THOMAS R. GABORSKI

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Tom Gaborski is a biomedical engineer, professor, and entrepreneur with expertise in materials engineering, biological separations, and cellular barrier models, including the biophysical study of cell-substrate interactions.

As the director of the NanoBio Materials Laboratory at RIT, he leads a team studying and developing nanomembranes for tissue-on-a-chip and the purification of extracellular vesicles. His laboratory has been funded by six different institutes at the National Institutes of Health, the National Science Foundation, New York State, the Hopeman Foundation, and two industry partners. He joined RIT in the spring of 2012 as a founding member of the Biomedical Engineering Department. Before returning to academia, Tom was the co-founder and president of SiMPore, an early-stage nanomaterials company, where he helped raise two rounds of investment, was awarded three NIH grants as principal investigator, and brought several products to market.

PROFESSIONAL EXPERIENCE

Department Head, Biomedical Engineering 2024-Present
Rochester Institute of Technology, Rochester, NY

Professor, Biomedical Engineering 2022-Present
Rochester Institute of Technology, Rochester, NY

Founding Director, Biomedical and Chemical Engineering Ph.D. Program 2020-2023
Rochester Institute of Technology, Rochester, NY

Associate Professor, Biomedical Engineering 2017-2022
Rochester Institute of Technology, Rochester, NY

Assistant Professor (Founding Member), Biomedical Engineering 2012-2017
Rochester Institute of Technology, Rochester, NY

President 2009-2012
SiMPore Inc., West Henrietta, NY

Vice President of Life Sciences 2008-2009
SiMPore Inc., West Henrietta, NY

Co-Founder & Board Member 2007-present
SiMPore Inc., West Henrietta, NY

EDUCATION

University of Rochester, Rochester, NY
Ph.D. in Biomedical Engineering 2008
Dissertation: *Quantitative methods for understanding physical mechanisms of neutrophil adhesion*

University of Rochester, Rochester, NY
M.S. in Biomedical Engineering 2004

Cornell University, Ithaca, NY
B.S. in Biological and Environmental Engineering 2002

AWARDS AND HONORS

RIT Board of Trustees Scholarship Award 2024
RIT Million Dollar PI Award 2019

Featured Faculty - RIT's Faculty Scholarship Report	2016
Young Innovator Award in Cellular and Molecular Bioengineering, BMES	2014
One of 10 Faculty to Watch – RIT Athenaeum	2014
Kirschstein Individual Predoctoral Fellowship (F31), NIH NIBIB	2005
Graduate Teaching Award, University of Rochester	2007
Sproull Presidential Graduate Fellowship, University of Rochester	2002
Undergraduate Teaching Award, Cornell University	2002

TEACHING EXPERIENCE (11 DIFFERENT COURSES: 6 NEW COURSES DEVELOPED, 3 REDESIGNED)

Interdisciplinary Research Methods BMECHE/ENGR 701 (RIT): 2022, 2023
This course emphasizes collaboration in modern research environment and are introduced to the concepts of inter-disciplinary and trans-disciplinary research conducted from both a scientific and an engineering perspective. Required course for first-year Engineering Ph.D. students. Co-taught with two other Engineering Ph.D. program directors.

Graduate Research Practicum BIME 697 (RIT): 2022, 2023
This course gives students supervised practical training within academic research laboratories prior to conducting their own dissertation research. Students will identify a laboratory or laboratories to conduct research. Students will be trained on experimental or computational methods specific to that laboratory and learn relevant applied data analysis techniques.

Graduate Research Seminar BMECHE/ENGR 795 (RIT): 2022, 2023
Weekly internal and external seminar series for all Biomedical and Chemical Engineering Graduate Students.

Graduate Literature Review BIME 749 (RIT): 2022
This course introduces students to the methods involved in conducting a review of existing research. Students will also review current journal articles within a specific research domain identified by the course instructor. The course will allow flexibility for students to select and critically review articles that align with their research interests within this domain. Elective graduate course (enrollment 11).

Medical Device Design BIME407 (RIT): 2018, 2019, 2020*, 2021*, 2022, 2023
Renamed and redesigned the curriculum to implement the team project-based Biodesign process.
Required core BME course plus elective for other engineering majors (enrollment 55-65)
*HyFlex simultaneous in-person and on-line 2020 and 2021

Engineering Cell-Substrate Interactions BIME770 (RIT): 2019
Designed, developed and delivered. Lecture and Lab.
Elective graduate course (enrollment 7)

Tissue Engineering BIME570/670 (RIT): 2014, 2015, 2016, 2018
Designed, developed and delivered four times.
Elective undergraduate and graduate course (enrollment 15)

Introduction to Biomaterials BIME370 (RIT): 2013, 2014, 2015, 2016, 2017, 2018
Designed, developed and delivered.
Required core BME course (enrollment 55-60)

Systems Physiology II BIME 411 (RIT): 2012, 2015
Designed, developed and delivered. Co-taught with Daniel Phillips.
Required core BME course (enrollment 50)

Musculoskeletal Biomechanics BIME200 (RIT): 2012
Redesigned course content and refined laboratory exercises. Lecture and Lab.
Required core BME course (enrollment 45)

Introduction to Programming for Biomechanics BME201L (University of Rochester): 2005, 2006
Required core BME course covering programming fundamentals using MATLAB (enrollment 45)

JOURNAL PUBLICATIONS (RIT STUDENTS AND THOSE MENTORED ARE UNDERLINED)

