

## REBECCA KUNTZ WILLITS, PH.D.

Professor and Chairperson  
Department of Chemical Engineering  
Northeastern University  
Boston, MA

### Academic Experience:

**Northeastern University**, Boston, MA

*Department Chair, Chemical Engineering*, July 2020 – present

*Professor in Chemical Engineering*, July 2020 – present

*Affiliated Professor in Bioengineering*, July 2020 - present

**The University of Akron**, Akron, OH

*Interim Department Chair, Biomedical Engineering*, August 2018 – June 2020

*Joint Professor in Mechanical Engineering*, August 2018 – June 2020

*Joint Professor in Chemical, Biomolecular, and Corrosion Engineering*, Aug 2019 – June 2020

*Professor in Biomedical Engineering*, July 2016 – June 2020

*Associate Chair for Graduate Studies in Biomedical Engineering*, Aug 2012 – June 2018

*Margaret F. Donovan Endowed Chair for Women in Engineering*, July 2010 – June 2020

*Associate Professor in Biomedical Engineering*, July 2010 – June 2016

**Case Western Reserve University Medical School**, Cleveland, OH

*Adjunct Assistant Professor for National Center of Regenerative Medicine*, appointed July 2011

**Saint Louis University**, Saint Louis, Missouri

*Associate Professor in Biomedical Engineering*, July 2005 – June 2010

*Secondary Appointment in Chemistry*, July 2009 – June 2010

*Assistant Professor in Biomedical Engineering*, Aug 1999 – June 2005

**Cornell University**, Ithaca, New York

*Research Assistant in Chemical Engineering*, August 1996 - August 1999

Research: Investigating cell migration in biological gels, structural determination of gels and modeling of delivery to reproductive tract

**Johns Hopkins University**, Baltimore, Maryland

*Research Assistant in Chemical Engineering*, August 1994 - August 1996

Research: Investigating cell migration in collagen gels, structural determination of gels

**Tufts University**, Medford, Massachusetts

*Teaching Assistant in Chemistry*, September 1993 - May 1994

*Research Assistant in Chemistry*, June 1993 - December 1993

Research Project: Synthesis of secondary messenger for insulin

### Education & Training:

**National Science Foundation CMMI Game Changer Academies**

"The primary premise of Game Changer Academies is that panel reviews benefit from functional interactions across difference, greater risk tolerance, better recognition of meritorious high-risk proposals, less vulnerability to bias, and more participatory decision-making processes."

Panel Fellow, 2021

Advanced Panel Fellow, 2022

**White People Challenging Racism (WPCR)**, Boston, MA

Fall 2020

**Academics for Black Survival and Wellness (A4BL)**

<https://www.academics4blacklives.com/anti-racism-training>

Summer 2020

**Drexel University**, Philadelphia, PA

Executive Leadership in Academic Technology and Engineering (ELATE) Fellow  
2017-18

**Cornell University**, School of Chemical Engineering, Ithaca, New York

Doctor of Philosophy in Chemical Engineering, August 1999

"Cell Migration in Polymer-Modified Mucus Gels," W. Mark Saltzman, thesis advisor

Minors: Biochemical Engineering & Immunology

**The Johns Hopkins University**, College of Engineering, Baltimore, Maryland

Master of Science in Chemical Engineering, May 1996

"Neutrophil Motility through Gels of the Extracellular Matrix," W. Mark Saltzman, thesis advisor

**Tufts University**, College of Engineering, Medford, Massachusetts

Bachelor of Science in Chemical Engineering, May 1994

summa cum laude

### Scholarly Interests:

Our research laboratory seeks to design 3D environments that control cell response, with a particular emphasis on neuro-regeneration. In order to achieve this goal, we seek to **understand** the behavior of cells and **enhance** neural cell response using techniques that engage endogenous responses. We have demonstrated the mechanosensing response of nerve growth, and have used that response to generate materials to enhance natural repair mechanisms *in vivo*. Our lab is also engaged in diversity, equity, and inclusion initiatives that seek to increase retention of students from those underrepresented in engineering. In addition to advocacy at the local and national level, we participate and lead initiatives ranging from activities in the K-12 classroom, higher education environment, and post-bac/graduate/post-graduate mentoring.

