affinity-based release of antibiotics", *Biomaterials* (2010) Mar;31(8): 2335-47 PMID: 20022369
35. *T.R. Thatiparti, **H.A. von Recum**, "Cyclodextrin Complexation for Affinity-Based Antibiotic Delivery", *Macromol Biosci.* (2010) Jan 11;10(1): 82-90 PMID: 19739069
36. *S.J. Kim, **H.A. von Recum**, "Endothelial Progenitor Populations in Differentiating Embryonic Stem Cells II: Drug Selection and Functional Characterization", *Tissue Eng Part A.* (2010) Mar;16(3): 1065-74 PMID: 19845466

37. *S.J. Kim, **H.A. von Recum**, "Endothelial Progenitor Populations in Differentiating Embryonic Stem Cells I: Identification and Differentiation Kinetics," *Tissue Eng Part A*. (2009) Dec;15(12): 3709-18 PMID: 19514847
38. *T.J. Sill, **H.A. von Recum**, "Electrospinning for Tissue Engineering and Drug Delivery", *Biomaterials* (2008) 29(13): 1989-2006 PMID: 18281090 [<1200 Citations], [Biomaterials "Most Cited Article, 2006-2010"]
39. *S.J. Kim, **H.A. von Recum**, "Endothelial Stem Cells and Precursors for Tissue Engineering: cell source, differentiation, selection, and application", *Tissue Eng Part B Rev.* (2008) 14(1): 133-47 PMID: 18454639
40. I.-K. Park†, **H.A. von Recum**†, S. Jiang, S.H. Pun, "Supramolecular Assembly of Cyclodextrin-Based Nanoparticles on Solid Surfaces for Gene Delivery", *Langmuir* (2006) 22(20): 8478-8484 PMID: 16981766
41. E. Alsberg†, **H.A. von Recum**†, M.J. Mahoney†, "Environmental Cues to Guide Stem Cell Fate Decision for Tissue Engineering Applications", *Expert Opin. Biol. Ther.* (2006) 6(9): 847-866 PMID: 16918253
42. J.M. Bergent†, **H.A. von Recum**†, T.T. Goodman, A.P. Massey, S.H. Pun, "Gold Nanoparticles as a Versatile Platform for Optimizing Physicochemical Parameters for Targeted Drug Delivery," *Macromolecular Biosciences* (2006) 6(7): 506-516 PMID: 16921538
43. R.E. Richard, R.A. De Claro, J. Yan, S. Chien, **H.A. von Recum**, J. Morris, H.-P. Kiem, D.C. Dalgarno, S. Heimfeld, T. Clackson, R. Andrews, C.A. Blau, "Differences in F36VMpl-Based In Vivo Selection Among Large Animal Models," *Molecular Therapy* (2004) 10: 730-740 PMID: 15451457
44. G. Voskerician, M.S. Shive, R.S. Shawgo, **H.A. von Recum**, J.M. Anderson, M.J. Cima, R. Langer, "Biocompatibility and biofouling of MEMS drug delivery devices," *Biomat.* (2003) 24: 1959-1967 PMID: 12615486
45. S.U. Stechshulte, A. M. Jousen, **H.A. von Recum**, V. Poulaki, Y. Moromizato, J. Yuan, R.J. D'Amato, C. Kuo, A.P. Adamis, "Rapid ocular angiogenic control via naked DNA delivery to cornea," *Invest. Ophthalmol. Vis. Sci.* (2001) 42: 1975-1979 PMID: 11481260
46. C.J. Kuo, F. Farnebo, E.Y. Yu, R. Cristofferson, R.A. Swearingen, R. Carter, **H.A. von Recum**, J. Yuan, J. Kamihara, E. Flynn, R. D'Amato, J. Folkman, R.C. Mulligan, "Comparative evaluation of antitumor activity of antiangiogenic proteins delivered by gene transfer," *Proc. Natl. Acad. Sci. USA*, (2001) 98: 4605-4610 PMID: 11274374
47. **H.A. von Recum**, T. Okano, S.W. Kim, P.S. Bernstein "Maintenance of retinoid metabolism in human retinal pigmented epithelium culture," *Exp. Eye Res.* (1999) 69: 97-107 PMID: 10375454
48. **H.A. von Recum**, A. Kikuchi, M. Yamato, Y. Sakurai, T. Okano, S.W. Kim, "Growth factors and matrix molecules preserve cell function on thermally responsive culture surfaces," *Tissue Engineering* (1999) 5: 251-265 PMID: 10434072
49. **H.A. von Recum**, T. Okano, T., S.W. Kim, "Growth factor release from thermally reversible substrates to improve growth and attachment", *J. Controlled Release* (1998) 55: 121-130 PMID: 9795028
50. **H.A. von Recum**, A. Kikuchi, M. Okuhara, T. Okano, Y. Sakurai, S.W. Kim, "Novel thermally reversible hydrogel for detachable cell cultures", *J. Biomed. Mater. Res.* (1998) 40: 631-639 PMID: 9599040

51. **H.A. von Recum**, A. Kikuchi, M. Okuhara, Y. Sakurai, T. Okano, S.W. Kim, "Retinal pigmented epithelium cultures on thermally responsive polymer porous substrates", *J. Biomater. Sci. Polym. Ed.* (1998) 9: 1241-1254 PMID: 9860183
52. **H.A. von Recum**, R.L. Cleek, S.G. Eskin, A.G. Mikos, "Degradation of polydispersed poly(l-lactic acid) to modulate lactic acid release", *Biomaterials* (1995) 16: 441-7 PMID: 7654870
53. 0

Articles Currently In Press:

1. J.A. Blatnik, *T.R. Thatiparti, D.M. Krpata, *S.T. Zuckerman, M.J. Rosen, H.A. von Recum, "Infection Prevention Using Affinity Polymer Coated, Synthetic Meshes in a Pig Hernia Model", *J. Surgical Research*, in press.

