CURRICULUM VITAE

Brian J. O'Grady
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Education:

Vanderbilt University **Nashville, TN**
Doctor of Philosophy, Materials Science and Engineering *May 2019*
Dissertation: Design, Development and Modeling of Perfusable Hydrogels to Regulate Cell Fate and Behavior in 3D Constructs

University of Texas at San Antonio **San Antonio, TX**
Master of Science, Biology *May 2014*
Thesis: A Novel Drug Therapeutic Treatment: Hydrogen Uncaging Using Photolysis for Fast and Focal Intracellular Acidification as a Cancer Therapeutic System

University of Texas at San Antonio **San Antonio, TX**
Bachelor of Science, Neurobiology *May 2012*

Academic Appointments:

Vanderbilt University Medical Center **Nashville, TN**
Assistant Professor **2025 – Present**
- Developing 4D, biomimetic hydrogels for advanced digital micromirror device (DMD), high-resolution bioprinting
- Developing techniques for bioprinting retinas using donor-derived tissue and vasculature
- Developing large-scale, vascularized bioprinted lung tissue from patient derived tissue and vasculature

Vanderbilt University, Lippmann Lab **Nashville, TN**
Postdoctoral Fellow ***2019 – 2025***
- Assessing neural organization in developing brain organoids using an n-cadherin peptide epitope conjugated to the backbone of methacrylated gelatin
- Developing a lumen-perfusable neurovascular unit in a 3D printed microfluidic device
- Developing a model to recapitulate neurological disease phenotypes predominantly associated with the blood-brain barrier and the neurovascular unit.
- Developing a model vascularizing organoids for large-scale tissue engineering

Vanderbilt University, Bellan Lab for Advanced Materials **Nashville, TN**
Graduate Research Assistant ***2015 – 2019***
- Developed a versatile, programmable pump system to support cell survival, proliferation, and differentiation in 3D, perfusable, biomaterial scaffolds and control the presentation of biochemical cues
- Modeled spatial and temporal gradients of morphogen presentation in a 3D scaffold using COMSOL
- Designed and fabricated bioreactors for *in vitro* models of human tissues
- Designed and executed in vitro experiments to differentiate mesenchymal stem cells into a spectrum of cell fates (osteogenic to chondrogenic) in 3D hydrogels
- Developed and characterized a hydrogel construct to model the human ductus arteriosus
- Developed a novel biomaterial to enable formation of synaptically-connected neuronal networks *in vitro* from single-cell suspensions of induced pluripotent stem cell-derived neural cells

- Characterized *in vitro* models of human tissues using confocal microscopy, immunofluorescence, Western blot, atomic force microscopy, scanning electron microscopy, Instron strength testing, and NMR

Vanderbilt University Medical Center, Dugan Lab – Division of Geriatric Medicine **Nashville, TN**
Research Assistant II ***06/2014 – 07/2015***

- Investigated the role of the proinflammatory cytokine interleukin-6 and the JAK-STAT pathways as risk factors correlating to the severity of Alzheimer's Disease
- Employed fluorescence microscopy to visualize the effect of these intracellular pathways in aging mice
- Applied electrophysiology techniques, including whole-nerve patch clamping on the spinal cord and single-cell patch clamping on brain slices *ex vivo,* to study peripheral nerve activity in aging mice
- Used microsurgery techniques to isolate cortical neurons from the mouse brain for primary cell culture

University of Texas at San Antonio, Gdovin Laboratory **San Antonio, TX**
Graduate Research Assistant ***2012 – 2014***

- Designed and developed a novel technique to induce cancer cell death through focal, intracellular acidosis (98% cell death in breast cancer cells in under 3 hours)
- Worked with collaborators in Physics to design, fabricate, and test an upconversion nanoparticle for photodynamic therapy *in vivo*

University of Texas at San Antonio, Gdovin Laboratory **San Antonio, TX**
Undergraduate Research Assistant ***2008 – 2012***

- Investigated central chemoreceptor function in the developing tadpole brainstem
- Employed fluorescence microscopy to optically record intracellular pH changes in chemoreceptor neurons
- Mastered electrophysiological techniques necessary to record respiratory motor output from the brainstem as well as single cell patch clamp for recording of membrane potential

