BIOGRAPHICAL SKETCH

NAME:	**Maribel Vazquez**
eRA COMMONS USER NAME:	VAZQUEZ
POSITION TITLE:	Professor of Biomedical Engineering

EDUCATION/TRAINING

INSTITUTION AND LOCATION	DEGREE	Completion Date	FIELD OF STUDY
Cornell University (Ithaca, NY)	B.S.	06/1992	Mechanical Engineering
Massachusetts Institute of Technology (Cambridge, MA)	M.S.	06/1996	Mechanical Engineering
Massachusetts Institute of Technology (Cambridge, MA)	Sc.D.	08/2001	Mechanical Engineering

A. PERSONAL STATEMENT:

My research integrates design of biomedical engineering (BME) systems with mechanistic biology and clinical application. My laboratory has developed microfluidic systems to correlate cell migration with altered signaling pathways across a wide range of bio-applications, including repair of the central, visual and peripheral nervous systems (NS). My current projects focus on neuronal cell replacements and their implications for reparative, cell-based therapies across the NS. My biomedical contributions have demonstrated that cellular positioning and interconnectivity needed for synaptic communication are finely-regulated by cell chemo-sensitivity to extracellular chemical and electrical gradient fields. My technological contributions have developed quantitative tools to bridge tunable cell responses with clinical outcomes in neuromuscular and retinal disorders. Further, the profound diversity of health challenges among USA adults with NS disorders has roused my educational initiatives in health disparities and in raising awareness of disparities in scientific publishing.

I began my career as a co-founding member of the BME Department at the City College of New York (CCNY), a public Minority Serving Institution (MSI) awarding doctoral degrees since 2008. My projects established the first microfluidics and microfabrication laboratories at CCNY and were continuously awarded funding for research and educational initiatives from the NIH (General Medicine, Cancer, Eye), NSF (Chemical, Bioengineering and Transport Systems, National Nanotechnology Initiative) and DoD (Office of Scientific Research). At CCNY I directly trained 25+ under/graduate researchers and completed 40+ independent engineering design and commercialization projects. The vast majority of these students were under-represented minorities, low-income, and/or first-generation in college, which mirrors my own background. As a result, I have continually engaged in research mentoring programs, such as the NSF Louis Stokes Alliance for Minority Participation (LSAMP) and Research Experience for Undergraduates (REU), as well as presented at student societies and organizations (Society of Hispanic Professional Engineers (SHPE), Society of Women Engineers (SWE)) to share my non-traditional career path and experiences in academia. I am passionate about research programs and initiatives that elevate non-traditional students to professional excellence in STEM.

Ongoing and recently completed projects that I would like to highlight include:

1. Cellular Bioengineering: From Biomaterials to Stem Cells (Research Experience for Undergraduate Site)
Principal Investigator (PI)**:** David Shreiber, Ph.D.; Co-PI: **Maribel Vazquez, Sc.D.**
National Science Foundation (**EEC-19-50509**); Period: 05/2021-05/2024
Supports development of REU projects that help develop an advanced and diverse community of STEM researchers in cellular bioengineering

2. Modulating electro-chemotactic stimuli and Top2b-mediated pathways to promote integration of cone progenitors
Principal Investigator**: Maribel Vazquez, Sc.D.**

National Eye Institute (R21 **EY031439-01**); Period: 05/2020-2/2022
Supports examination of external stimuli to impact integration of transplanted retinal cells

3. A combinatory microfluidic and in vivo modeling approach to evaluate collective migration during retinogenesis
Principal Investigator**: Maribel Vazquez, Sc.D.**
National Science Foundation (**CBET 1804411**); Period: 8/2018-8/2022
Supports development of microfluidic testing systems to predict changes in the collective behavior of genetically-modified retinal progenitor populations during in vivo development of Drosophila Melanogaster

4. Emergent Behaviors of Integrated Biological Systems (EBICS II)
Principal Investigator: Roger Kamm, Ph.D.; Subcontract-PI: **Maribel Vazquez, Sc.D.**
National Science Foundation (**CBET 0939511**); Period: 7/2010-8/2022
Supports development of microfluidics to examine glial-neuronal interactions.