Articles Currently Under Review:

1. *A.S. Fu, *E. Rivera-Delgado, D. Silver, J. Lathia, H.A. von Recum, "In Situ Refilling Drug Delivery Devices", under review.
2. *T.J. Sill, *P.K. Wilson, H.A. von Recum, "Modifying affinity-based release by multiplexing interactions", *J. Biomater. Sci. Polym. Ed.*, under review.
3. *D. Juric, *T.R. Thatiparti, H.A. von Recum, "Improved loading and delivery of antibiotics from cyclodextrin-based polymers using molecular imprinting", *J. Biomed. Mater. Res.* under review.
4. *S.T. Zuckerman, *E.O Ojo, H.A. von Recum, *J.N. Korley, "Affinity-based drug delivery independent on microparticle size", *J. Controlled Release.*, under review.
5. *E.L. Cyphert, H.A. von Recum, M. Yamato, M. Nakayama, "Surface Sulfonamide Modification of Poly(N-isopropylacrylamide)-based Block Copolymer Micelles to Alter pH and Temperature Responsive Properties and Intracellular Migration, *Acta Biomaterialia*, under review.
6. *S.R. Merritt, E.L. Cyphert, N.F. Steinmetz, H.A. von Recum, "Uptake and intracellular trafficking of non-viral gene delivery nanoparticles enabled by nucleolin", *Experimental Biology and Medicine*, under review.

Books, Book Chapters, and Reviews:

1. "Affinity-Based Drug Delivery," *A.S. Fu, and H.A. von Recum, in *Engineering Polymer Systems for Improved Drug Delivery*, R. A. Bader and D. A. Putnam eds, John Wiley & Sons, Inc., Hoboken, NJ, USA. doi: 10.1002/9781118747896.ch13
2. "Bioconjugation Strategies: Lipids, Liposomes, Polymersomes, and Microbubbles" A. Sen Gupta, H.A. von Recum *Chemistry of Bioconjugates: Synthesis, Characterization, and Biomedical Application* R. Narain ed. John Wiley & Sons, Inc., New York, 2013
3. "Affinity Based Delivery of Proteins" *J.M. Halpern, H.A. von Recum in *Biomaterials and Regenerative Medicine*, P.X. Ma ed. Cambridge Press, New York, 2014 ISBN: 9781107012097
4. "Drug delivery applications of injectable biomaterials," *D.J. Overstreet, B.L. Vernon, H.A. von Recum *Injectable Biomaterials: Science and Applications*, B. Vernon ed. Woodhead Publishing Ltd, Cambridge, UK, 2011
5. "Novel manipulation technology of cell sheets for tissue engineering," M. Yamato, A. Kikuchi, A. Kohsaka, T. Terasaki, H.A. von Recum, S.W. Kim, Y. Sakurai, T. Okano *Tissue Engineering for*

Therapeutic Use, Y. Ikada, T. Okano eds., Elsevier, New York, 1999.

6. "Tissue Engineering Concepts", **H.A. von Recum**, M.J. Yaszemski, A.G. Mikos, *Handbook of Biomaterials Evaluation*, 2nd Edn., 385-409, A. F. von Recum ed., Taylor & Francis, Philadelphia, 1999.

Conference Proceedings and Abstracts:

1. *Cyphert EL, von Recum HA. Erythromycin modification to improve the acidic stability while optimizing it for infection site-specific release. Society for Biomaterials Annual Meeting. Minneapolis, MN. April 6, 2017.
2. *Cyphert EL, *Zuckerman ST, von Recum HA. Post-Implantation Drug Reloading of Devices is Not Affected by Bacterial Biofilm. Biomedical Engineering Society Annual Meeting. Minneapolis, MN. October 2016.
3. *Cyphert EL, *Zuckerman ST, von Recum HA. Using affinity to drive post-implantation device reloading in the presence of bacterial biofilm. Society for Biomaterials Regional Meeting-Biomaterials Day. Case Western Reserve University. Cleveland, OH. October 2016.
4. *Cyphert EL, *Rivera E, *Fu AS, von Recum HA. Chemotherapeutic Delivery Based on Tumor pH Using an in Situ Affinity Change. Society for Biomaterials Annual Meeting. Denver, CO. April 16, 2014.
5. Sadeghi, Z., *Rivera-Delgado, E., Kenyon, J., Satyanarayan, S, *Wang, N.X., Kavran, M., Rabie, A., Firouz Daneshgari, F., **von Recum, H.A.**, Hijaz, A., "Periurethrally implanted affinity-based CCL-7 releasing hydrogels for stimulating stem cell migration in stress urinary incontinence, International Continence Society, Barcelona Spain, August, 2013, Rio de Janeiro, Brazil, October, 2014
6. Sadeghi, Z., Kenyon, J., *Rivera-Delgado, E., *Wang, N.X., Satyanarayan, S, *Wang, N.X., Rabie, A., Kavran, M., Firouz Daneshgari, F., **von Recum, H.A.**, Hijaz, A., "Periurethrally implanted affinity-based CCL-7 releasing hydrogels for stimulating stem cell migration in stress urinary incontinence, American Urological Association, Orlando, FL, May, 2014
7. Sadeghi, Z., *Rivera-Delgado, E., Kenyon, J., Satyanarayan, S, *Wang, N.X., Kavran, M., Rabie, A., Firouz Daneshgari, F., **von Recum, H.A.**, Hijaz, A., "Feasibility of intravaginal implanted affinity-based CCL7 slow releasing hydrogels for stimulating stem cell migration in stress urinary incontinence". International Continence Society, Barcelona Spain, August, 2013
8. *Halpern, J.M., *Fang, K.L., **von Recum, H.A.** "Evaluation of an autoclaved cyclodextrin affinity-based drug delivery system for orthopedic implant infections", American Chemical Society, San Diego, CA, March, 2012
9. *Fu, A.S., Saidel, G.M., **von Recum, H.A.**, "Mathematical Modeling of a Tunable Drug Delivery Platform Based on High Affinity Molecular Interactions", Controlled Release Society, Portland, OR, July 2010
10. *Thatiparti, T.R., **von Recum, H.A.**, "Antibiotic modification for tunable complexation and controlled release from cyclodextrin hydrogels", Controlled Release Society, Portland, OR, July 2010
11. *Rivera-Delgado, E., **von Recum, H.A.**, "Long-term release of small antiangiogenic compounds from a beta-cyclodextrin affinity based delivery system", Controlled Release Society, Portland, OR, July 2010
12. *Lee, E.L., **von Recum, H.A.**, "Cell culture platform for mechanical conditioning and nondamaging cellular detachment", Awardee address for the Masters Student Award for Outstanding Research, Society for Biomaterials, Seattle, April 2010
13. *Fu, A.S., *Thatiparti, T.R., Saidel G, **von Recum H.A.** "Modeling drug release from a tunable drug delivery platform based on high affinity molecular interactions" Society for Biomaterials Regional Conference, Lexington, KY, August, 2009.