Teaching and Mentoring Experience:

Vanderbilt University, Department of Biomedical Engineering **Nashville, TN**
Laboratory Course Instructor ***Spring 2024***

- Teaching Biomedical Instrumentation Lab II for undergraduate students in Biomedical Engineering
- Introducing students to a systems-level approach to the design of devices that monitor clinically-relevant physiological functions and variables, driven by the needs of specific pathophysiological conditions
- Laboratory exercises stress instrumentation design and integration of multiple modalities into a biomedical platform

Vanderbilt University, Department of Mechanical Engineering **Nashville, TN**
Graduate Teaching Assistant ***Fall 2018***

- Taught for one semester in the Mechanical Engineering Module for Introduction to Engineering, a survey course for first year undergraduate students
- Introduced students to the engineering design process and guided them through the process of optimizing a small-scale electro-mechanical vehicle

Vanderbilt University, Materials Science and Engineering Program **Nashville, TN**
Graduate Teaching Assistant ***2015 – 2016***

- Taught for two semesters in Materials Science I and II Laboratory courses
- Introduced undergraduate engineering students to methodologies for fabricating and characterizing materials, including metallurgy, transmission electron microscopy, and Instron mechanical testing
- Graded assignments and provided detailed feedback for improvement

Vanderbilt University, School of Engineering **Nashville, TN**
Undergraduate Research Mentor ***2016 – 2019***

- Trained and mentored undergraduate engineering students conducting research in Dr. Leon Bellan's Laboratory during the summer and the academic year through the Vanderbilt SyBBURE Program (Jason Wang, 2016-2018 – currently a Ph.D. student at University of Illinois Urbana-Champaign, and Callie Weber, 2017-2019 – currently a Ph.D. student at University of Maryland)
- Trained and mentored an undergraduate engineering student conducting research through the VUSE Summer Research Program (Haley Antoine, 2018 – currently a senior undergraduate student at Cornell)
- Mentored a senior design team of Biomedical Engineering students (Fall 2018 – Spring 2019)

University of Texas at San Antonio, Department of Biology **San Antonio, TX**
Graduate Teaching Assistant ***2012 – 2014***

- Taught for four semesters in the Advanced Physiology and Evolution of Respiration course for upper-class biology students
- Tutored students in physiology of a wide range of animal species
- Guest-lectured, graded assignments, and provided detailed feedback for improvement

Professional Affiliations:

Tissue Engineering International & Regenerative Medicine Society
American Society for Biochemistry and Molecular Biology
Vanderbilt Brain Institute
Materials Research Society
Biomedical Engineering Society
American Physiological Society
American Heart Association
Mexican American Engineering and Scientists Society
Society for the Advancement of Chicanos and Native Americans in Science
BrightFocus Foundation

Awards and Recognitions:

- Emerging Leaders in Neuroscience (2025)
- Student and Young Investigator Scientific Excellence Award - TERMIS World Congress (2024)
- Rising Stars in Engineering in Health (2023)
- K99/R00 MOSAIC Postdoctoral Career Transition Award (2023)
- Postdoctoral Fellow Spotlight, Chan Zuckerberg Initiative (2021)
- Neurodegeneration Challenge Network Invited Talk, Chan Zuckerberg Initiative (2020)
- Postdoctoral Fellow Spotlight, Vanderbilt Memory & Alzheimer's Center (2020)
- Loan Repayment Award, National Institutes of Health (2020)
- Best Postdoctoral Fellow Poster, Vanderbilt Memory & Alzheimer's Center (2020)
- Postdoctoral Traineeship, Vanderbilt Interdisciplinary Training Program in Alzheimer's Disease, NIH/NIA T32 (2019 – 2022)
- RISE Research Program, University of Texas at San Antonio (2011)

Publications:

Peer-reviewed manuscripts

- **Brian J O'Grady**[†], Scott McCall, Sam Cullison, Matthew Schrag, Alexis K Yates, Andrew Kjar, Corinne W Curry, Hyosung Kim, Ethan Lippmann. "Anatomically and Physiologically Accurate Engineered Neurovascular Unit and Blood-Brain Barrier Model Using Postmortem Human *Ex Vivo* Brain Tissue." 2024 September 29. DOI: https://doi.org/10.1101/2024.09.26.615283. *Advanced Healthcare Materials.* ***[†]co-corresponding authors***