### Academic Honors & Awards:

2024 Gilda Barabino Mentoring Award, Chemical Engineering Northeastern University

2023 College of Engineering **Diversity Recognition Award**, Northeastern University

**Biomedical Engineering Society Fellow**, elected 2020

2018 **Faculty Engagement Award**, LIFE Awards, The University of Akron (nominated and selected by students)

2018 Omicron Delta Kappa **Passion Award**, The University of Akron (nominated and selected by students)

**American Institute of Medical and Biological Engineering Fellow**, elected 2017

2013 UA **Research Mentor of the Year** (nominated by students)

2012 "**Favorite Faculty Member**" by National Residence Hall Honorary, Richard Hansford Chapter, UA

2006 Emerson Electric Co. **Gold Star Grant Award**

2006 Women's Commission "**Woman of the Year**" for Faculty

2005 Council for Advancement and Support of Education (CASE) **Missouri Professor of the Year**

2003 Emerson Electric Co. **Excellence in Teaching Award**

2004 and 2005 SLU nominee for CASE U.S. Professor of the Year Program

2002 **Faculty Excellence Award**, Student Government Association of Saint Louis University

2002 Outstanding **Faculty of the Year**, Association of Parks College Students, Saint Louis U.

NSF **Engineering Education Scholars Workshop**, Carnegie Mellon University, 1999

Whitaker Foundation Scholarship, 1996-1997

Golden Key National Honor Society, 1994

Department of Chemical Engineering Award, Tufts University, 1994

Ghublikian Scholarship, Tufts University scholarship, 1992-1994

AICHE Scholarship Award, 1 of 10 nationally, 1993

Tau Beta Pi, national engineering honor society, 1992

DOW Chemical USA Scholarship, national SWE scholarship, 1992

Richardson Vicks Scholarship, excellence in science and engineering, 1990

### Publications (last 5 yr):

\* indicates undergraduate author; \*\* indicates high school author; #co-first authors

#### **Corresponding Author**

For complete list, visit <https://www.ncbi.nlm.nih.gov/myncbi/1VUk-VpvclrAu/bibliography/public/>

1. **Jacqueline C. Linn**, Erika Moore, Ana Maria Porras, Elizabeth Wayne, Patrick M. Boyle, Lesley W. Chow, Katharina Maisel, Shelly R. Peyton, Sarah E. Stabenfeldt, Kelly R. Stevens, Jessica O. Winter, **Rebecca Kuntz Willits**. Framework for Department-level Accountability to Diversify Engineering. Accepted in *Nature Reviews Bioengineering*, 2024.
2. Yang Hu, Matthew L. Becker, and **Rebecca Kuntz Willits**. Quantification of Cell Migration: Metrics Selection to Model Application. *Frontiers in Cell and Developmental Biology – Cell Adhesion and Migration*, May 2023.
3. Narges Yazdani and **Rebecca Kuntz Willits**. Mimicking the neural stem cell niche: An engineer's view of cell:material interactions. *Frontiers in Chemical Engineering*, Jan 2023.