14. *Lee, E.L., **von Recum, H.A.**, "Cell Culture Platform for Mechanical Conditioning and Nondamaging Cellular Detachment" Regenerative Medicine and Adult Stem Cell Therapy Conference (MSC 2009), Cleveland, August 2009
15. *Thatiparti, T.R., **von Recum, H.A.**, "Novel cyclodextrin materials with improved drug loading and release capacity", Materials and Processing for Medical Devices, Minneapolis, August 2009
16. *Thatiparti, T.R., **von Recum, H.A.**, "Release of Multiple Therapeutic Agents from Rationally Designed Materials", Biomaterials Gordon Research Conference, Holderness, NH, July 2009
17. *Wang, N.X., **von Recum, H.A.**, "Microparticle Delivery of Interleukin-7 for HIV T-Cell Therapy", Controlled Release Society, Copenhagen, July 2009
18. *Lee, E.L., **von Recum, H.A.**, "Design for a Cell Conditioning Platform with Non-damaging Cell Detachment", Society for Biomaterials, San Antonio, TX, April 2009
19. *Lee, E.L., **von Recum, H.A.**, "Elastic Surfaces for Cell Detachment using a pNIPAAm Copolymer", American Chemical Society Regional Meeting, Cleveland, April 2009
20. *Wang, N.X., **von Recum, H.A.**, "Degradable Microparticles for Protein Delivery", American Chemical Society Regional Meeting, Cleveland, April 2009
21. *Thatiparti, T.R., **von Recum, H.A.**, "Cyclodextrin based hydrogel coatings for antibiotic drug delivery", American Chemical Society Regional Meeting, Cleveland, April 2009
22. Broome, A.-M., *Rivera-Delgado, E., *Kim, S.J., Basilion, J.P., **von Recum, H.A.**, "Imaging differentiation-induced hematopoietic stem cells", Stem Cell Engineering Conference, Coronado Island, CA, January 2008
23. *Sill, T.J., **von Recum, H.A.**, "Reversible Biomolecule Self-Assembly and Presentation on Biomaterials Surfaces", Stem Cell Engineering Conference, Coronado Island, CA, January 2008
24. *Kim, S.J., **von Recum, H.A.**, "Evaluation of Differentiation Methods Using Embryonic Stem Cells with Endothelial Specific Markers", Stem Cell Engineering Conference, Coronado Island, CA, January 2008
25. * Kim S.J., *Gray D.R., **von Recum H.A.**, "Promoter-Dependent Selection of ESC-Derived Endothelial Cells: Evaluation in Tumor Angiogenesis", Biomedical Engineering Society, St. Louis, MO, October 2008.
26. *Lee, E.L., **von Recum, H.A.**, "Cell Culture Platform for Mechanical Conditioning and Nondamaging Cellular Detachment" , Biomedical Engineering Society, St. Louis, MO, October 2008.
27. *Overstreet, D., Sill, T.J., **von Recum, H.A.**, "Affinity-Based Control of Antibiotic Release", Controlled Release Society, New York, July 2008
28. *Rivera-Delgado, E., **von Recum, H.A.**, "Designing a genetic mechanism for tissue specific detection " , Annual Biomedical Research Conference for Minority Students, Austin, TX, November 2007
29. *Sill, T.J., *Makovey, I., **von Recum, H.A.**, "Refillable Drug Delivery System Utilizing Beta-Cyclodextrin", Biomedical Engineering Society, Los Angeles, September 2007
30. *Kim, S.J., **von Recum H.A.**, "Selection of Endothelial Cells From Differentiation ESCs Using GFP/PuroR Under Endothelial Promoters", Biomedical Engineering Society, Los Angeles, September 2007
31. *Sill, T.J., **von Recum, H.A.**, "Refillable Polymers for Drug Delivery", Polymer Industry Northeast Ohio, Cleveland, June 2007
32. *Sill, T.J., *Makovey, I., **von Recum, H.A.**, "Reversible Attachment of Bioactive Molecules to Polymer Surfaces", Society for Biomaterials, Chicago, April 2007
33. *Kim, S.J., **von Recum, H.A.**, "Genetic Selection of Differentiated Stem Cells", Research ShowCASE, Cleveland, April 2007
34. *Kim, S.J., **von Recum, H.A.**, "Selection of Embryonic Stem Cells for Tissue Engineered Blood Vessels", Biomedical Engineering Society, Chicago, October 2006

35. Park, I.-K., **von Recum, H.A.**, Jiang, S., Pun, S.H., “Spatially-Controlled Delivery of Cyclodextrin-Based Polyplexes from Solid Surfaces”, American Society for Gene Therapy, Baltimore, May, 2006
36. Bergen, J.M., **von Recum, H.A.**, Goodman, T.T., Massey, A.P., Pun, S.H. “Liver Targeting of Gold Nanoparticles: Effects of Size and Surface Modification on Preferential Hepatocyte Uptake”, American Institute of Chemical Engineers, Cincinnati, October, 2005
37. Bonig, H.B., **von Recum, H.A.**, Priestly, G.V., Papayannopoulou, T., “Altered properties of primary murine kit plus bone marrow cells and 32D cells transduced with the active catalytic subunit of pertussis toxin”, American Society of Hematology, San Diego, 2003
38. **von Recum, H.A.**, S. Chien, Blau, C.A., “Chemically Induced Dimerization of Mpl Causes Selective Expansion of Hemopoietic Precursors from Embryonic Stem Cells”, American Society of Hematology, Philadelphia 2002
39. **von Recum, H.A.**, Langer, R.S., “Drug Delivery Microchip for Gene Regulation”, American Society for Gene Therapy, Seattle 2001
40. Stechschulte, S., **von Recum, H.A.**, Folkman, J. “Rapid ocular angiogenic control via naked DNA delivery to cornea”, Association for Research in Vision and Ophthalmology, Ft. Lauderdale, May 2001
41. **von Recum, H.A.**, Okano, T., Kim, S.W. “Continuous, polarized sheets for transplantation”, Association for Research in Vision and Ophthalmology, Ft. Lauderdale, May 1998
42. **von Recum, H.A.**, Okano, T., Kim, S.W. “Polarized retinal pigmented epithelium suitable for transplantation from porous thermally reversible culture substrates”, Society for Biomaterials, San Diego, April 1998
43. **von Recum, H.A.**, Okano, T., Kim, S.W. “Delivery of growth factor to epithelial cells from extracellular matrix”, American Association of Pharmaceutical Scientists, Boston, 1997
44. **von Recum, H.A.**, Okano, T., Kim, S.W. “Novel hydrogel for detachable cell culture”, Society for Biomaterials, New Orleans, May 1997
45. **von Recum, H.A.**, Okano, T., Kim, S.W. “Release of factors from thermally reversible surfaces for improved epithelial cultures”, Controlled Release Society World Symposium, Kyoto, Japan, July 1996
46. **von Recum, H.A.**, Okano, T., Kim, S.W. “Early factor release for improving morphology of detachable retinal pigment epithelium culture”, World Biomaterials Congress, Toronto, May 1996
47. **von Recum, H.A.**, Okano, T., Kim, S.W. “Thermally reversible polymers for culture of detachable RPE sheets”, Association for Research in Vision and Ophthalmology, Ft. Lauderdale, May 1996
48. **von Recum, H.A.**, Okano, T., Kim, S.W. “Detachable epithelial monolayers cultured on thermally reversible poly(N-isopropyl acrylamide) coated substrates”, Biomedical Engineering Society, Phoenix, October 1995
49. **von Recum, H.A.**, Mikos, A.G. “Molecular weight effects on lactic acid release during poly(l-lactic acid) degradation”, Society for Biomaterials, San Francisco, April 1995
50. **von Recum, H.A.**, Mikos, A.G. “Modulated release of lactic acid during poly(l-lactic acid) degradation”, American Institute of Chemical Engineers, San Francisco, 1994