- Daniel Chavarria, Kissamy A. Georges, **Brian J. O'Grady**, Khalid K. Hassan, and Ethan S. Lippmann. "Modular Cone-and-Plate Device for Mechanofluidic Assays in Transwell Inserts." *Frontiers in Bioengineering.*

- Andrew Kjar, Mia R. Haschert, José C. Zepeda, A. Joey Simmons, Alexis Yates, Daniel Chavarria, Melanie Fernandez, Gabriella Robertson, Adam M. Abdulrahman, Hyosung Kim, Nicole T. Marguerite, Rachel K. Moen, Lauren E. Drake, Corinne W. Curry, **Brian J. O'Grady**, Vivian Gama, Ken S. Lau, Brad Grueter, Jonathan M. Brunger, and Ethan S. Lippmann. "Biofunctionalized gelatin hydrogels support development and maturation of iPSC-derived cortical organoids." *Cell Reports.* (2024)
- Corinne W Curry, Sarah M Sturgeon, **Brian J O'Grady**, Alexis K Yates, Andrew Kjar, Hayden A Paige, Lucas S Mowery, Ketaki A Katdare, Riya V Patel, Kate Mlouk, Madison R Stiefbold, Sidney Vafaie-Partin, Atsuyuki Kawabata, Rachel M McKee, Stephanie Moore-Lotridge, Adrienne Hawkes, Jiro Kusunose, Katherine N Gibson-Corley, Jeffrey Schmeckpeper, Jonathan G Schoenecker, Charles F Caskey, Ethan S Lippmann. "Growth factor-free, peptide-functionalized gelatin hydrogel promotes arteriogenesis and attenuates tissue damage in a murine model of critical limb ischemia." *Biomaterials*. (2023)
- **Brian J. O'Grady**†, Michael D. Geuy, Hyosung Kim, Kylie M. Balotin, Everett R. Allchin, David C. Florian, Neelansh N. Bute, Taylor E. Scott, Gregory B. Lowen, Scott A. Guelcher, John P. Wikswo, Leon M. Bellan, Ethan S. Lippmann†. "Rapid Prototyping of Cell Culture Microdevices Using Parylene-Coated 3D Prints." *Lab on a Chip* 21: 4814-4822 (2021). ***†co-corresponding authors***
- Allison Bosworth, Hyosung Kim, Kristin O'Grady, Isabella Richter, Lynn Lee, **Brian J. O'Grady**, Ethan Lippmann. "Influence of Substrate Stiffness on Barrier Function in an iPSC-derived In Vitro Blood-Brain Barrier Model." *Cell and Molecular Bioengineering* (2021). Epub: September 20, 2021.
- **Brian J. O'Grady**, Kylie Balotin, Allison Bosworth, Penn McClatchey, Robert Weinstein, Mukesh Gupta, Kara Poole, Leon Bellan, Ethan Lippmann. "Development of an N-Cadherin Biofunctionalized Hydrogel to Support the Formation of Synaptically Connected Neural Networks." *Biomaterials Science and Engineering* 6(10): 5811-5822 (2020).
- **Brian J. O'Grady**, Ethan S. Lippmann. "Recent Advancements in Engineering Strategies for Manipulating Neural Stem Cell Behavior." *Current Tissue Microenvironment Reports* 1: 41-47 (2020).
- Alejandra I. Romero-Morales***** and **Brian J. O'Grady***, Kylie M. Balotin, Leon M. Bellan, Ethan S. Lippmann, Vivian Gama. "Spin∞ an Improved Miniaturized Spinning Bioreactor for the Generation of Human Cerebral Organoids from Pluripotent Stem Cells." *HardwareX* 6: e00084 (2019). ****co-first authors***
- **Brian J. O'Grady**, Daniel A. Balikov, Ethan Lippmann, Leon M. Bellan. "Spatiotemporal Control of Morphogen Delivery to Pattern Stem Cell Differentiation in Three-Dimensional Hydrogels." *Current Protocols* 51(1): e97 (2019).
- **Brian J. O'Grady**, Daniel A. Balikov, Jason Wang, Emma K. Neal, Yu-Chuan Ou, Rizia Bardhan, Ethan S. Lippmann, Leon M. Bellan. "Spatiotemporal Control and Modeling of Morphogen Delivery to Induce Gradient Patterning of Stem Cell Differentiation Using Fluidic Channels." *Biomaterials Science* 7(4): 1358-1371 (2019).
- Nicholas G Campbell, Aparna Shekar, Jenny I Aguilar, Dungeng Peng, Vikas Navratna, Dongxue Yang, Alexander N Morley, Amanda M Duran, Greta Galli, **Brian J. O'Grady**, Ramnarayan Ramachandran, James S Sutcliffe, Harald H Sitte, Kevin Erreger, Jens Meiler, Thomas Stockner, Leon M Bellan, Heinrich JG Matthies, Eric Gouaux, Hassane S Mchaourab, Aurelio Galli. "Structural, Functional, and Behavioral Insights of Dopamine Dysfunction Revealed by a Deletion in SLC6A3." *PNAS* 116(9): 3853-3862 (2019).
- **Brian J. O'Grady**, Jason Wang, Shannon Faley, Daniel Balikov, Ethan Lippmann, Leon M. Bellan. 2018. "A Customizable, Low-Cost Perfusion System for Sustaining Tissue Constructs." *SLAS Technology* 23(6): 592-598 (2018).
- C.R. Marutha Ravindran, Sara C. Bravo, Theo Busby, Charles N. Crain, John A. Escobedo, Kenneth Gresham, **Brian J. O'Grady**, Lourdes Rios, Shashwata Roy and Matthew J. Gdovin. "Intracellular Acidosis and pH Regulation in Central Respiratory Chemoreceptors." *Journal of Health Care for the Poor and Underserved* 22(40): 174 (2011).