54. Torabian P, Singh N, Crawford J, Gonzalez G, Burgado N, Videva M, Miller A, Perdue J, Dinu M, Pietropaoli A, **Gaborski TR**, Michel LV. The effect of clinically relevant beta-lactam, aminoglycoside, and quinolone antibiotics on bacterial extracellular vesicle release from E. coli. bioRxiv preprint. doi.org/10.1101/2023.11.22.568081
53. Poskus MD, **Gaborski TR** and Day SW. Computational Modeling of Blood Damage and Mass Transport in A Membrane-based Microfluidic Device. bioRxiv preprint. doi.org/10.1101/2020.06.15.152686
52. Ramirez MM, Soule CW, Delgadillo LF and **Gaborski TR**. Nanopatterned thermoresponsive functionalization of substrates via nanosphere lithography. bioRxiv preprint. doi.org/10.1101/796268
51. Winston T, Song S, Shi H, Yang Y, Alsudais M, Kontaridis MI, Wu Y, **Gaborski TR**, Meng Q, Cooney RN, Ma Z. Lineage-Specific Mesenchymal Stromal Cells Derived from Human iPSCs Showed Distinct Patterns in Transcriptomic Profile and Extracellular Vesicle Production. Advanced Science. 2024. https://doi.org/10.1002/advs.202308975
50. McCloskey MC, Pelin K, Trempel M, Widom LP, Kuebel J, Chen K, **Gaborski TR**, Engelhardt B, McGrath JL. Use of the MicroSiM (μSiM) Barrier Tissue Platform for Modeling the Blood-Brain Barrier. J. Vis. Exp. 2024. 203: e65258.
49. Goliwas KF, Libring S, Berestesky ED, Gholizadeh S, Schwager SC, Frost A, **Gaborski TR**, Zhang J and Reinhart-King C. Mitochondrial Transfer from Cancer Associated Fibroblasts Increases Migration in Aggressive Breast Cancer. Journal of Cell Science. 2023. 136(14): jcs260419.
48. Gholizadeh S, Allahyari Z, Carter RN, Delgadillo LF, Marchi N and **Gaborski TR**. Optimization of Parylene C and Parylene N thin films for use in cellular co-culture and tissue barrier models. Scientific Reports. 2023. 13: 4262.
47. Mansouri MM, Ahmed A, Ahmad D, McCloskey MC, Joshi IM, **Gaborski TR,** Waugh RE, McGrath JL, Day SW and Abhyankarr VV. The Modular μSiM Reconfigured: Integration of Microfluidic Capabilities to Study in vitro Barrier Tissue Models under Flow. Advanced Healthcare Materials. 2022. 11(21): 2200802.
46. Michel LV and **Gaborski TR**. Outer Membrane Vesicles as Molecular Biomarkers for Gram-negative Sepsis: Taking Advantage of Nature's Perfect Packages. Journal of Biological Chemistry. 2022. 298(10):102483.
45. Ahmed A, Joshi IM, Mansouri MM, Byerley AM, Day SW, **Gaborski TR** and Abhyankarr VV. Local Extensional Flows Induce Long-Range Fiber Alignment in 3D Collagen Hydrogels. Biofabrication. 2022. 14(3): 035019.
44. Allahyari Z and **Gaborski TR**. Engineering Cell-Substrate Interactions on Porous Membranes for Microphysiological Systems. Lab on a Chip. 2022. 22: 2080-2089.
43. Allahyari Z, Casillo SM, Perry SP, Gholizadeh S and **Gaborski TR**. Disrupted Surfaces of Porous Membranes Reduce Nuclear YAP Localization and Enhance Adipogenesis through Morphological Changes. ACS Biomaterials Science & Engineering. 2022. 8(5): 1791-1798.
42. Lucas K, Dehghani M, Khire T, Flax JD, **Gaborski TR** and McGrath JL. A Predictive Model of Nanoparticle Capture on Ultrathin Nanoporous Membranes. Journal of Membrane Science. 2021. 633: 119357.
41. Ahmed A, Joshi IM, Mansouri MM, **Gaborski TR** and Abhyankarr VV. Engineering Fiber Anisotropy within Natural Collagen Hydrogels. American Journal of Physiology-Cell Physiology. 2021. 320(6): C1112-C1124.
40. Ahmed A, Joshi IM, Larson S, Gholizadeh S, Forouzandeh F, Borkholder DA, **Gaborski TR** and Abhyankar AA. Microengineered Three-Dimensional Collagen Landscapes with Independetly Tunable Fiber Anisotropy and Directionality. Advanced Materials Technologies. 2021. 6(4): 2001186.
39. Rode RP, Chung HH, Miller HN, **Gaborski TR** and Moghaddam S. Trilayer Interlinked Graphene Oxide Membrane for Wearable Hemodialyzer. Advanced Materials Interfaces. 2021. 8(3): 2170011. (***Cover Illustration***).
38. Gholizadeh S, Allahyari Z, Carter RN, Delgadillo LF, Marchi N and **Gaborski TR**. Robust Variable and Gradient Thickness Membranes for Tissue Barrier Models. Advanced Materials Technologies. 2020. 5(12): 2000474.
37. Salminen AT, Tiothof J, Izhiman Y, Masters EA, McCloskey MC, **Gaborski TR**, Kelley DH, Pietropaoli AP, Waugh RE and McGrath JL. Endothelial Cell Apicobasal Polarity Facilitates Distinct IL-8 Secretion and Immune Responses to Systemic vs. Local Inflammation. Integrative Biology. 2020. 12(11): 275–289.
36. Salminen AT, Allahyari Z, Gholizadeh S, McCloskey MC, Ajalik R, Cottle RN, **Gaborski TR** and McGrath JL. In Vitro Studies of Transendothelial Migration for Biological and Drug Discovery. Frontiers in Medical Technology. 2020. 2: 600616.
35. Ramirez MM, Soule CW, Dehghani M and **Gaborski TR**. Use of Nanosphere self-assembly to pattern ultrathin membranes for the study of extracellular Vesicles. Nanoscale Advances, 2020. 2, 4427-4436. (***Cover Illustration***)
34. Lucas K, Ahmad SD, Dehghani M, **Gaborski TR** and McGrath JL. Critical Flux Behavior of Ultrathin Silicon Nanomembranes. Separation and Purification Technology. 2020. 251:117342.
33. Dehghani M, Gulvin SM, Flax J and **Gaborski TR**. Systematic evaluation of PKH Labelling on extracellular Vesicle Size by nanoparticle tracking Analysis. Scientific Reports. 2020. 10:9533.