Invited Presentations:

1. “Affinity Delivery of Therapeutics for Tissue Engineering,” Page Morton Hunter Distinguished Lecture, Clemson University, Department of Biomedical Engineering, February, 2017
2. “Refillable Drug Delivery Polymers”, University of Akron, Department of Biomedical Engineering, September, 2015
3. “Drug Delivery from Electrospun Materials”, IOP Electrostatics, Southampton, UK, April 2015
4. “Affinity Based Delivery of Small Molecules”, Department of Biomedical Engineering, Georgia Tech, Atlanta, GA March, 2015
5. “Use of Molecular Interactions to Control the Rate of Drug Delivery”, Department of Biomedical Engineering, Cornell University, Ithaca, NY, Oct, 2014

6. "Exploiting Molecular Interactions for Drug Delivery", University of Montana, Department of Pharmaceutical Sciences, Missoula, MT, Sep, 2014
7. "Affinity Based Delivery of Proteins and Peptides", University of Toronto, Toronto Canada, August, 2014
8. "Affinity Based Delivery for Tissue Engineering", Gordon Conference on Biomaterials and Tissue Engineering, Holderness, NH, July 2013
9. "Polymers for Drug Delivery", Utah State University, Department of Biological Engineering, June, 2013
10. "Molecular Imprinting of Cyclodextrin Polymers", International Polymer Conference, Kobe, Dec, 2012
11. "Small Molecule Delivery from Cyclodextrin" Notre Dame University, Department of Chemical and Biomolecular Engineering, Nov, 2011
12. "Using Affinity to Control Drug Delivery," University of Washington St. Louis, Department of Biomedical Engineering, Nov, 2010
13. "Polymer Coatings for Drug Delivery: Antibiotics and Beyond" Department of Orthopedics, Case Western Reserve University, April, 2010
14. "Drug Delivery from Device Coatings: Antibiotics, Chemotherapeutics, Others" Department of Urology Research Retreat, Case Western Reserve University, December 2009
15. "Antibiotic Delivery from Device Coatings" Wound Care Symposium, Case Western Reserve University, October 2009
16. "Polymeric Platforms for Affinity-Based Drug Delivery", Syracuse University, Biomaterials Institute, September 2009
17. "Affinity-Based Drug Delivery", Society for Biomaterials Regional Conference, Lexington, KY, August 2009
18. "Heterogeneity of Endothelial Progenitors from Embryonic Stem Cells", Regenerative Medicine Workshop, Hilton Head, SC, March 2009
19. "Moving Forward with Pluripotent Cell Research in Cleveland", Center for Stem Cell and Regenerative Medicine Retreat, Cleveland, January 2009
20. "New Strategies for Controlled Release Drug Delivery" Department of Pharmacology, Case Western Reserve University, December 2008
21. "Electrospun Nanofibers for Controlled Drug Delivery", Nanomedicine Summit, Cleveland, September 2008
22. "The Use of Embryonic Stem Cells in Cardiovascular Tissue Engineering", Center for Stem Cell and Regenerative Medicine, Cleveland, June 2008
23. "Endothelial-Specific Promoters to identify and select differentiating in stem cells", Cardiovascular Research Institute Seminar Series, Case Western Reserve University, March 2008
24. "Embryonic Stem Cells for Cardiac Tissue Engineering", State of the Heart, American Heart Association Regional Meeting, Cleveland, March 2008
25. "Engineering Embryonic Stem Cells: Overcoming Limitations and Exploring New Directions", University of Florida, Department of Biomedical Engineering, February 2008
26. "Tissue Specific Promoters for Stem Cell Identification, Selection and Imaging" Department of Biology, Case Western Reserve University, January 2008
27. "Reversible Molecular Interactions for Tissue Engineering and Drug Delivery" Department of Chemical Engineering, Case Western Reserve University, November 2007
28. "Embryonic Stem Cells", Center for Stem Cell and Regenerative Medicine, Cleveland, October 2007
29. "Self-Assembled Surface Interactions with Nanoparticles for Gene Delivery", Targeted Nanoparticles BRTT, Cleveland, August 2007
30. "Thermally Responsive Polymers for Tissue Engineering and Drug Delivery" Department of Macromolecular Science and Engineering, Case Western Reserve University, February 2007
31. "Embryonic Stem Cells for Angiogenesis and Vascular Tissue Engineering" Department of Orthopedics, Case Western Reserve University, May 2007
32. "Stem Cells Demystified", Public Policy Brown Bag Lunch Seminar Series, Case Western Reserve University, April, 2007
33. "Embryonic Stem Cells for Cardiovascular Tissue Engineering", Cleveland Cardiovascular Stem Cell Clinical Trial Network Retreat, October 2006

34. "Surface modifications and design of molecular interfaces for tissue engineering and drug delivery applications", Materials, Medicine, and Nanotechnology Summit, Cleveland, October 2006
35. "Activation of Gene Regulation by Drug Delivery Microchip", Inaugural Gordon Conference on BioMEMS, New London, CT, June 2006
36. "Regulation of Cell Fate in Embryonic Stem Cells" Department of Pathology, Case Western Reserve University, October 2005
37. "Retinal Transplantation", Rehabilitation Engineering Society of North America, Salt Lake City, 1996

Patents and Disclosures:

Patents

1. Reversible Molecule Attachment for Protein and Drug Delivery	Mar-07	61/183,698;PCT/US10/37183;13/376,298
2. Affinity-Based Delivery For HIV Prevention	Jun-11	61/859,617;14/300,641
3. Halogenated Flame Retardants Derived From Plant-Based Polyphenols	Feb-13	61/870,512
4. Genistein And Derivatives As Bisphenol Replacements	Mar-13	61/784,261;2013-2447-02;2013-2447-03;62/073,052
5. Affinity-Based Delivery And Refilling For Cancer Therapy	May-13	61/833,048; 14/451,527

Invention Disclosures

MIT 01/30/2000	"Resealable Microfabricated Gateways" H.A. von Recum , J. Lahann, R. Langer, UW
UW 04/24/2006	"Delivery of CD-Based Polyplexes from Solid Surfaces" H.A. von Recum , S.H. Pun,

2006-1295	Cellular Expression of therapeutic Chondroitinase ABC
2007-1412	Reversible Molecule Attachment for Protein and Drug Delivery
2008-1511	Multifunctional targeted nanobubble-nanosphere composite vehicles
2010-1803	Cell Culture Platform for Cell Detachment and Mechanical Conditioning
2010-1914	Slow-Release Antibiotic Coatings for Orthopaedic Implants
2010-1915	Slow-Release Antibiotic Gel for Anti-Inflammatory Joint Injection
2011-2043	Polymers Which Release Vitamin A Related Molecules Upon Their Degradation
2011-2116	Affinity Approach For Dispersion And Aggregation Prevention
2011-2117	Di-Tyrosine Derivatives For Bisphenol Replacement
2011-2118	Color-Changing Paint Using Affinity Inclusions
2011-2121	Affinity-Based Delivery For HIV Prevention
2012-2148	Using Pathogen Action To Liberate Microbicides
2012-2149	Microparticle or Spray Coating Of Affinity Based Delivery Platforms
2013-2298	Resveratrol Derivatives for Bisphenol Replacements
2013-2347	Combinations Of Biologically Derived Phenols And Diols/Phenols As Replacement For Bis-Phenol
2013-2442	Halogenated Flame Retardants Derived From Plant-Based Polyphenols
2013-2447	Genistein And Derivatives As Bisphenol Replacements
2013-2453	Naturally-Derived Phenyl Phosphate Esters
2013-2454	Ether-Amide Polymer From Naturally Derived Polyphenols
2013-2455	Naturally-Derived Isocyanate Independent Urethane Polymer Esters
2013-2483	Endoscopically Applied Polymer For Locking-In Migrating Cancer Cells Following Tumor Resection
2013-2484	Endoscopically Applied Polymer For Blocking Uptake And Intestine Leading To Weight Loss From
2013-2504	Affinity-Based Delivery And Refilling For Cancer Therapy

2015-2730	Use of Heparin-Based Polymers For the Affinity Delivery of MCP-3 (CCL7) in the Prevention and Treatment of Urinary Incontinence
2015-2737	Cardiovascular Therapies Provided Through Affinity-Based Release of Anti-Proliferative Drugs

RESEARCH SUPPORT

Current Funding:

- 1. National Institutes of Health, NIGMS R01GM121477** "Reducing Adhesions in Hernia Repair Meshes Through a Polysaccharide Coating". Principal Investigator (12/16 through 11/19) \$1,200,000 (total)
- 2. National Institutes of Health, NIBIB R13EB024393** "2017 Biomaterials and Tissue Engineering Gordon Research Conference and Gordon Research Seminar" Co-PI (4/17 through 4/18). \$15,000 (direct).
- 3. American Heart Association Grant-in-Aid 16GRNT31320001** "Preventing Infection in Arteriovenous Grafts". Principal Investigator (01/16 through 12/17) \$154,000 (total).
- 4. National Center for Accelerated Innovation (NCAI-CC)** "Preventing Cardiovascular Graft Infection Through an Antibiotic Delivery Coating". Principal Investigator (01/16 through 12/16) \$111,750 (total)
- 5. Coulter-Case Translation and Research Partnership Pilot** "Therapeutic Delivery of Small Molecules", Co-Principal Investigators (Co-Principal Investigators: Jeffrey Capadona, CWRU, Mark Luciano, CCF) (06/13-08/15) \$30,000 (total) + \$25,000 supplement
- 6. CCTIP and Infectious Diseases Pilot** "Salt and Pepper Shaker Approach to Implant Infection", Principal Investigator (07/17 through 06/18), \$50,000 (total).
- 7. NIH, NHLBI SBIR (R43 HL121928-01)** "Affinity-based delivery of Sirolimus for prevention of AV graft failure". Co-Investigator (Principal Investigator, Sean Zuckerman, Affinity Therapeutics) (4/14 through 3/16) \$389,360 (total).
- 8. NIH, NHLBI, R43 HL134480-01A1** "Affinity-based Delivery of Statins for Prevention of AV Fistula Occlusion". Co-Investigator (Principal Investigator, Sean Zuckerman, Affinity Therapeutics) (4/16 through 3/18) \$389,360 (total).
- 9. Case Comprehensive Cancer Center, Cancer Imaging Pilot** "Drug Reloading in an Orthotopic Glioblastoma Model", Principal Investigator (1/17-12/17) \$5,000 (direct).
- 10. NIH, NIBIB, R13EB024393** "2017 Biomaterials and Tissue Engineering Gordon Research Conference and Gordon Research Seminar". Co-Principal Investigators H.A. von Recum and Joel Collier. 7/17 through 6/18). \$13,500 (direct).
- 11. NSF, DMR-1744049** "2017 Gordon Research Conference on Biomaterials". Co-Principal Investigators H.A. von Recum and Joel Collier. 7/17 through 6/18). \$5010 (direct).

Pending Proposals:

- 1. NIH, NCI, R03CA204890-01A1** "Sirolimus Delivery from Esophageal Stents to Prevent Scarring after Mucosectomy". Principal Investigator (07/16 through 06/18) \$139,582 (total).

Score: 22 Program Officer reports this is "Well within previously funded range".

- 2. National Science Foundation** "Exploring degradation to impact affinity-based drug delivery materials". Principal Investigator (07/16 through 06/19) \$450,000 (total).

Score: Excellent/Excellent/Very Good. Program Officer reports this is "Waiting on NSF Budget".