Patents

- Methacrylated Peptides for Bioinstructive Hydrogels (Inventor, Provisional Patent)
- Nozzle for High Resolution DMD Biopringing

- Biofunctionalized Hydrogels to Instruct Cortical Organoid Laminar Patterning (Inventor, Provisional Patent)
- Biofunctionalized Hydrogel for Cell Culture (Inventor, Provisional Patent)
- Next Generation Neurovascular Models Built from Human iPSC's (Inventor, Provisional Patent)
- Spinning Bioreactor for Cell Culturing (Inventor, Provisional Patent)
- Software for Controlling Spinning Bioreactors (Inventor, Provisional Patent)
- Biofunctionalized Hydrogel to Support Vascular Identity in Endothelial Cells (Inventor, Provisional Patent)
- Cad Biomaterial for Growth of Arterioles In Vivo (Inventor, Provisional Patent)
- Bioreactor Systems (Inventor, Provisional Patent)
- A New Class of Biomaterials to Treat Tissue Ischemia by Promoting Large Blood Vessel Growth (Inventor, Provisional Patent)
- A Novel Drug Therapeutic Treatment: Hydrogen Uncaging Using Photolysis for Fast and Focal Intracellular Acidification as a Cancer Therapeutic System, 2014, U.S. Patent US20170202964A1 (Inventor)