4. McKay Cavanaugh, Darya Asheghali, Cecilia M. Motta, Elena Silantyeva, Shantanu P. Nikam, Matthew L. Becker, and **Rebecca K. Willits**. Influence of Touch-Spun Nanofiber Diameter on Contact Guidance during Peripheral Nerve Repair. *Biomacromolecules* 2022, 23, 6, 2635–2646. <https://doi.org/10.1021/acs.biomac.2c00379>
5. Emily Mulvany, Sara McMahan, Jiazhu Xu, Narges Yazdani, **Rebecca Willits**, Jun Liao, Ge Zhang, Yi Hong, In vitro comparison of harvesting site effects on cardiac extracellular matrix hydrogels. *Journal of Biomedical Materials Research, Part A*, 2021. <https://doi.org/10.1002/jbm.a.37184>
6. Kelly R. Stevens, Kristyn S. Masters, P.I. Imoukhuede, Karmella A. Haynes, Lori A. Setton, Elizabeth Cosgriff-Hernandez, Muyinatu A. Lediju Bell, Padmini Rangamani, Shelly E. Sakiyama-Elbert, Stacey D. Finley, **Rebecca K. Willits**, Abigail N. Koppes, Naomi C. Chesler, Karen L. Christman, Josephine B. Allen, Joyce Y. Wong, Hana El-Samad, Tejal A. Desai, Omolola Eniola-Adefeso, *Fund Black scientists*, **Cell**, Volume 184, Issue 3, 2021, Pages 561-565. <https://doi.org/10.1016/j.cell.2021.01.011>
7. Jassim, Assraa<sup>#</sup>, McKay Cavanaugh<sup>#</sup>, Lucy Coughlin, Jessica Stukel, **Rebecca Willits**, Denise M. Inman, *Transcorneal Electrical Stimulation Reduces Neurodegenerative Process in a Mouse Model of Glaucoma*. **Annals of Biomedical Engineering**, 2021. <https://doi.org/10.1007/s10439-020-02608-8>
8. Koh, G.P., C. Fouad, W. Lanzinger, **R. K. Willits**. *Effect of Intraoperative Electrical Stimulation on Recovery after Rat Sciatic Nerve Isograft Repair*. **Neurotrauma Reports**, November 2020. <https://doi.org/10.1089/neur.2020.0049>
9. Silantyeva, E., **R.K. Willits**, M.L. Becker. *Post-fabrication Tethering of Molecular Gradients on Aligned Nanofibers of Functional Poly( $\epsilon$ -caprolactone)s*. **Biomacromolecules**. 20(12):4494-4501, 2019.
10. Motta, Cecilia M.M., K.J. Endres, C. Wesdemiotis, **R.K. Willits** and M.L. Becker. *Enhancing Schwann Cell Migration Using Concentration Gradients of Laminin Derived-peptides*. **Biomaterials**. 218:119335, 2019. <https://doi.org/10.1016/j.biomaterials.2019.119335>
11. Cavanaugh, McKay, Elena Silantyeva, Galina Pylypiv Koh, Elham Malekzadeh, William Lanzinger, **Rebecca Willits**, Matthew Becker. *RGD-modified nanofibers enhance functional outcomes in rats after sciatic nerve injury*. *Biomimetic Materials for Regenerative Medicine*; **Journal of Functional Materials**. 2019.
12. Philip, D.#, Silantyeva, E.#, Becker, M.L., and **R.K. Willits**. *RGD-functionalized nanofibers increase early GFAP expression during neural differentiation of mouse embryonic stem cells*. **Biomacromolecules**, #co-first authors. <https://doi.org/10.1021/acs.biomac.9b00018>

**Book Chapters:**

1. Scott, R.A.\* and **R.K. Willits**. *Future applications of injectable biomaterials: the use of microgels as modular injectable scaffolds*, in **Injectable Biomaterials**. Edited by Brent Vernon. Woodhead Publishing. Jan 2011.
2. **Willits, R.K.** and W.M. Saltzman. *Section 10.1, Controlled delivery of systemic therapy in Drug Delivery: Engineering Principles for Drug Therapy* by W.M. Saltzman, Oxford University Press, 2001.
3. **Willits, R.K.** and W.M. Saltzman. *Section 10.3, Topically applied devices for controlled-release in Drug Delivery: Engineering Principles for Drug Therapy* by W.M. Saltzman, Oxford University Press, 2001.