Past Basic Research Funding:

- 1. National Science Foundation, CAREER Award (CBET-0954489)** "CAREER: Research and Educational Program in Affinity Drug Delivery". Principal Investigator (04/10 through 08/15) \$450,000 (total).
 - a. REU Supplement 2014** (+ \$20,000 total)
 - b. REU Supplement 2013** (+ \$21,000 total)
 - c. Graduate Diversity Supplement 2012** (+ \$50,000 total)
- 2. National Institutes of Health, Challenge Grant (RC1 EB010795-01)** "Vascularization of Polymeric Tissue Beds". Co-Principal Investigator (Co-PI: Roger Marchant, CWRU) (10/09 through 9/11) \$1,570,000 (total).
- 3. National Institutes of Health, NEI (R21 R21 EY019406-01)** "DNA Delivery for Treatment of Proliferative Vitreoretinopathy and Ocular Scarring" Principal Investigator (02/09 through 01/11) \$431,750 (total).
- 4. Center for Stem Cell and Regenerative Medicine Project "Embryonic and Induced Pluripotent Stem Cell Facility"**, Co-Principal Investigator (Co-Principal Investigator: Paul Tesar, CWRU) (6/09-5/12) \$550,000 (total).
- 5. Center for Stem Cell and Regenerative Medicine Pilot "Imaging Platform for Pluripotent Stem Cells"**, Principal Investigator (1/10-12/10) \$55,000 (total).
- 6. Ohio Cancer Research Associates "Multiplexing Molecular Interactions to Improve Chemotherapeutic Delivery"**, Principal Investigator (7/08-12/10) \$50,000 (total).
- 7. National Science Foundation (CMMI-0826435)** "Mechanical Modulation of Stem Cell Shape and Fate". Co-Principal Investigator (PI: Melissa Knothe Tate, CWRU) (9/08 through 8/11) \$399,325 (total).
- 8. National Science Foundation, REU (Renewal / Round 2) (EEC-1004776)** "Undergraduate Research in Biomedical Engineering". Co-Principal Investigator (PI: Roger Marchant, CWRU) (5/10 through 4/14) \$330,572 (total).
- 9. National Science Foundation, REU (Round 1) (EEC-0552804)** "Undergraduate Research in Biomedical Engineering". Co-Principal Investigator (PI: Roger Marchant, CWRU) (5/06 through 4/10) \$310,000 (total).
- 10. National Institutes of Health, NIAID (U19 AO-868981-01)** "Basic and Comparative Studies of CCR5 Inhibition to Prevent HIV Transmission". Co-Investigator (PI: Michael Lederman, CWRU) (04/08 through 03/11) \$5,500,000 (total).
- 11. National Institutes of Health, NHLBI (R01 HL089796-01)** "Regulation of Angiogenesis by Kininogen". Co-Investigator (PI: Keith McCrae, CWRU) (03/09 through 02/15) \$2,100,000 (total).
- 12. American Heart Association Beginning Grant-in-Aid 0765390B** "Molecular Imaging to Evaluate the Function of Implanted Endothelial Stem Cells in Cardiac Repair", Principal Investigator (7/07-6/09) \$121,000 (total).
- 13. CWRU Institute for Advanced Materials' (IAM) Image Guided Biomaterials Development Pilot Award** "High Throughput Imaging for Biomaterials Evaluation" Principal Investigator (11/1-10/12) \$25,000 (total)

14. **CWRU Pluripotent Stem Cell Facility (PSCF) Pilot Award** “Developing a Pluripotent Stem Cell Line from Patients Resistant to HIV Infection” Principal Investigator (11/1-10/12) \$25,000 (total)
15. **American Cancer Society Cuyahoga Pilot** “*Bio-Active Seeds for Controlled Release Cancer Therapy*”, Principal Investigator (01/08-12/08) \$25,000 (total).
16. **Innovative Incentive Grant, APT Center, Louis Stokes Cleveland VA Hospital** “Sterilization of Affinity-Based Antibiotic Delivery Systems” Principal Investigator (7/12-6/13) \$25,000 (total)
17. **Center for Stem Cell and Regenerative Medicine Pilot** “*Culture Surfaces for Mechanical Conditioning and Non-Enzymatic Detachment of Stem Cells*”, Principal Investigator (01/08-12/08) \$55,000 (total).
18. **Clinic Tissue Engineering Center Project** “*Molecular Surface Design for Tissue Engineered Hydrogels*”, Principal Investigator (7/05-12/08) \$165,000 (total).
19. **Presidential Research Initiative Award** “*Degradable Cross-linked Hydrogels for Vaccine Antigen Release*”, Co-Principal Investigator (Co-Principal Investigator: Scott Sieg, CWRU) (5/06-12/08) \$80,000 (total).
20. **Targeted Nanoparticles BRTT Pilot** “*Nanobubble-Nanoparticle Complexes for Ultrasound Imaging and Drug Delivery*”, Co-Investigator (Principal Investigator: Agata Exner, CWRU) (10/07-6/09) \$100,000 (total).
21. **National Brain Tumor Foundation** “*Polymers for siRNA Delivery*”, Co-Investigator (Principal Investigator: Eben Alsberg, CWRU) (4/06-3/09) \$25,000 (total).

Past Translational Research Funding:

1. **Coulter-Case Translation and Research Partnership Project** “Preventing Esophageal Stricture through Drug Delivery”, Co-Principal Investigator (Co-Principal Investigators: Jeffrey Marks, Steve Schomish, CWRU) (06/13-08/15) \$120,000 (total).
2. **Sherwin Williams Sponsored Research Project** “New Polymers for Coatings”. Principal Investigator (8/13-12/15) \$157,000 (total)
3. **Medical Device Innovation Consortium (MDIC) Pilot Award** “Role of Pt Dissolution in Neural Electrode-Induced Cytotoxicity”. Co-Principal Investigator (Co-PI: Jeff Capadona, CWRU) (10/13 through 9/15) \$100,000 (total).
4. **National Institutes of Health, NIGMS SBIR 1R43GM100525-01** “Cyclodextrin-Based Microparticle Polymer Formulations for the Slow, Sustained Delivery of Microbicides”. Co-Investigator (Principal Investigator, Julius Korley, Affinity Therapeutics) (4/12 through 3/15) \$389,360 (total).
5. **National Science Foundation SBIR IIP-1315396** “Sustained Delivery of RANTES Analogs from an Affinity-based System” Co-Investigator (Principal Investigator, Julius Korley, Affinity Therapeutics) (8/13 through 7/14) \$150,000 (total).
6. **National Institutes of Health, NHLBI, National Level I-Corps Award (R43 HL121928-01A1S1)** “Affinity-based delivery of Sirolimus for prevention of AV graft failure”. Co-Investigator (Principal Investigator, Sean Zuckerman, Affinity Therapeutics) (4/15 through 3/16) \$25,000 (total).
7. **National Science Foundation, National Level I-Corps Award IIP-1217182** “I-Corps: Microparticle Formulations to Combat Unintended Infections” Principal Investigator (3/12 through 02/15) \$50,000 (total)