Conference Presentations and Invited Talks

- **Brian J. O'Grady**. "Engineering Next-Gen BBB Models: A Novel Microfluidic Approach for Vascular Research" Invited Talk. *Cerebral Vascular Biology*. Ann Arbor, MI (June 2025).
- **Brian J. O'Grady**. "Next-Generation 3D Model of the Neurovascular Unit and Blood-Brain Barrier Leveraging Ex Vivo Human Brain Tissue for Studying Neurovascular Pathologies." Invited Talk. Weill Medical College of Cornell University, Brain and Mind Research Institute. *Emerging Leaders in Neuroscience*. (January 2025).
- **Brian J. O'Grady**. "Next-Generation Innovations and Technologies for Studying Pathological Conditions." Invited Talk. the Annual Biomedical Research Conference for Minoritized Scientists (ABRCMS) *Expert Lecture*. (November 2024).
- **Brian J. O'Grady**. "Advanced 3D Model of the Neurovascular Unit and Blood-Brain Barrier Using Ex Vivo Human Brain Tissue to Model Neurovascular Pathologies." Invited Talk. Vanderbilt University Medical Center (September 2024).
- **Brian J. O'Grady**, Scott McCall, Sam Cullison, Matthew Schrag, Ethan Lippmann. "Advanced 3D Model of the Neurovascular Unit and Blood-Brain Barrier Using Ex Vivo Human Brain Tissue to Model Neurovascular Pathologies." Oral Presentation. *Tissue Engineering and Regenerative Medicine Society World Congress*. Seattle, WA (July 2024).
- **Brian J. O'Grady**. "Engineered Models of the Human Neurovascular Unit for Human Clinical Trials on a Chip." Invited Talk. Arizona State University (March 2024).
- **Brian J. O'Grady**. "Engineering Technologies for Three-Dimensional Models of the Human Neurovascular Unit." Invited Talk. Northwestern University (March 2024).
- **Brian J. O'Grady**, Alexis Yates, Matthew Schrag, Ethan Lippmann. "A Three-Dimensional Blood-Brain Barrier Model Using Ex Vivo Tissue to Study Neurovascular Pathology." Oral Presentation. *Biomedical Engineering Society*. Seattle, WA (October 2023).
- **Brian J. O'Grady**. "Developing Technologies to Engineer Three-Dimensional Models of the Human Neurovascular Unit." Invited Talk. University of Alabama Birmingham (May 2023).
- **Brian J. O'Grady**. "Developing Technologies to Engineer Three-Dimensional Models of the Human Neurovascular Unit." Invited Talk. University of Michigan (March 2023).
- **Brian J. O'Grady**. "Developing Technologies to Engineer Three-Dimensional Models of the Human Neurovascular Unit." Invited Talk. Binghamton University (February 2023).
- **Brian J. O'Grady**, Alexis Yates, Matthew Schrag, Ethan Lippmann. "A Three-Dimensional Blood-Brain Barrier Model Using Ex Vivo Tissue to Study Neurovascular Pathology." Oral Presentation. *Vanderbilt Biomaterials Day*. San Antonio, TX (October 2022).
- **Brian J. O'Grady**, Alexis Yates, Matthew Schrag, Ethan Lippmann. "A Three-Dimensional Blood-Brain Barrier Model Using Ex Vivo Tissue to Study Neurovascular Pathology." Oral Presentation. *Biomedical Engineering Society*. San Antonio, TX (October 2022).