32. Miller JJ, Carter JA, Hill K, DesOrmeaux JPS, Carter RN, **Gaborski TR**, Roussie JA, McGrath JL and Johnson DG. Free Standing, Large Area Silicon Nitride Membranes for High Toxin Clearance and Small Format Hemodialysis. Membranes. 2020. 10(6): 119.
31. Piazza N, Dehghani M, **Gaborski TR** and Wuertz-Kozak K. Therapeutic potential of extracellular vesicles in degenerative diseases of the intervertebral disc. Frontiers Bioengineering and Biotechnology. 2020. 8:311.
30. Khire TS, Salminen AT, Swamy H, Lucas KS, McCloskey MC, Ajalik RE, Chung HH, **Gaborski TR**, Waugh RE, Glading AJ and McGrath JL. et al. Microvascular Mimetics for the Study of Leukocyte–Endothelial Interactions. Cellular and Molecular Bioengineering. 2020. 13:125-139. (***Cover Illustration***)
29. Hill K, Walker SN, Salminen AT, Chung HL, Li Z, Ezzat B, Miller JJ, Desormeaux JP, Zhang J, Hayden A, Burgin T, Piraino L, May MN, **Gaborski TR**, Roussie JA, Taylor J, DiVicenti L, Shestopalov AA, McGrath JL and Johnson DG. Second Generation Nanoporous Silicon Nitride Membranes for High Toxin Clearance and Small Format Hemodialysis. Advanced Healthcare Materials. 2020 9(4):1900750.
28. Allahyari Z, Gholizadeh S, Chung HH, Delgadillo, LF and **Gaborski TR**. Micropatterned Poly(ethylene glycol) Islands Disrupt Endothelial Cell–Substrate Interactions Differently from Microporous Membranes. ACS Biomaterials Science & Engineering. 2020. 6(2):959-968.
27. Dehghani M, Lucas K, Flax J, McGrath J and **Gaborski TR**. Tangential flow microfluidics for the capture and release of nanoparticles and extracellular vesicles on conventional and ultrathin membranes. Advanced Materials Technologies. 2019 4(11): 1900539.
26. Salminen AT, Zhang J, Madejski GR, Khire TS, Waugh RE, McGrath JL and **Gaborski TR**. Ultrathin Dual-Scale Nano- and Micro-Porous Membranes for Vascular Transmigration Models. Small. 2019. 15(6): 1804111. (***Cover Illustration***)
25. Chung HH, Bellefeuille S, Miller HN and **Gaborski TR**. Extended live-tracking and quantitative characterization of wound healing and cell migration with SiR-Hoechst. Experimental Cell Research. 2018. 1-2:198-210.
24. Chung HH, Ramirez MM, Kwarta BJ and **Gaborski TR**. Use of Porous membranes in tissue barrier and co-culture models. Lab on a Chip. 2018. 18:1671-1689.
23. Chung HH, Casillo SM, Perry SJ and **Gaborski TR**. Porous substrates promote early endothelial migration at the expense of fibronectin fibrillogenesis. ACS Biomaterials Science & Engineering. 2018 4(1): 222-230. (***Cover Illustration***)
22. Ramirez MM and **Gaborski TR**. Fabrication Techniques Enabling Ultrathin Nanostructured Membranes for Separations. Electrophoresis. 2017. 38 (19): 2374-2388.
21. Casillo SM, Peredo AP, Perry SJ, Chung HH and **Gaborski TR**. Membrane pore spacing can modulate endothelial cell-substrate and cell-cell interactions. ACS Biomaterials Science & Engineering. 2017. 3(3): 243-248.
20. Carter RN, Casillo SM, Mazzocchi AR, DesOrmeaux JS, Roussie JA and **Gaborski TR**. Ultrathin transparent membranes for cellular barrier and co-culture models. Biofabrication. 2017. 9(1): 015019.
19. Winans JD, Smith KJP, **Gaborski TR**, Roussie JA, McGrath JL. Membrane capacity and fouling mechanisms for ultrathin nanomembranes in dead-end filtration. Journal of Membrane Science. 2016. 499: 282-289.
18. Qi C, Striemer CC, **Gaborski TR**, McGrath JL and Fauchet PM. Influence of silicon dioxide capping layers on pore characteristics in nanocrystalline silicon membranes. Nanotechnology. 2015. 26 (5): 055706.
17. Miller JJ, Carter RN, McNabb KB, Winans JD, DesOrmeaux JS, Striemer CC and **Gaborski TR**. Lift-off of Large-Scale Ultrathin Nanomembranes. Journal of Micromechanics and Microengineering. 2015. 25 (1): 015011.
16. Nehilla BJ, Nataraj N, **Gaborski TR** and McGrath JL. Endothelial Vacuolization Induced by Highly-permeable Silicon Membranes. Acta Biomateriala. 2014. 10 (11): 4670-4677.
15. DesOrmeaux JS, Winans JD, Wayson SE, **Gaborski TR**, Khire TS, Striemer CC and McGrath JL. Nanoporous Silicon Nitride Membranes Fabricated from Porous Nanocrystalline Silicon Templates. Nanoscale. 2014. 6 (18): 10798-10805.
14. Mazzocchi AR, Man AJ, DesOrmeaux JS and **Gaborski TR**. Porous membranes Promote Endothelial Differentiation of Adipose-Derived Stem Cells and Perivascular Interactions. Cellular and Molecular Bioengineering. 2014. 7(3): 369-378.
13. Qi C, Striemer CC, **Gaborski TR**, McGrath JL and Fauchet PM. Highly Porous Silicon Membranes Fabricated from Silicon Nitride/Silicon Stacks. Small. 2014. 10(14): 2946–2953.
12. **Gaborski TR**, Sealander MN, Waugh RE and McGrath JL. Dynamics of adhesion molecule domains on neutrophil membranes: Surfing the dynamic cell topography. European Biophysics Journal. 2013. 42(11-12):851-855.
11. Snyder JL, Getpreecharsawas J, Fang DZ; **Gaborski TR**, Striemer CS, Fauchet PM, Borkholder DA and McGrath JL. High performance, low voltage electroosmotic pumps with molecularly thin nanoporous silicon membranes. PNAS. 2013. 110(46):18424-30.