B. POSITIONS, SCIENTIFIC APPOINTMENTS, AND HONORS

Appointments

1992-1994	Mechanical Engineer-Cleanroom Support, Intel Corporation (Portland, OR)
1994-1996	Cleanroom Development and Micro-contamination, Intel Corporation (Santa Clara, CA)
1997-1999	Teaching Assistant, MIT Dept. of Mechanical Engineering (Cambridge, MA)
1999-2001	Research Assistant, MIT Whitehead Institute for Biomedical Research (Cambridge, MA)
2001-2002	Assistant Professor, Dept. of Mechanical Engineering, City College of New York (NY)
2002-2005	Assistant Professor, Dept. of Biomedical Engineering, City College of New York (NY)
2006-2018	Associate Professor, Dept. of Biochemistry, Graduate City University of New York (NY)
2007-2018	Associate Professor (Tenured), Dept. of Biomedical Engineering, CCNY (NY)
2019-2020	Associate Professor (Tenured), Dept. of Biomedical Engineering, Rutgers University (NJ)
2021-Now	Full Professor (Tenured), Dept. of Biomedical Engineering, Rutgers University (NJ)

Selected Honors:

1996-1999	Intel Cooperative Graduate Fellowship-GEM: MIT (Cambridge, MA)
2002-2006	Harold Shames Junior BME Faculty Chair: CCNY (New York, NY)
2004	American Association for the Advancement of Science (AAAS) Honoree: Latin American Lecture Series for Women in Science and Engineering (Brazil, Panama, Uruguay)
2007	Mentoring Award: Alfred P. Sloan Foundation for Minority Education (NY)
2010	Cellular and Molecular Bioengineering: Best BMES Conference Paper (TX)
2013	Univision TV New York (Ch41) Technical Feature, 'STEM and the Elusive Role Model'
2014	Coulter College for Translation of BME Innovation: Faculty Design Advisor Winner (FL)
2015	Biomedical Engineering Society (BMES): Department Diversity Award (FL)
2016	Gordon Research Conference in Microfluidics (Italy): Invited Speaker and Panelist
2017	President's Award for Excellence in Mentoring, Research and Teaching, CCNY (NY)
2020	Induction into the American Institute of Medical and Biological Engineers (AIMBE)

Professional Service:

2001-2006	Co-founding member, Dept. of Biomedical Engineering, City College of New York
2002-2010	MIT Mechanical Engineering Review Committee, Alumna Member
2003-Now	Society of Hispanic Professional Engineers, Academic Member
2002-Now	Biomedical Engineering Society, Active Member and Session(s) Co-Chair
2005-Now	NSF Proposal Reviewer (EEC, MRI, CBET Divisions)
2005-Now	NIH Study Section Ad-hoc Reviewer and Special Emphasis Panelist • NIGMS, NCI Special Emphasis Panels (SEP) • Instrumentation and Systems Development [ISD] • NEI Audacious Goals Initiative [AGI]
2008-2013	Fund for the City of New York, Sloan Awards for Excellence in K-12 Teaching Science and

Mathematics, Selections Panel

2008-2016 Undergraduate Curriculum and ABET Chair, City College of New York
2014-2016 Graduate Officer, Master's in Translational Medicine, City College of New York
2017-Now NIH U54 Minority Partnership Advisory Council
2020-Now AIMBE Nominations Review Committee (Tissue Engineering); Operations Committee
2021-Now Director of Faculty Development and Diverse Scholar Engagement, Rutgers University

C. CONTRIBUTIONS TO SCIENCE:

1. Bionanotechnology

My early work examined how cell connectivity and communication is altered during manipulation and mechanical loading of matrix-laden suspensions in vitro. In complement, we developed bionanotechnology to investigate the mechanisms that underlie the cell responses observed. Through these projects, we were among the first groups to achieve live-cell cytoplasmic delivery of functionalized nanoprobes.

a. Kong, Q.J.; **Vazquez, M**., 'Three-Dimensional Cellular Networking in Collagen Gels Populated with Medial Collateral Ligament Fibroblasts,' Cell Comm Adhes., 2006 Jun;13(3):139-49.
b. Kong, Q.J.; **Vazquez, M**., 'Flow-induced shear stresses increase the number of cell-cell contacts within extracellular matrix,' J Biomed Mater Res A. 2009 Jun 15; 89.
c. Sabharwal, N.; Holland, E.C.; **Vazquez, M**., 'Nanolabeling of Activated Glial Progenitors,' Ann Biomed Eng. 2009 Oct: 37(10):1967-73.
d. Dudu V.; Rotari V.; **Vazquez M**., 'Sendai Virus-based Liposomes Enable Targeted Cytosolic Delivery of Nanoparticles in Brain Tumor-Derived Cells,' J Nanobiotechnology. 2012 Feb 17;10:9 (Cover Article)

2. Microfluidic Platforms:

I advanced the lab's cell-based studies with the design of microfluidic systems that enable scrutiny of cell responses to finely-tuned stimuli. Our projects customize microsystems to evaluate cell gradient sensitivity to extracellular factors and pharmacological compounds of therapeutic interest.