- **Brian J. O'Grady**, Alexis Yates, Matthew Schrag, Ethan Lippmann. "A Three-Dimensional Model of the Neurovascular Unit Using Human Ex Vivo Brain Tissue." Invited Talk. *SELECTBIO 3D-Models for Drug Testing: Organoids & Tissue Chips 2022*. Seattle, WA (September 2022)
- **Brian J. O'Grady**. "Simple, Cost-Effective Techniques for Rapid Prototyping 3D printed Microfluidics and Microdevices." Invited Talk. *MEMS Micromanufacturing* (March 2022).
- **Brian J. O'Grady**, Alexis Yates, Kylie Balotin, Michael Geuy, Matthew Schrag, Ethan Lippmann. "Development of a 3D Neurovascular Unit for *In Vitro* Modeling of Neurological Diseases and Screening Potential Therapeutics." Oral Presentation. *Materials Research Society*. Boston, MA (December 2021).
- **Brian J. O'Grady**. "Development of a 3D Neurovascular Unit for *In Vitro* Modeling of Neurological Diseases and Screening Therapies." Invited Talk. *Biomedical Engineering Society Underrepresented Needs in Technology and Engineering* (November 2021).
- **Brian J. O'Grady**, Alexis Yates, Kylie Balotin, Michael Geuy, Matthew Schrag, Ethan Lippmann. "A Three-Dimensional Blood-Brain Barrier Model Using Ex Vivo Tissue to Study Neurovascular Pathology." Poster Presentation. *Biomedical Engineering Society*. Orlando, FL (October 2021).
- **Brian J. O'Grady**. "Controlling Hardware with the Software." Invited Talk. Chan Zuckerberg Initiative *CZI Neurodegeneration Community Projects* (March 2020).
- **Brian J. O'Grady**, Alexis Yates, Kylie Balotin, Michael Geuy, Matthew Schrag, Ethan Lippmann. "A Three-Dimensional Blood-Brain Barrier Model Using Ex Vivo Tissue to Study Neurovascular Pathology." Oral Presentation. *Vanderbilt Alzheimer's Disease Day*, Nashville, TN (October 2020).
- **Brian J. O'Grady**, Alexis Yates, Kylie Balotin, Michael Geuy, Matthew Schrag, Ethan Lippmann. "A Three-Dimensional Blood-Brain Barrier Model Using Ex Vivo Tissue to Study Neurovascular Pathology." Oral Presentation. *Biomedical Engineering Society Annual Meeting*, (October 2020).
- **Brian J. O'Grady**, Dan Balikov, Jason Wang, Emma Neal, Yu Ou, Rizia Bardhan, Ethan Lippmann, Leon Bellan. "Controlling Stem Cell Fate in 3D using Morphogen Gradients in a Hydrogel." Oral presentation. *Biomedical Engineering Society Annual Meeting*, Atlanta, GA (October 2018).
- **Brian J. O'Grady**, Courtney Berger, Jeff Reese, Elaine Shelton and Leon Bellan. "Tissue Engineered 3D Construct for Modeling Ductus Arteriosus Closure." Poster presentation. *Biomedical Engineering Society Annual Meeting*, Atlanta, GA (October 2018).
- **Brian J. O'Grady**, Dan Balikov, Jason Wang, Emma Neal, Yu Ou, Rizia Bardhan, Ethan Lippmann, Leon Bellan. "Spatiotemporal Control of Morphogen Delivery to Induce Multi-Differentiation of Stem Cells Using Fluidic Channels." Oral Presentation. *Materials Research Society*, Boston, MA (November 2017).
- Lourdes Rios, **Brian J. O'Grady**, John Escobedo, James Bayne and Matthew J. Gdovin. "5-HT1a Receptor Agonist Abolishes Hypercapnic Response in Central Respiratory Chemoreceptors of the Bullfrog Tadpole Brainstem, *Lithobates catesbeianus*." Poster presentation. Annual Biomedical Research Conference for Minority Students (ABRCMS), St. Louis, MO (November 2011).
- **Brian J. O'Grady**, Haley Hazlett, Elma Frias, Matthew Gdovin. "pH of a Bleb: Compartmentalization of Intracellular pH." Poster presentation. The University of Texas at San Antonio Annual College of Sciences Research Conference (October 2013).
- Aryana J. Cruz, Sarah M. Aceves, James N. Bayne, **Brian J. O'Grady**, Matthew J. Gdovin. "Caffeine Therapy and Its Effect on Central Respiratory Chemoreception in Larval *Lithobates catesbeianus."* Poster presentation. The Society for the Advancement of Chicanos/Hispanics and Native Americans in Science (SACNAS) 40th National Conference and Celebration. (October 2013).

Other Presentations

- **Brian J. O'Grady**. "A New Biomaterial that Supports the Growth of Neurons into Neural Networks." Vanderbilt Institute of Nanoscale Science and Engineering (VINSE) Spotlight Podcast (March 2021). (Link to podcast)

Extramural Activities

Scientific Journal Review (ad hoc reviewer)
Archives of Computational Methods in Engineering
Journal of Nanobiotechnology
ACS Biomaterials Science & Engineering
PLOS ONE
Frontiers in Biomaterials Science
Advanced Science

Scientific Award Review
VinFuture Nomination Board Member (2026)

Research Support:

NIH/NINDS Postdoctoral Career Transition Award (K99/R00)
O'Grady (PI)
09/01/2023 – 08/31/2028
Development of a 3D Neurovascular Unit for In Vitro Modeling of Subarachnoid Hemorrhage and Screening Therapies

NIH Loan Repayment Award
O'Grady (PI)
07/01/20 – 06/30/22
Development of a 3D Bioinstructive Hydrogel to Model Alzheimer's Disease Neuropathology In Vitro

NIH/NIA 5T32AG058524-03
Jefferson (PI), Role: Trainee
06/01/19 – 05/31/22
Interdisciplinary Training Program in Alzheimer's Disease