10. Johnson DG, Khire TS, Lyubarskaya YL, Smith KJ, DesOrmeaux JS, Taylor JG, **Gaborski TR**, Shestopalov AA, Striemer CC, McGrath JL. Ultrathin Silicon Membranes for Wearable Hemodialysis. Advances in Chronic Kidney Disease. 2013. 20 (6): 508-515.
9. Kavalenka MN, Striemer CC, Fang DZ, Shome K, **Gaborski TR**, McGrath JL, Fauchet PM. Ballistic and non-ballistic gas flow through ultrathin nanopores. Nanotechnology. 2012. 13;23(14):145706.
8. Snyder JL, Clark A Jr., Fang DZ, **Gaborski TR**, Striemer CC, Fauchet PM, McGrath JL. An experimental and theoretical analysis of molecular separations by diffusion through ultrathin nanoporous membranes. J Memb Sci. 2011. 1;369(1-2):119-129.
7. **Gaborski TR**, Snyder JL, Striemer CC, Fang DZ, Hoffman M, Fauchet PM, McGrath JL. High Performance Separation of Nanoparticles with Ultrathin Porous Nanocrystalline Silicon (pnc-Si) membranes. ACS Nano. 2010. 23; 4(11):6973-81.
6. Fang DZ, Striemer CS, **Gaborski TR**, McGrath JL and Fauchet PM. Methods for controlling the morphology of ultra-thin porous nanocrystalline silicon membranes. J Phys: Condens Matter 2010 Nov 17; 22(45):4134
5. Fang DZ, Striemer CS, **Gaborski TR**, McGrath JL, Fauchet PM. Pore size control of ultra-thin silicon membranes by rapid thermal carbonization. Nano Letters. 2010. 10(10):3904-8.
4. Agrawal AA, Nehilla BJ, Reisig KV, **Gaborski TR**, Fang DZ, Striemer CC, Fauchet PM, McGrath JL. Porous nanocrystalline silicon as a substrate for cell culture experiments. Biomaterials. 2010. 31(20):5408-17.
3. **Gaborski TR**, Sealander MN, Ehrenberg MS, Waugh RE, McGrath JL. Image Correlation Microscopy for Mobility and Cluster Measurements Using Uniform Illumination. Journal of Microscopy. 2010. 237(1):39-50.
2. **Gaborski TR**, Clark Jr A, Waugh RE, McGrath JL. Membrane mobility of beta2 integrins and rolling associated adhesion molecules on resting neutrophils. Biophysical Journal. 2008. 95(10):4934-47.
1. Striemer CC, **Gaborski TR**, McGrath JL, Fauchet PM. Charge- and size-based separation of macromolecules using ultrathin silicon membranes. Nature. 2007. 445(7129):749-53.

BOOK CHAPTERS

1. M Dehghani and **TR Gaborski**. Fluorescent Labeling of Extracellular Vesicles. Extracellular Vesicles Vol. 45. Methods of Enzymology. Academic Press, New York, 2020.
2. **TR Gaborski** and JL McGrath. Dynamics of the Neutrophil Surface During Emigration from Blood. Principles of Cellular Engineering: Understanding the Biomolecular Interface. Academic Press, New York, 2006.

PATENTS (4 ISSUED, 3 ADDITIONAL APPLICATIONS)

4. CC Striemer, PM Fauchet, **TR Gaborski**, and JL McGrath, “Ultrathin Porous Nanoscale Membranes, Methods of Making, and Uses Thereof,” US Patent No. 8,518,276, Issued May 27, 2013. (*Licensed*)
3. CC Striemer, PM Fauchet, **TR Gaborski**, and JL McGrath, “Ultrathin Porous Nanoscale Membranes, Methods of Making, and Uses Thereof,” US Patent No. 8,182,590, Issued May 22, 2012. (*Licensed*)
2. JL McGrath, **TR Gaborski**, JL Snyder, CC Striemer, PM Fauchet, and M. Springer, “Cell Culture Devices Having Ultrathin Porous Membrane and Uses Thereof,” US Patent No. 8,119,394, Issued February 21, 2012. (*Licensed*)
1. JL McGrath, IM Schwartz, M Bindschalder, M Ehrenberg, and **TR Gaborski**. “Nanofabrication using actin filaments.” US Patent No. 7,193,054. Issued March 20, 2007.

SELECT CONFERENCE PLATFORM PRESENTATIONS AND INVITED TALKS (2012-PRESENT)

31. Development of Nanopocket Membranes for the Purification and Fractionation of Extracellular Vesicle Subpopulations. ISEVxTech – International Society of Extracellular Vesicles. Honolulu, HI. November 17, 2022.
30. The Discontinuous Surface of Porous Membranes Can be Engineered to Reduce Cell-Substrate Interactions Similarly to Soft Materials. American Institute for Chemical Engineering Annual Meeting. Phoenix, AZ. November 14, 2022.
29. Development of Nanopocket Membranes for the Purification and Fractionation of Extracellular Vesicle Subpopulations. Exosomes, Microvesicles and Other Extracellular Vesicles Keystone Symposia. Santa Fe, NM. November 2, 2022. (Invited)
28. How a serendipitous discovery and side project led to the founding of a nanomaterials company. Northeast Regional Meeting of the American Chemical Society (ACS). Rochester, NY. October 5, 2022. (Invited)
27. Towards the Development of Nanopocket Membranes for the Purification and Fractionation of Extracellular Vesicle Subpopulations. Northeast Regional Meeting of the American Chemical Society (ACS). Rochester, NY. October 4, 2022. (Invited)