**Conference Proceeding Papers (last 5 yr)**

1. Makki, N., & Cutright, T., & Coats, L., & Willits, R., & Stone, T., & Williams, L., & Rodrigues, D. (2022, August), *Preparation of Female and Minority PhD and Post-Docs for Careers in Engineering Academia (Experience)* Paper presented at 2022 ASEE Annual Conference & Exposition, Minneapolis, MN. <https://peer.asee.org/40880>
2. Cutright, T.J., R.K. Willits, and D.W. Ott. *Comparing effectiveness of peer mentoring for direct admit and college-ready freshmen*. ASEE Annual Conference proceedings, 2020.
3. Cutright, T. J., & Willits, R. K., Coats, L. T., Stone, T., Williams, L. N., & Rodrigues, D. F. *Update on Academics with Diversity Education and Mentorship in Engineering (ACADEME) Activities and Fellows*. ASEE Annual Conference proceedings, 2020.

**Patents & Disclosures:**

- Provisional Patent Filed: "Neuronal biosensor for detection of toxins" at Saint Louis University in May 2012
- Provisional Patent Filed: "Device and method for controlling nerve growth" at UA in April 2013
- Provisional Patent Filed: "Fluorescence-Assisted Counting Apparatus For Qualitative And/Or Quantitative Measurement Of Fluorescently Tagged Particles" at UA in Nov 2013

**Selected Seminars and Presentations**

1. Willits, R.K. *Research Seminar on Microenvironmental Cues for Nerve Regeneration*. Invited.
  - a. Worcester Polytechnic Institute, 4/17/2024
  - b. Cornell University, 9/25/2023

**since 2019:**

- c. Virginia Tech, 3/17/2023
  - d. Colorado School of Mines, 3/3/2023
  - e. Pharmaceutical Sciences, Northeastern, 11/3/2022
  - f. Washington University in St. Louis, 9/21/2022
  - g. Rensselaer Institute of Technology, 4/13/2022
  - h. Stevens Institute of Technology, 10/1/2021
2. Gomez-Maldonado, D.; Yazdani, N.; Zhang, A.; Willits, R. (2023). *Property tuning of PEG microgel-based hydrogels for neural tissue*. In *Sustainable Engineering and Nanofabrication of Polymers: Sustainable Polymers*. ACS Fall 2023, Harnessing the power of data. San Francisco, CA.
  3. Gomez-Maldonado, D.; Zhang, A.; Yazdani, N.; Willits, R.K. (2023). *Characterization of PEG microgel-based hydrogels for tissue engineering*. Northeastern Regional Meeting 2023 American Chemical Society - Chemistry: Crossing Intersections. Boston, MA.
  4. Zhang, A.; Gomez-Maldonado, D.; Willits, R.K. (2023). *Fabrication and characterization of amine-functionalized poly(ethylene glycol) microgels*. Northeastern Regional Meeting 2023 American Chemical Society - Chemistry: Crossing Intersections. Boston, MA.
  5. Narges Yazdani & Rebecca Willits (2023). *The influence of laminin-511 fragments on neural stem cell behavior*. TERMIS. Boston, MA.
  6. Cavanaugh, McKay and Rebecca Willits, *Influence of Tethered Cadherin on Human Induced Pluripotent Neural Stem Cells*, Society for Biomaterials, Baltimore, MD, 2022.
  7. Yazdani, Narges and Rebecca Willits. *The influence of incorporation of laminin peptide sequences on integrin activation and focal adhesion formation*. Society for Biomaterials, Baltimore, MD, 2022.
  8. Cavanaugh, McKay, Darya Asheghali, Cecilia Motta, Elena Silantyeva, Matthew Becker and Rebecca Willits. *Influence of Touch-Spun Fibers Diameter on Neurite Outgrowth and Schwann Cell Migration*. AIChE 2021, Boston MA.
  9. Hong, Yi, Mulvany, Emily, McMahan, Sara, Xu, Jiazhu, Yazdani, Narges, Willits, Rebecca, Liao, Jun, Zhang, Ge. *Cardiac Extracellular Matrix Hydrogels: Harvesting Location Comparison*. BMES 2020, Virtual.
  10. Mawhinney, K., N. Yazdani, M. Kimel, R. Willits, S. Jana. *Analysis of mechanical and cytotoxic properties of emulsion-templated macroporous-mesoporous polyurea gels*. Abstracts of papers of the American Chemical Society, 2019.
  11. Albaba, D.\*, R.K. Willits. *Examining Tube Formation of Human Umbilical Vein Endothelial Cells in Collagen Gels*. BMES 2019, Philadelphia, PA.
  12. Cavanaugh, M. A. Jassim, L. Coughlin, J. Stukel, D. Inman, R. Willits. *Transcorneal Electrical Stimulation Shown To Reduce The Signs Of Glaucoma*. BMES 2019, Philadelphia, PA.
  13. Willits, R.K. *Microenvironmental cues to enhance neural repair*. University of Minnesota, 10/2019. *Invited*.
  14. Willits, R.K. *Engineering the environment to enhance nerve regeneration*. UVM, 2/2019. *Invited*.