8. **National Institutes of Health, NICHD STTR (R41 HD063241-01)** *"In Vivo Assessment of Embryonic Stem Cell Teratoma Prevention"*. Principal Investigator (5/10 through 4/11) \$389,360 (total).
9. **National Science Foundation, Partnership for Innovation Project (Round 2)** *"Cyclodextrin-based Polymer Coatings for the Slow and Sustained Release of Therapeutics"*. Principal Investigator (08/11-07/12) \$40,035 (total).
10. **National Science Foundation, Partnership for Innovation Project (Round 1)** *"Cyclodextrin-based Polymer Coatings for the Slow and Sustained Release of Therapeutics"*. Principal Investigator (08/10-07/11) \$40,035 (total).
11. **Sherwin-Williams Pilot Award** *"New Polymers for Coatings"*. Principal Investigator (8/12-8/13) \$25,000 (total)
12. **STERIS Pilot Award** *"Controlled Drug Release to Boost T-Cells"*, Co-Principal Investigator (Co-Principal Investigator: Scott Sieg, CWRU) (3/10-4/11) \$50,000 (total).
13. **Johnson and Johnson Pilot Award** *"Durable Antimicrobial Platform for Implants"*, Principal Investigator, (7/10-6/11) \$50,000 (total).
14. **Coulter-Case Translation and Research Partnership Project** *"Antibiotic Delivery in a Large Animal Model"*, Co-Principal Investigator (Co-Principal Investigator: Michael Rosen, CWRU) (6/09-5/12) \$120,000 (total).
15. **Coulter-Case Translation and Research Partnership Pilot** *"Therapeutic delivery of retinoids for macular degeneration"*, Co-Principal Investigators (Co-Principal Investigators: Tadao Maeda, Sahil Parikh, CWRU) (10/09-6/10) \$30,000 (total).
16. **Coulter-Case Translation and Research Partnership Pilot** *"Delivery of antibiotics from polymeric fibers"*, Co-Principal Investigator (Co-Principal Investigator: Michael Rosen, CWRU) (4/09-3/10) \$35,000 (total).
17. **Coulter-Case Translation and Research Partnership Pilot** *"Controlled drug release to boost T-cell response in AIDS"*, Co-Principal Investigator (Co-Principal Investigators: Scott Sieg, Michael Lederman, CWRU) (7/08-4/09) \$60,000 (total).
18. **Coulter-Case Translation and Research Partnership Pilot** *"Controlled Ladder-type hydrogel delivery of IL-7"*, Co-Principal Investigator (Co-Principal Investigators: Scott Sieg, Michael Lederman, CWRU) (7/06-4/07) \$36,000 (total).

PROFESSIONAL SERVICE

Memberships:

Society for Biomaterials
 Controlled Release Society
 Biomedical Engineering Society
 Tissue Engineering and Regenerative Medicine International Society
 International Society for Stem Cell Research

Professional society leadership:

- Society for Biomaterials
 - Program Chair, Cardiovascular Biomaterials Special Interest Group (2006-2008)
 - Program Chair, Drug Delivery Special Interest Group (2008-2010)
 - By-Laws Committee Member (2009-2010, 2014-2017)
 - Long-Range Planning Committee, Co-Chair (2014-2015)

- Audit Committee (2014-2015)
- Membership Committee Member (2010-2105)
 - Membership Chair (2011-2014)
- Member-At-Large (2014-2015)
- Executive Council (2011-2015)
- Leadership Board (2014-2015)
- Long-Range Planning Committee
 - Co-Chair (2014-2015)
- Financial Audit Committee
 - Co-Chair (2014-2015)
- Biomedical Engineering Society
 - Communications Committee Member (2010-2011)
- Controlled Release Society
 - Mentoring Committee Member (2011-2012)

Conference leadership:

- Gordon Conference: Biomaterials and Tissue Engineering
 - Vice Chair (2015)
 - Chair (2017)
- Gordon Conference Polymers
 - Session Chair (2015)
- Session Chair: "Drug Delivery", Biomedical Engineering Society, 2016
- Track Chair: "Drug Delivery", Biomedical Engineering Society, 2010
- Track Chair: "Neural Tissue Engineering", Biomedical Engineering Society, 2010
- Track Chair : "Drug Delivery", Society for Biomaterials, 2010
- Track Chair : "Drug Delivery", Society for Biomaterials, 2009
- Session Chair: "BioFunctional Materials", American Chemical Society Regional Meeting, 2009
- Session Chair: "Breast Cancer Drug Delivery", Department of Defense, Era of Hope, 2008
- Track Chair : "Cardiovascular Biomaterials", Society for Biomaterials, 2008
- Track Chair : "Cardiovascular Biomaterials", Society for Biomaterials, 2007
- Session Chair: "Human Embryonic Stem Cells in Tissue Engineering, Biomedical Engineering Society, 2006
- Session Chair: "Polymers in Gene Therapy", World Biomaterials Congress, Kona, HI, 2000

Proposal review panels:

- Reviewer for National Science Foundation
 - CBET, Biomedical Engineering Unsolicited Proposals Panel, 2009
 - IIPC, Biomedical SBIR Panel, 3/2014, 10/2015, 02/2017
 - Graduate Research Fellowships 2014, 2015, 2016, 2017
- Reviewer for National Institutes of Health
 - Challenge Grant Proposals, 2009
 - U54 Center Grants, 2012
 - BMBI, 9/12, 5/15, 6/17
 - SBIR, MOSS, 6/15, 11/15, 11/16, 3/17, 6/17
 - SBIR, BST, 11/16
 - SBIR, IMST, 3/17
 - U01, BST-M, 3/17
 - R01 SAT, 6/17
 - SBIR SBIB, 6/17
 - SBIR CVRS, 7/17
- Reviewer for Department of Defense