26. Towards the Development of Nanopocket Membranes for the Purification and Fractionation of Extracellular Vesicle Subpopulations. The Ohio State University and Nationwide Children's Hospital. July 28, 2022. (Invited)
25. Engineering the Ideal Membrane: in vitro Tissue Barrier and Cellular Co-Culture Models. University of Massachusetts - Amherst. Amherst, MA. March 24, 2022. (Invited)
24. Engineering the Ideal Membrane: in vitro Tissue Barrier and Cellular Co-Culture Models. Brandeis University. Waltham, MA. January 24, 2022. (Invited)
23. Development of Nanopocket Membranes for the Purification and Fractionation of Extracellular Vesicles. American Institute of Chemical Engineers Annual Meeting. Boston, MA. November 10, 2021.
22. Engineering the Ideal Membrane: in vitro Tissue Barrier and Cellular Co-Culture Models. Syracuse Biomaterials Institute. Syracuse, NY. October 20, 2021. (Invited)
21. Development of nanopocket membranes for tangential flow analyte capture (TFAC) of extracellular vesicles. North American Membrane Society Annual Meeting. Phoenix, AZ – Virtual. May 20, 2020.
20. Engineering porous membranes to optimize in vitro cellular barrier models. IEEE Nanomedicine. Honolulu, HI. December 4, 2018. (Invited)
19. Transparent Ultrathin Porous Membranes for Cellular Barrier & Co-Culture Models. Biomedical Engineering Department Seminar. Vanderbilt University. Nashville, TN. March 14, 2018. (Invited)
18. From Academia to Startup Life and Back Again. Biochemistry & Cellular and Molecular Biology Department Seminar Series. University of Tennessee. Knoxville, TN. February 28, 2018. (Invited)
17. Transparent Ultrathin Porous Membranes for Cellular Barrier & Co-Culture Models. Biomedical Engineering Department Seminar. University of Toledo. Toledo, OH. September 15, 2017. (Invited)
16. Capture and Release of Extracellular Vesicles on Nanoporous Membranes. ASME International Conference on Mini Micro and Nanochannels. Boston, MA. August 30, 2017.
15. Transparent and ultrathin nanomembranes for cellular barrier and co-culture models. Biomedical Engineering Society Annual Meeting. Minneapolis, MN. October 7, 2016.
14. Focus Group. Foresight Institute Atomic Precision Workshop. Breakthrough Technologies for Energy. Palo Alto, CA. May 20-22, 2016. (Invited)
13. BME 6670 – Bionanotechnology. Improving human health with nanotechnology - A case study on hemodialysis. Cornell University. Ithaca, NY. November 17, 2015. (Invited Guest Lecture)
12. Ultrathin silicon-based nanomembranes for Biomedical Applications. Mechanical Engineering Department Seminar. University of Florida. Gainesville, FL. October 13, 2015. (Invited)
11. Ultrathin silicon-based nanomembranes can revolutionize biological separations and serve as advanced cell culture platforms. ASME International Conference on Nano-, Micro- and Mini-Channels. July 7, 2015. (Invited)
10. Ultrathin Membranes Promote Endothelial Differentiation of Adipose-Derived Stem Cells. Invited Presentation. World Stem Cell and Regenerative Medicine Congress. London, UK. May 22, 2015. (Invited)
9. BME 6670 – Bionanotechnology. Improving human health with nanotechnology - A case study on hemodialysis. Cornell University. Ithaca, NY. November 13, 2014. (Invited Guest Lecture)
8. Porous membranes Promote Endothelial Differentiation of Adipose-Derived Stem Cells and Perivascular Interactions. Young Innovator Award Session. Biomedical Engineering Society Annual Meeting. San Antonio, TX. October 25, 2014. (Invited)
7. BME 6670 – Bionanotechnology. Improving human health with nanotechnology - A case study on hemodialysis. Cornell University. Ithaca, NY. October 29, 2013. (Invited Guest Lecture)
6. Low-Voltage Electroosmotic Flow and DNA Shearing Using Ultrathin Nanoporous Silicon Membranes. Platform Talk. Biomedical Engineering Society Annual Meeting. Seattle, WA. September 28, 2013.
5. Highly Permeable, Transparent and Degradable Membranes for Tissue Scaffolding. Platform Talk. Microscopy and Microanalysis Annual Meeting. Indianapolis, IN. August 6, 2013.
4. Low voltage electroosmotic pumps for lab-on-a-chip applications using molecularly thin silicon membranes. IEEE Electronic Devices Society of Western NY Annual Meeting. November 14, 2012. (Invited Keynote Talk)
3. BME 6670 – Bionanotechnology. Improving human health with nanotechnology - A case study on hemodialysis. Cornell University. Ithaca, NY. October 16, 2012. (Invited Guest Lecture)
2. Dynamics of Adhesion Molecule Domains on Neutrophil Membranes. Microscopy & Microanalysis. July 31, 2012. Phoenix, AZ.
1. Optically Transparent and Permeable Microarrays for Cellular Assays. Microscopy & Microanalysis. August 1, 2012. Pheonix, AZ.

