THOMAS R. GABORSKI

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Thomas Gaborski is an entrepreneurial bioengineering faculty member with expertise in nano and microsystems. He is currently the director of the NanoBio Device Laboratory at RIT, with over $2M in active funding from NIH and NSF designing and utilizing nanomembranes for tissue-on-a-chip and biological separations including portable hemodialysis. Previously, he was the co-founder and president of SiMPore, a nanomaterials startup company, where he helped secure private investment and commercialize several research products.

PROFESSIONAL EXPERIENCE

Associate Professor (with tenure), Biomedical Engineering 2017-Present
Rochester Institute of Technology, Rochester, NY

Associate Professor (Adjunct, Secondary Faculty), Biomedical Engineering 2017-Present
University of Rochester, Rochester, NY

Assistant Professor, Biomedical Engineering 2012-2017
Rochester Institute of Technology, Rochester, NY

VP of Life Sciences and President 2008-2012
SiMPore Inc., West Henrietta, NY
Ultimately led a team of more than ten full-time scientists and business professionals that developed and commercialized materials and life sciences products utilizing a novel ultrathin nanomembrane. Initially lead the conceptualization and development of life science research products as the principal investigator on three NIH SBIR grants. Helped fundraise over $2M in private investment.

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

NIH NIGMS R35 Early Stage Investigator Grant Award ($1.8M)	2016 – 2021
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 – 2008
Graduate Teaching Award, University of Rochester	2007
Sproull Presidential Graduate Fellowship, University of Rochester	2002 – 2004
Undergraduate Teaching Award, Cornell University	2002

TEACHING EXPERIENCE

Average Instructor and Course Rating of 4.3 and 4.4 out of 5 for the prior three years
College Average 4.0 to 4.1

Tissue Engineering BIME570/670 (RIT) 2014-Present
Designed, developed and delivered three times.
Elective undergraduate and graduate course

Biomaterials BIME370 (RIT) 2013-Present
Designed, developed and delivered five times.
Required second year core BME course

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

Engineering Cell-Substrate Interactions MSCE889 (RIT) 2014
Designed, developed and delivered.
Elective graduate course

Musculoskeletal Biomechanics BIME200 (RIT) 2012
Redeveloped course content (second time taught at RIT), Refined laboratory exercises.
Required second year core BME course

Introduction to Programming for Biomechanics BME201L (University of Rochester) 2005, 2006
Required second year core BME course

PEER REVIEWED JOURNAL PUBLICATIONS

1. Chung HH, Ramirez MM, Kwarta BJ and **Gaborski TR**. Porous membranes in tissue barrier and co-culture models. Lab on a Chip. 2017 *Under Review*.
2. 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. 2017. DOI: 10.1021/acsbiomaterials.7b00792
3. Ramirez MM and **Gaborski TR**. Fabrication Techniques Enabling Ultrathin Nanostructured Membranes for Separations. Electrophoresis. 2017. 38 (19): 2374-2388.
4. 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.
5. Carter RN, Casillo SJ, Mazzocchi AR, DesOrmeaux JS, Roussie JA and **Gaborski TR**. Ultrathin transparent porous glass membranes for cell culture. Biofabrication. 2017. 9(1): 015019.
6. 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.
7. 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.
8. 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.
9. Nehilla BJ, Nataraj N, **Gaborski TR** and McGrath JL. Endothelial Vacuolization Induced by Highly-permeable Silicon Membranes. Acta Biomateriala. 2014. 10 (11): 4670-4677.
10. 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.
11. 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.
12. 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.
13. **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.

14. 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.
15. 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.
16. 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.
17. 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.
18. **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.
19. 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
20. 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.
21. 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.
22. **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.
23. **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.
24. 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. **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

1. J Snyder, JL McGrath, PM Fauchet, **TR Gaborski** and CC Striemer, "High-Performance, Low-Voltage Electroosmotic Pumps with Molecularly Thin Nanomembranes," US Patent Application 14/524,024, Filed October 27, 2014.
2. **TR Gaborski**, JL McGrath, RD Richmond and CC Striemer, "Methods for Facilitating Fluid Flow Through Nanomembranes," US Patent Application US 13/496,012, Filed October 1, 2010.
3. 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.
4. 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.
5. 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.
6. 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.

CONFERENCE PLATFORM PRESENTATIONS AND INVITED TALKS (2012-PRESENT)

1. Capture and Release of Extracellular Vesicles on Nanoporous Membranes. ASME International Conference on Mini Micro and Nanochannels. Boston, MA. August 30, 2017.
2. Transparent and ultrathin nanomembranes for cellular barrier and co-culture models. Biomedical Engineering Society Annual Meeting. Minneapolis, MN. October 7, 2016.
3. Invited Focus Group. Foresight Institute Atomic Precision Workshop. Breakthrough Technologies for Energy. Palo Alto, CA. May 20-22, 2016.
4. BME 6670 – Bionanotechnology. Improving human health with nanotechnology - A case study on hemodialysis. Cornell University. Ithaca, NY. Invited Guest Lecture. November 17, 2015.