**Research Funding (current):**

NIH 1 R01 NS124889-01A1: "Synergistic Enhancement of Peripheral Nerve Defect Repair using Peptide Functionalized Aligned Nanofiber Conduits" 6/1/2022 – 5/31/2027 (\$858,408 (total) to Willits lab; co-I)

NSF CMMI Grant. Project Entitled: "Toward a Mechanotransduction Mimic of the Neural Stem Cell Niche" 9/1/2019 – 8/30/2024. (\$466,457.00; PI, 100%)

**Teaching:****Northeastern University**

Tissue Engineering & Regenerative Medicine Journal Club, Spring 2022

Faculty sponsor/advisor for Capstone group: Spring 2021, Fall 2022, Spring 2024

**The University of Akron*****Courses Developed or Significantly Redesigned:***

Transport Fundamentals for BME (Undergraduate, Fall 2014, Fall 2015, Fall 2017)

Biomaterials Characterization (Graduate, Spring 2011)

Biotransport (Undergraduate/Graduate, Spring 2012)

Independent Research (Undergraduate, Fall 2011, Spring 2012, Summer 2014, Spring 2015, Fall 2015, Spring 2016, Fall 2016, Fall 2017, Fall 2018)

Fundamentals of Biomedical Engineering (Graduate, Fall 2013, Fall 2014, Fall 2015, Fall 2016, Fall 2018, Spring 2020)

Experimental Techniques in Biomaterials (Undergraduate, Spring 2015, Spring 2016, Spring 2017)

Biomaterials Lab (Undergraduate, Spring 2018)

Immunology and Biomedical Engineering (Graduate, Fall 2016)

**Other Courses Taught:**

Tools for Biomedical Engineers (Undergraduate, Fall 2019)  
 Sophomore Seminar (Undergraduate, Fall 2019)  
 Introduction to BME Design (Undergraduate, Spring 2019)  
 Biofluid Mechanics (Undergraduate, Fall 2010, Fall 2011, Fall 2012, Fall 2013, Fall 2014)  
 Biomedical Computing (Undergraduate, Spring 2011, Spring 2012, Spring 2013)  
 Tissue Engineering (Undergraduate/Graduate, Fall 2012)  
 Transport Phenomena in Biomedical Engineering (Graduate, Spring 2012)  
 BME Graduate Colloquium (Graduate, Fall 2012, Spring 2013, Fall 2013, Fall 2014)  
 Mini-course in Developing a Graduate Fellowship Proposal (Graduate, Fall 2015)

**Saint Louis University****Courses Developed:**

Transport Fundamentals (2000-2009)  
 Biotransport (2001-2010)  
 Tissue Engineering (2001 – 2004; 2009)  
 Drug Delivery (2006)  
 Design of BME Laboratory Experiments (2002 – 2009)  
 Numerical Methods (2007-2009)  
 Advanced Transport (2004)