EXTERNAL RESEARCH FUNDING
(CUMULATIVELY $7M AWADED TO GABORSKI AND >$20M COLLABORATIVELY)

ACTIVE PROJECTS

R35 GM153461 6/1/24-5/31/29
National Institutes of Health/NIGMS
Engineering Cell-Substrate Interactions on Porous Membranes to Create Physiologically Relevant Model Systems
The overall goal of this research proposal is to understand how cells behave on porous substrates and then engineer ideal membranes to integrate into *in vitro* tissue barrier and co-culture models. These models will aid in drug candidate screening as well as improve our understanding of how cells communicate under normal and pathological conditions in the body.
Role: PI; $1,811,600 to Gaborski

U2C AG088071 1/1/24-12/31/28
National Institutes of Health/NIA
Translational Center for Barrier MPS (TRaCe-bMPS)
The goal of the TRaCe-bMPS Center is to take five validated microphysiological systems (bMPS) built on the μSiM (microphysiological system featuring a Silicon Membrane) tissue chip platform through the process of qualification as FDA-approved Drug Discovery Tools (DDTs). This RIT subcontract beginning 1/1/25 will focus on developing and qualifying drug DDTs using the μSiM tissue chip platform for sepsis modeling.
Role: Co-I; $179,024 to Gaborski

R61 & R33 HL154249 9/3/20-8/31/25
National Institutes of Health/NHLBI
The μSiM-hNVU - a human BBB platform for the study of brain injury mechanisms during systemic infection
The study of brain injury in sepsis and other forms of systemic inflammation is limited by a lack of in vitro tools that model the interface between the blood and brain. This project will address this unmet need by building a human neurovascular unit chip where circulating factors are introduced on the ‘blood side’ and a microglia report on inflammatory status on the ‘brain side.’
Role: Multi-PI (McGrath, Englehart, Gaborski, Singer and Waugh); $504,918 to Gaborski

R21 AR081987 9/1/23-7/31/25
National Institutes of Health/NIAMS
Extracellular Vehicles from CRISPR-Modified MSCs for the Treatment of Degenerative Disc Disease
The long-term goal of this research is to optimize the use of extracellular vesicles (EVs) for treating degenerative disc disease (DDD). Gaborski’s role as Co-I in this project is to isolate and purify the modified MSC EVs through traditional methods as well as with novel nanopocket membranes.
Role: Co-I; $143,035 to Gaborski

R21 GM146156 6/1/22-5/31/25
National Institutes of Health/NIGMS
Development of size-selective capture and release membranes for purification of extracellular vesicles
The goals of this project are to size-selectively separate and purify human extracellular vesicle subpopulations through development of a nanomembrane device as well as incorporate inline technologies to remove contaminating lipoprotein nanoparticles commonly found in plasma.
Role: PI; $406,938 to Gaborski

Hank and Lynn Hopeman Foundation 4/1/22-3/31/25
Understanding and Modulating the Permeability of the Blood-Brain-Barrier to Study Transport of Synthetic and Natural Biomolecules to the Brain
The goal of this feasibility project is to use our tissue-on-a-chip platform of the blood-brain barrier and our studies of the barrier breakdown to learn how we might intentionally and temporarily reduce barrier integrity to allow drugs to transit this barrier to treat neurological diseases.
Role: PI; $250,000 to Gaborski

R44GM137651
National Institutes of Health/NIGMS 3/1/22-2/28/25
Commercializing the μSIM: A Modular Platform for the Development and Analysis of Barrier Tissue Models
Gaborski's role as a Co-I is to develop and fabricate soft and more physiologically-relevant membranes for the membrane module.
Role: Co-I; $143,179 to Gaborski

Sartorius-Stedim Sponsored Research 6/1/21-12/31/24
Feasibility of Size Measurement and Characterization of Nanoparticles Using a Sartorius Virus Counter
The major goal of this project is to investigate the feasibility of characterizing nanoparticles and extracellular vesicles using a Sartorius Virus Counter (VC) instrument.
Role: PI; $456,342 to Gaborski

MCB 2229111 Future Manufacturing 1/1/23-12/31/24
National Science Foundation
FMSG: Bio: Advancing Extracellular Vesicle Biomanufacturing of CRISPR-Edited Human iPSC-derived MSCs with Next-Generation Purification
The goal of this project is to enable scale-up biomanufacturing potentials of MSC-derived small extracellular vesicles (EVs) by integrating human induced pluripotent stem cells (hiPSCs) for scalability in donor cell source, synthetic biology tools for scalability in exosome biogenesis, and advanced nano-membrane technology for scalability in small EV purification.
Role: Co-I ;$159,875 to Gaborski

COMPLETED PROJECTS AND EQUIPMENT SUPPLEMENTS OR GRANTS

National Science Foundation 8/1/23-7/31/26
MRI:Acquisition of High Speed Volumetric Particle Tracking System
This NSF MRI grant supports the purchase and installation of a high-speed volumetric particle tracking system. Gaborski will be involved with characterization and training of the equipment for use in microfluidic separation devices.
Role: Co-I; $574,304 Equipment Purchase

R21 AI163782 6/9/21-5/31/24
National Institutes of Health/NIAID
Using nanopocket membranes to capture bacterial outer membrane vesicles from biofluids
The goals of this project are to identify whether bacterial outer membrane vesicles (OMVs) could be a molecular diagnostic biomarker for sepsis *and* develop a rapid approach to isolate them from patient plasma. We seek to develop a straightforward high-purity and rapid separation technology that effectively isolates and purifies OMVs from biofluids, including plasma.
Role: Multi-PI (Michel and Gaborski); $208,501 to Gaborski

R35 GM119623 9/1/16-5/31/22
National Institutes of Health/NIGMS
Transparent Ultrathin Nanomembranes for Barrier Cell Models and Novel Co-Culture Systems
The goal of this work is to develop novel ultrathin membranes to improve and enable *in vitro* cellular barrier models and co-culture systems and optimize design through study of cell-substrate interactions.
Role: PI; $1,815,287 to Gaborski

R35 GM119623-S5 2020
National Institutes of Health/NIGMS
Administrative Equipment Supplement
This administrative equipment supplement supports the purchase of a dedicated parylene deposition system that will be used to produce ultrathin polymer films that will be developed into porous membranes.
Role: PI; $51,309 to Gaborski