a. Mishra S.; Thakur A.; Redenti S.; **Vazquez M**., A model microfluidics-based system for the human and mouse retina,' Biomed Microdevices. 2015 Dec;17(6):107.
b. McCutcheon S.; Majeska R.; Schaffler M.B.; **Vazquez M**., 'A multiscale fluidic device for the study of dendrite-mediated cell to cell communication.' Biomed Microdevices 2017, Aug 8;19(3):71.
c. Singh T.; **Vazquez, M**.; Time-dependent addition of Schwann cells increase myotube viability and length in vitro tri-culture model of neuromuscular junction,' Regen Eng and Transl Med, (*Accepted 02.2019)*
d. Peña JS.; Robles D.; Zhang S.; **Vazquez M**., 'A Milled Microdevice to Advance Glia-Mediated Therapies in the Adult Nervous System,' Micromachines (Basel). 2019 Jul 31;10 (8).

3. Cell Migratory Processes:

We leveraged our bioengineering designs to develop predictive microsystems able to mechanistically interrogate the migration of neural cells for clinical and translational applications. Our work was among the earliest to identify the finely-tuned chemotactic responses of neural progenitors to very dilute extracellular growth factor gradients.

a. Rico-Valera J.; Singh T.; McCutcheon S.; **Vazquez M**., 'EGF as a new Therapeutic Target for Metastasis,' Cell Mol Bioeng. 2015 June 1; Volume 6, Issue 1, pp 137-149.
b. Thakur A., Mishra S., Pena J., Zhou J., Redenti S., Majeska R., **Vazquez, M**., 'Collective adhesion and displacement of retinal progenitor cells upon extracellular matrix substrates of transplantable biomaterials,' J. Tissue Eng. (2018) Vol. 9: 1–14.
c. Mishra, S.; Pena, J.; Redenti, S.; **Vazquez, M**., 'A novel electro-chemotactic approach to impact the directional migration of transplantable retinal progenitor cells,' Exp Eye Res 2019 Aug;185:107688.
d. Pena, J.S.; **Vazquez, M.**, 'VEGF upregulates EGFR expression to stimulate chemotactic behaviors in Müller glia,' Brain Sci 2020, 10(6), 330.

4. Interfaces with Neuro-restorative Therapies:

We have continued to adapt our technology to the nervous system with platforms that enhance emerging regenerative strategies. We are among the first projects to examine collective neural cell behavior within microfluidic systems for transplantation strategies. Our group is additionally a pioneer in adapting microsystems to examine the behavior of primary neural cells from invertebrates for robust genetic study.

a. Pena J.; Dulger N.; Redenti, S.; Majeska R.; **Vazquez, M**., 'Controlled microenvironments to evaluate chemotactic properties of cultured Muller glia,' Exp Eye Res. 2018 May 19; 173:129-137.
b. Pena C.; Zhang, S.; Majeska, R.; Venkatesh, T.; **Vazquez, M**., 'Invertebrate retinal progenitors as regenerative models in a microfluidic system,' Cells Oct 22;8(10).
c. Mishra, S.; **Vazquez, M**., 'A Gal-MµS device to evaluate cell migratory response to combined galvano-chemotactic fields,' Biosensors (Basel). 2017 Nov 21;7(4).
d. Markey, M.W.; **Vazquez, M.**, 'Targeting collective behaviors of transplanted retinal cells as strategies to improve cellular integration,' Neuro. Regen. Res. 2022 Jun;17(6):1271-1272.

5. Disparities in Human Health and in the Scientific Community

My projects in neuro-repair have elucidated profound health disparities across adult populations with neural disorders in the USA. These results inspire my educational research and outreach to incorporate the challenges of health disparities into engineering design and training. I have developed course curricula to include health disparities at all undergraduate levels, as well as incorporated health disparities into yearly capstone design projects and K-12 summer training programs.

a. **Vazquez M.**, Marte O., Barba J., Hubbard K., 'An Approach to Integrating Health Disparities within Undergraduate Biomedical Engineering Education,' Ann Biomed Eng. 2017 Nov; 45(11):2703-2715.
b. **Vazquez, M.**; 'Engaging Biomedical Engineering in Health Disparities Challenges,' J Community Med Health Educ 2018, 8:595.
c. Pena J.; **Vazquez, M.**, 'Reducing health disparities in adult vision loss via interfaces with emerging technology,' Nature Eye (Lond). 2019 Apr;33(4):532-533.
d. Desai, T.; Omolala, E.; Stevens, K.R.; **Vazquez, M**.; Imoukhuede P., 'Perspectives on Disparities in Scientific Visibility,' Nat. Rev. Mater. Vol. 6, Issue 7, p.556-559

Partial List of Published Work in MyBibliography:

https://www.ncbi.nlm.nih.gov/sites/myncbi/maribel.vazquez.1/bibliography/48173945/public