**Other Courses Taught :**

Senior Project (Group Mentor, 1999 – 2010)  
 Departmental Seminar (2008-9)

**Cornell University****Lectures Given :**

“Drug Delivery & HIV” in introductory Biomedical Engineering course

**Professional and Honor Societies:**

American Chemical Society  
 American Institute of Chemical Engineers  
 Biomedical Engineering Society  
 Golden Key Honor Society  
 National Center for Regenerative Medicine  
 American Association for the Advancement of Science  
 Sigma Xi  
 Society for Biomaterials  
 Tau Beta Pi, President MA $\Delta$ , 1993-1994  
 Women in Engineering ProActive Network (WEPAN)  
 American Institute for Medical and Biological Engineering

**Service:****To the Chemical Engineering profession:**

- Organized and ran a national seminar series for diverse faculty candidates in Chemical Engineering, 2021-2022
- MichBio Panelist, **Funding Disparities Between Black and White Scientists - A National Call to Action**, <https://www.youtube.com/watch?v=qZ8cl1WbGn0>
- Co-Founded and organized a Department Chair group and forum for regional (Northeast/Mid-Atlantic) chemical engineering department heads.
- Co-Developed seminar workshops for future faculty in Chemical Engineering, 2024-present

**Advisory Boards**

- **Tufts University Chemical Engineering**, External Advisory Board, Member 2022-present
- **Cornell University Chemical Engineering**, Smith School Advisory Council, Member 2024-present

**American Institute for Chemical Engineers**

- Undergraduate Poster judge: 2021

**American Institute for Medical & Biological Engineers National Roles:**

- **Fellow review committee**: 2017, 2020
- **Nominations committee**: 2022, 2023

**WEPAN National Board of Directors, 2021 – 2023**

- **Research Committee**
- **Membership Committee**

**Biomedical Engineering Society National Roles:****BMES Board of Directors**, 2017 - 2020**BMES Meetings Committee**, 2007-2010**BMES National Meeting Program Co-Chair**, 2008**BMES Student Affairs Committee**, Member: 2009, 2010, 2013, 2014; Co-Chair: 2010-2011,  
Chair: 2011 – 2013**BMES Undergraduate Research Track Co-Chair**, 2010**BMES Awards Committee**, Member: 2013-2019; Chair: 2015-2018**BMES Diversity Committee**, 2018 – 2021**BMES ad hoc Elections Committee**, Chair, 2021-2022 – This committee developed  
recommendations to increase the transparency of the elections process.**Society for Biomaterials**

- **Awards Committee (elected)** 2020-21, 2023-24
- **Membership Committee** 2023-24
- **Session Coordinator/co-chair** 2022

**Controlled Release Society National Role:**

Education Committee

**Sigma Xi, SLU Chapter:**

Secretary, 2005-2010.

**Advisor to Student Professional Organizations:**

UA BMES student organization, 2011 – present.

UA Tau Beta Pi advisor, 2018 – present.

SLU BMES student organization, 1999 – 2010.

SLU SWE student organization, 2003 – 2010.

**Editorial Board:****Annals of Biomedical Engineering**, 2020 – present.**Peer Review – Grants:**

ACS, Research Corp, NSERC, NIH, NSF, DOD

**National Conference Session Chair:***Neural Tissue Engineering*, 2001 BMES Annual Meeting*Tissue Engineering I*, 2001 SFB*Natural and Bioinspired Materials I*, 2016 BMES*Dynamic Biomaterials*, 2016 BMES*Drug Delivering Biomaterials III*, 2017 BMES*Mechanobiology of Stem Cell Engineering*, 2019 BMES**National Conference Paper/Abstract Reviewer:***Multimedia Session*, 2002 ASEE Annual Conference*Session N – Biological and Biomimetic Materials-Properties to Function*, 2002 MRS Annual  
Spring Conference*Tissue Engineering*, 2001 SFB

BMES, 2008, 2009, 2010, 2012, 2013, 2014, 2015, 2016, 2017, 2018, 2019, 2022