R21 EB023527 7/15/17-4/30/20
National Institutes of Health/NIBIB
Plasma clearance of water-soluble and albumin-bound toxins using graphene oxide nanoengineered laminates
The goal of this work is to engineer graphene oxide membranes and adsorbent matrices to remove both water-soluble and albumin-bound toxins from blood to investigate the feasibility of use in hemodialysis and liver-assist devices.
Role: Multi-PI (Moghaddam and Gaborski); $175,816 to Gaborski

R35 GM119623-S4 2019
National Institutes of Health/NIGMS
Administrative Equipment Supplement
This administrative equipment supplement supports the complete environmental control of an existing wide-field microscope and z-stack image acquisition for time-lapse imaging of 2D and 3D cellular transmigration across tissue barrier models.
Role: PI; $55,778 to Gaborski

STTR Phase II 1660177 4/1/17-3/31/19
National Science Foundation
Development of ultrathin silicon nitride nanomembrane for prototype dialysis modules targeted for home hemodialysis
The goal of this work is to optimize lift-off of large sheets of ultrathin nanomembranes and incorporate membranes in miniature dialyzer cartridges for benchtop experiments and small animal trials and to purify cellular exosomes.
Role: Co-PI; $79,332 to Gaborski

R35 GM119623-S3 2018
National Institutes of Health/NIGMS
Administrative Equipment Supplement
This administrative equipment supplement is funding the purchase of an ultracentrifuge to assist in the isolation and purification of extracellular vesicles. This will support our work in studying the cellular communication in co-culture systems via microvesicles, exosomes and small signaling molecules.
Role: PI; $53,325 to Gaborski

New York Empire State Economic Development Fund 2018
Cell and Tissue Technologies Laboratory
This NYESED award is funding the acquisition of specialized wet lab equipment to facilitate interaction between academic researchers and the private sector. Equipment includes a Nanoparticle Analyzer, Cell Culture and Molecular Biology tools.
Role: Co-PI; $110,000 Equipment Purchase

NYSTAR/CEIS 9/1/15-6/30/16
Feasibility of Large Area Nanoporous Silicon Membranes for Bioprocess Filtration
The goal of this work was to demonstrate the feasibility of using ultrathin nanomembranes in a custom tangential flow filtration device to purify and isolate biomolecules including exosomes.
Role: PI; $24,437 to Gaborski

STTR Phase I 1521373 7/1/15-8/31/16
National Science Foundation
Development of ultrathin silicon nitride nanomembrane for prototype dialysis modules targeted for home hemodialysis
The goal of this work was to optimize lift-off of large sheets of ultrathin nanomembranes and incorporate membranes in miniature dialyzer cartridges for benchtop experiments and small animal trials.
Role: Co-PI; $60,577 to Gaborski

NYSTAR/CEIS 12/1/14-3/31/15
Feasibility of Large Area Nanoporous Silicon Membranes for Hemodialysis
The goal of this work was to demonstrate the feasibility of creating large sheets of ultrathin nanomembranes using a MEMS lift-off approach and incorporating a patterned polymeric scaffold to provide mechanical support.
Role: Co-PI; $26,064 to Gaborski

NYSTAR/CEIS 1/1/13-8/31/13
Cellular Co-Culture Microarrays for High-Throughput Screening
The goal of this work was to demonstrate the feasibility of a patterned hydrogel microarray supported on a porous membrane for co-culture screening applications.
Role: PI; $26,222 to Gaborski

R43 RR033156 9/20/11-9/19/12
National Institutes of Health/NCRR
Microfabricated porous TEM grids for improved phase contrast and CryoEM imaging
The goal of this work was to demonstrate feasibility of a microfabrication technology for manufacturing Zernike phase plates for contrast enhancement in electron microscopy (EM) tomography and cryo-EM imaging.
Role: Multi-PI (Gaborski, Marko and Striemer); $155,819 to Gaborski

R43 GM097792 9/01/11-5/31/12
National Institutes of Health/NIGMS
Nanoporous membranes for cellular microarrays and in vitro assays
The goal of this work was to develop miniaturized arrays for high-throughput cell-based drug screens and culture assays for cellular co-culture research including stem cell differentiation.
Role: PI; $184,665 to Gaborski

R43 GM090498 9/01/10-10/31/11
National Institutes of Health/NIGMS
Nanoporous silicon membranes for protein purification
The goal of this proposal was to determine the feasibility of using a novel nanoporous membrane technology to rapidly purify and isolate proteins and other biomolecules.
Role: PI; $153,245 to Gaborski

F31 EB005103 6/1/05-5/31/08
National Institutes of Health/NIBIB
Analysis of physical mechanisms of cell adhesion
This individual predoctoral fellowship sponsored research into understanding the mechanisms of adhesion molecule mobility and topological positioning on human neutrophils.
Role: Graduate Fellow; $125,019 to Gaborski

SERVICE (ROCHESTER INSTITUTE OF TECHNOLOGY)

Faculty Co-Lead on Renovations of Engineering Hall for Nano Bio Labs and Instrumentation Facility	2021-Present
RIT | nano Cleanroom Advisory Committee	2020-Present
Faculty Advisor to the RIT Cycling Team	2012-Present
Office Manager Search Committee Chair, Biomedical Engineering	2024
Co-Lead on Development of RIT Biomedical Engineering M.S. Degree	2021-2023
Director, Biomedical and Chemical Engineering Ph.D. Program	2020-2023
College of Engineering Graduate Curriculum Committee	2021-2023
Biomedical and Chemical Engineering Ph.D. Program Admissions Committee Chair	2020-2023
Organizer and Lead of the Biomedical Engineering Research Seminar Series	2019-2023
Co-Chair of Search Committee for Associate Provost & Dean of the Graduate College	2022
Institute Future of Faculty Committee	2018-2020
BME Department Undergraduate Curriculum Committee	2012-2020
Science & Engineering Research Building Visioning Committee, Strategy Subcommittee Chair	2019-2020
College of Engineering Research and Strategy Committee	2018-2020
Faculty Search Committee Chair (2 openings), Biomedical Engineering	2018-2019
Institute Research and Strategy Committee	2017-2019
RIT BMES Club Faculty Advisor	2016-2018
Faculty Search Committee (1 Opening), Biomedical Engineering	2016-2017
Dean Search Committee (Pre-Tenure representative), Kate Gleason College of Engineering	2015-2016
BME Co-op Faculty Liaison	2013-2016
Faculty Search Committee (1 Opening), School of Life Sciences, College of Science	2013-2014
Faculty Search Committee (2 Openings), Biomedical Engineering	2012-2013
Faculty Search Committee (2 Openings), Biomedical Engineering	2012