5. Ultrathin silicon-based nanomembranes for Biomedical Applications. Invited Department Seminar. University of Florida Mechanical Engineering. October 13, 2015.
6. Ultrathin silicon-based nanomembranes can revolutionize biological separations and serve as advanced cell culture platforms. Invited Technology Platform Talk. ASME International Conference on Nano-, Micro- and Mini-Channels. July 7, 2015.
7. Ultrathin Membranes Promote Endothelial Differentiation of Adipose-Derived Stem Cells. Invited Presentation. World Stem Cell and Regenerative Medicine Congress. London, UK. May 22, 2015.
8. BME 6670 – Bionanotechnology. Improving human health with nanotechnology - A case study on hemodialysis. Cornell University. Ithaca, NY. Invited Guest Lecture. November 13, 2014.
9. 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.
10. BME 6670 – Bionanotechnology. Improving human health with nanotechnology - A case study on hemodialysis. Cornell University. Ithaca, NY. Invited Guest Lecture. October 29, 2013.
11. Low-Voltage Electroosmotic Flow and DNA Shearing Using Ultrathin Nanoporous Silicon Membranes. Platform Talk. Biomedical Engineering Society Annual Meeting. Seattle, WA. September 28, 2013.
12. Large Area Ultrathin Transparent Silicon Membranes for High Content Cellular Imaging. Poster Presentation. Biomedical Engineering Society Annual Meeting. Seattle, WA. September 26, 2013.
13. Leukocyte Isolation and Sorting Using Microdiaphragm Pumping and Registered Microfiltration. Poster Presentation. Biomedical Engineering Society Annual Meeting. Seattle, WA. September 26, 2013.
14. Highly Permeable, Transparent and Degradable Membranes for Tissue Scaffolding. Platform Talk. Microscopy and Microanalysis Annual Meeting. Indianapolis, IN. August 6, 2013.
15. Feasibility of High-Throughput Cellular Co-Culture Screening Assays. Poster Presentation. NYSTAR/CEIS Annual Symposium. Rochester, NY. March 26, 2013.
16. Low voltage electroosmotic pumps for lab-on-a-chip applications using molecularly thin silicon membranes. IEEE Electronic Devices Society of Western NY Annual Meeting. Invited Platform Talk. November 14, 2012.
17. BME 6670 – Bionanotechnology. Improving human health with nanotechnology - A case study on hemodialysis. Cornell University. Ithaca, NY. Invited Guest Lecture. October 16, 2012.
18. Dynamics of Adhesion Molecule Domains on Neutrophil Membranes. Microscopy & Microanalysis. Platform Talk. July 31, 2012. Phoenix, AZ.
19. Optically Transparent and Permeable Microarrays for Cellular Assays. Microscopy & Microanalysis. Platform Talk. August 1, 2012. Pheonix, AZ.
20. Invited Panel Discussion. Biomedical Careers Panel Discussion. NIH NIBIB Training Grantees Meeting. Bethesda, MD. June 29, 2012.

EXTERNAL FUNDING (NIH, NSF, NYSTAR)

ACTIVE – Three projects totaling $3M from NIH and NSF; $2.1M to Gaborski Laboratory

R35 GM119623 – Impact Score 20; Percentile N/A 9/1/16-6/30/21
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 (100% to Gaborski Laboratory)

R21 EB023527 – Impact Score 26; Percentile Top 7th 7/15/17-4/30/19
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: PI, Multi-PI $413,129 (40% to Gaborski Laboratory)

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 $750,000 (10% to Gaborski Lab)

COMPLETED - $700,000 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 $225,000 (25% to Gaborski Laboratory)

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

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

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

R43 RR033156 – Impact Score 10; Percentile N/A 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: PI (Multi-PI) $155,819

R43 GM097792 – Impact Score 28; Percentile N/A 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

R43 GM090498 – Impact Score 35; Percentile N/A 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

F31 EB005103 – Priority Score 130 (former scoring system) 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

SERVICE (ROCHESTER INSTITUTE OF TECHNOLOGY)

RIT BMES Club Faculty Advisor	2016-Present
BME Co-op Faculty Advisor	2013-Present
Faculty Advisor to the RIT Cycling Team	2012-Present
Faculty Search Committee, Biomedical Engineering, College of Engineering	2016-2017
Dean Search Committee, Kate Gleason College of Engineering	2015-2016
Faculty Search Committee, Biotechnology, School of Life Sciences	2013-2014
Faculty Search Committee (2 Openings), Biomedical Engineering, College of Engineering	2012-2013
Faculty Search Committee (2 Openings), Biomedical Engineering, College of Engineering	2012

SERVICE (EXTERNAL)

Proposal Reviewer for Israeli Ministry of Science, Technology and Space and Netherlands Organization for Scientific Research
Reviewer for ACS Nano, Acta Biomaterialia, Cellular and Molecular Bioengineering, Electrophoresis, Scientific Reports

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-Present