- Prostate Cancer Research Program (PCRP) for the Department of Defense Congressionally Directed Medical Research Programs (CDMRP) 2011, 2012, 2015
- Reviewer for the State of Maryland Stem Cell Review Committee, 2007-present
- Reviewer for American Heart Association, Bioengineering and Vascular Biology Review Panels, 2008-present
 - **Identified as an exceptional reviewer, 2012**
- Reviewer for New York Health Department and Empire State Stem Cell Board, 2008, 2009, 2016
- Reviewer for the Kansas City Area Life Sciences Institute, 2008
- Reviewer for the Florida Department of Health, James & Esther King Biomedical Research Program, 2008, 2009, 2010
- Reviewer for American Cancer Society
 - Institutional Research Grant Pilot Awards, 2009-present
 - Silber Student Fellowships, 2009, 2010
- Reviewer for Rice University Hamill Innovation Awards, 2010
- Reviewer for federal grant agencies in:
 - Ireland
 - South Africa
 - Germany
 - Switzerland
 - Hungary
 - Netherlands
 - Italy

Editorial Service:

- Associate Editor, Experimental Biology and Medicine 2012-present
 - Guest Editor, 2 Issues on Immunoengineering, 2016
 - Guest Editor, Issue on Microbiome, 2018
- Editorial Board
 - Regenerative Therapy
 - Guest Editor, Issue on Tissue Engineering, 2016
- Reviewer for:
 - Tissue Engineering
 - Biomaterials
 - Journal of Biomedical Materials Research
 - Journal of Biomaterials Science: Polymer Edition
 - Journal of Controlled Release
 - Macromolecular Bioscience
 - Acta Materialia
 - **Identified as an exceptional reviewer, 2013**

External academic activities:

- **Supervision of summer students from other institutions:**
 - Sara Hurley (Fordham University) “NSF REU Macromol Engineering” June-August 2017
 - Erin Sheehan (Ohio State University) “NSF Supplement” June-August 2017
 - Nimmi Ramanath (UCLA) “CREATE Summer” July-September 2015
 - Gia Velasquez (Yale University), “NSF REU Biomedical Engineering” June-August 2012
 - Ana Dede (WPI), “NSF REU Biomedical Engineering” June-August 2011
 - Kyle Alberti (Syracuse University), “NSF REU Biomedical Engineering” June-August 2010
 - Nicole Averell (University of Akron), “NSF REU Biomedical Engineering” June-August 2009
 - TreChelle Carson (Fisk University), “NSF REU Macromol Engineering” June-August 2008
 - Lauren Dugard (Cornell University), “NSF REU Biomedical Engineering” June-August 2008

- Brian Boies (University of Texas, Southwestern), Summer Medical Student, June-August 2007
- Edgardo Rivera-Delgado (University of Puerto Rico, Mayaguez), “NSF REU Biomedical Engineering” June-August 2007
- **Hosted foreign exchange students:**
 - Johannes F. von Recum, University of Marburg, Marburg, Germany (August -Oct 2009)
 - Maaïke Roefs, University of Twente, Enschede, Netherlands (April – June 2010)
 - Tony Ekkelenkamp, University of Twente, Enschede, Netherlands (Dec, 2010 – Feb 2011)
 - Paul De Jonge, University of Twente, Enschede, Netherlands (Dec, 2011 – Feb 2012)

UNIVERSITY SERVICE

University committees and other service assignments

- Member, Advisory Committee, Support of Undergraduate Research & Creative Endeavors (SOURCE), (2010-2012)
- Member, Graduate Program Directors Committee, Case School of Medicine (2010-2012)
- Member, Case School of Engineering Graduate Studies Committee (2010-2012)
 - Committee Chair (2011-2012)
- Member, Stem Cell Research and Ethics Center, Steering Committee (2009-present)
 - Awarded \$0.7 million in internal (Dean and Provost) funds to develop the Stem Cell Research and Ethics Center, 2010
- Member, Institute for Advanced Materials, Steering Committee (2009-present)
 - Awarded \$1.8 million in internal (Dean and Provost) funds to develop the Institute for Advanced Materials, 2010
 - Co-Chair, Biomaterials Initiative (2012-present)
- Member, Case School of Engineering Research Committee (2005-2007, 2009, 2015-2017)
- Member, Faculty Senate (2014-present)
 - CSE Representative to the Executive Committee 2015-2017
 - Faculty Senate Research Committee 2015-2016
- Member, Undergraduate Academic Standing Board (2012-2019)
- Member, CSE Executive Committee, 2015-2017
- Member, National Center for Regenerative Medicine (2006-present)
 - Chair, Research Leadership Council, (2008-2010)
 - Advisory Council, 2015
 - Co-Director, Pluripotent Stem Cell Facility, (2010-present)
- Member, Case Comprehensive Cancer Center (2007-present)
 - Member, Developmental Therapeutics (2008-present)
 - Member, Cancer Imaging Program (2010-present)
 - Co-Director, Image-Guided Therapeutics Subgroup (2012-present)
 - Member, Angiogenesis Basic Sciences Program (2009-present)
- Member, Clinical Tissue Engineering Center (2005-2009)
- Advisory Board, Cancer Therapeutics Training Grant, (2012-present)

Biomedical Engineering committees and other service assignments

- Leadership Committee, Department of Biomedical Engineering (2008-2012, 2014-2016)
- Chair, Alan Ford Distinguished Lecture Committee (2009-2010)
- Adamczyk Lecture Committee (2017-present)
- Research Committee, Department of Biomedical Engineering (2014-present)
 - Associate Chair (2014-2016)
 - Member (2014-present)
- Graduate Education Committee, Department of Biomedical Engineering (2006-2012, 2014-2016)

- Associate Chair, Director of Graduate Education (2010-2012)
- Vice Chair (2008-2010)
- Member, 2006-2012, 2014-2016
- Chair, Qualifying Exam Subcommittee (2007-2012)
- Member, Department of Biomedical Engineering Undergraduate Education Committee, (2005-2006, 2013)
- Member, Department of Biomedical Engineering Publicity Committee, (2013-2014)

Mentoring summary

- **Graduate student mentoring (see details below):**
 - Total Ph.D. graduates: **6**
 - Current Ph.D. advisees: **1 (co-advised with Agata Exner)**
 - Total M.S. graduates: **8**
 - Current M.S. advisees: **4**
 - Total academic advisees: **15**
 - Total Ph.D. committees: **75**
 - Total M.S. committees: **28**
 - **Total Students 44**
- **Post-doctoral research training (see details below):**
 - Total post-doctoral fellows: **12**
 - Current post-doctoral fellows: **4 (1 co-advised with Danny Manor)**
 - Past research technicians: **2**
- **Undergraduate research mentoring:**
 - Research advisor: **28**
 - Academic advisor: **66 (21 current)**