SERVICE (EXTERNAL)

Standing Member of Grant Proposal Study Section: National Institutes of Health (NIH) Training and Workforce Development Study Section (TWD-D) 2023-2026

Ad hoc Grant Proposal Panel and Study Section Reviewer (US): National Institutes of Health (NIH) Training and Workforce Development Study Section, NIH Innovative Molecular Analysis Technologies, NIH Innovative Biospecimen Science Technologies for Basic and Clinical Cancer Research, and National Science Foundation (NSF) Division of Civil, Mechanical, and Manufacturing Innovation.

Ad hoc Grant Proposal Reviewer (International): Natural Sciences and Engineering Research Council of Canada (NSERC), Israeli Ministry of Science, Technology and Space, and Netherlands Organization for Scientific Research.

Journal Editorial Board Member: Micromachines, Membranes.

Past and Present Journal Reviewer: ACS Applied Materials & Interfaces, ACS Biomaterials Science & Engineering, ACS Nano, Acta Biomaterialia, Biofabrication, Biomimetics, Biophysical Journal, Biotechnology Advances, Biotechnology and Bioengineering, Cellular and Molecular Bioengineering, Electrophoresis, Journal of Extracellular Vesicles, Journal of Membrane Science, Lab on a Chip, Membranes, Nanomedicine, Nature Communications, and Scientific Reports.

Standing Member, NIH TWD-D Study Section	2023-Present
Founder and Co-Administrator, MidCareer PI Slack (>400 Science & Engineering Faculty)	2017-Present
Abstract reviewer for the Annual BMES Conference	2013-Present
Organizer & Chair – Transport in Membranes & Nanofluids Track, ASME ICNMM Annual Meeting	2016, 2017
Co-Chair, Advances in Micro/Nano Manufacturing Platform Session, BMES Annual Meeting	2016
Organizer of Demo Day @ RIT, Nanotechnology Summer Camp, Rochester Museum & Science Center	2014
Co-Chair, Stem Cell Environments and Differentiation, BMES Annual Meeting	2014
Co-Chair, Mechanobiology and Stem Cell Translation Poster Session, BMES Annual Meeting	2014
Co-Chair, Microphysiology Systems Platform Session, BMES Annual Meeting	2013
Rochester NanoDays Event, Rochester Museum & Science Center	2012-2015

PAST AND PRESENT RESEARCH TEAM MEMBERS

Postdoctoral Researchers

Alan Man, *now Assoc Professor, Engineering, Pierce College*	2012-2013
Robert Carter, *now Assoc Department Head, Mechanical Engineering, RIT*	2013-2015
Henry Chung, *now Project Engineer, Triton Systems*	2016-2019
Marcela Mireles, *now Research Engineer, University of Rochester*	2016-2019
Kevin Petersen	2022-Present

Research Technicians

Jason Gerbsch	2022-Present

Ph.D. Students

Mehdi Aslan Dehghani, *now Scientist, Sartorius Stedim*	2015-2020
Alec Salminen (Co-advised with James McGrath), *now ORISE Postdoc at FDA*	2015-2021
Shayan Gholizadeh, *now Postdoc at Harvard Medical School*	2017-2022
Zahra Allahyari, *now Postdoc at Harvard Medical School*	2017-2022
Adeel Ahmed (co-advised with Vinay Abhyankar), *now Postdoc at UWisc-Madison*	2017-2022
Munther Alsudais	2019-Present
Louis Widom	2019-Present
Panteha Torabian	2021-Present
Atiyeh Hosseinifakh	2021-Present
Nadezhda Nikiforova	2022-Present

M.S. Students	**graduation year**
Cody Soule, *now Principal Process Engineer, Global Foundries*	2018
David Hurley, *now Research and Development Process Engineer, SIEV Technologies*	2018
Stephanie Boula, *now Project Manager, Confluent Medical*	2019
Daniella Lincoln, *now Process Engineer, Bausch + Lomb*	2021

B.S. Students	**graduation year**
Joshua Miller	2013
Katelyn Busse	2016
Alex Dawson-Elli	2016
Michael Potter	2016
Zachary Oppito	2016
Jascha Wilcox	2016
Andrea Mazzocchi	2016
Elizabeth Stoyan	2016
Randi Del Rosario	2017
Melissa Mendoza	2017
Ana Peredo	2017
Spencer Perry	2017
Stephanie Casillo	2018
Elizabeth Hirschman	2018
Shane Peechatka	2018
Sean Bellefeuille	2019
Phillip Tinder	2019
Shannon Gulvin	2020
Nikki VanOstrand	2021
Hayley Miller	2021
Sarah Henretta	2022
Daniel DiMartino	2023
Anna Kasper	2023
Cara Guernsey	2023
Jess Ritz	2024 (anticipated)
Zoii Henry	2024 (anticipated)
Nicholas Luey	2024 (anticipated)

Jazmin Salazar	2025 (anticipated)
John Chon	2025 (anticipated)
Abby Wojehowski	2025 (anticipated)
Leanna Frasch	2026 (anticipated)
Ethan Kishimori	2027 (anticipated)