JAMES J. TRONOLONE

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SUMMARY

I am a Biomedical Engineer with experience in nano- and micro-fabrication, microfluidics, and biomedical research. I am currently pursuing my Ph.D. at Texas A&M University specializing in microphysiological model development for the mimicking of human disease outside of 2D well-plate assays or animal models. I am also interested in addressing gaps in tissue engineering such as vascularization, immunoprotection, and xeno-free biomaterials using next-generation *in vitro* technology.

EDUCATION

Texas A&M University — *Expected 2023*
College of Engineering
Ph.D. in Biomedical Engineering

The George Washington University — May 2019
School of Engineering and Applied Sciences (SEAS)
M.S. in Biomedical Engineering, *Summa Cum Laude*

The George Washington University — May 2018
School of Engineering and Applied Sciences (SEAS)
B.S. in Biomedical Engineering, Electrical Eng. Minor, *Magna Cum Laude*

TECHNICAL SKILLS

Biological Techniques/Assays	• 2D and 3D Mammalian Primary and Stem Cell Culture • Immunofluorescence • Flow Cytometry • qPCR • ELISA	Software/ Programming	• Matlab • Python • SolidWorks • ImageJ • Adobe Illustrator • Microsoft Office (Word, Excel, Power Point)
Microfabrication	• Photo-Lithography • Soft-Lithography • Electron Beam Lithography • Surface Modification • Bio-Interfaced Circuitry Design, Simulation, and Fabrication	Imaging	• Fluorescence Microscopy • Optical Sectioning Microscopy (Zeiss Apotome) • Laser Confocal Microscopy • Scanning Electron Microscopy • Atomic Force Microscopy

WORK EXPERIENCE

BioinSyst – College Station, TX — July 2019 – Present
Graduate Research Assistant

U.S Food and Drug Administration (FDA) – White Oak, MD — June 2018 – June 2019
ORISE Research Fellow

The LeBlanc Lab — May 2016 – June 2018
Undergraduate Research Assistant (September 2016 – June 2018)
Nanotechnology Fellow (May 2016 – August 2016)

AWARDS

American Heart Association Predoctoral Fellowship	$64,072	January 2022
National Science Foundation Graduate Research Fellowship	$138,000	April 2019
TAMU BMEN National Excellence Fellowship	$285,500	April 2019
Oak Ridge Institute for Science and Education (ORISE) Post-Baccalaureate Research Fellowship	$46,656	June 2018
GW SEAS Graduate Award	$10,000	August 2018
GW Graduate Merit Fellowship	$5,000	August 2018
SEAS Summer Undergraduate Program in Engineering Research (SUPER)	$6,000	May 2017
The Charles Gilmore Internship in Materials Science	$1,637	May 2016
National Science Foundation Nanotechnology Fellowship	$3,334	May 2016
GW SEAS Presidential Scholarship	$48,000	August 2014
The George Washington University's University and Alumni Award	$120,000	August 2014

PUBLICATIONS

Tronolone, J. J., Mathur, T., Chaftari, C. P., & Jain, A. Quantitative standardization of engineered microvasculature-on-chip recapitulates physiological insulin secretion in a vascularized pancreas-chip. *In preparation.*

Mathur, T., **Tronolone, J. J.**, & Jain, A. Comparative analysis of blood-derived endothelial cells for designing next-generation personalized vascular organ-on-chip biotechnology. *J Am Heart Assoc*. 2021;10:e022795. doi: 10.1161/JAHA.121.022795.

Saha, B., Mathur, T., **Tronolone, J. J**., Chokshi, M., Lokhande, G. K., Selahi, A., Gaharwar, A. K., Afshar-Khargan, V., Sood, A. K., Bao, G., & Jain, A. Human tumor microenvironment chip evaluates the consequences of platelet extravasation and combinatorial antitumor-antiplatelet therapy in ovarian cancer. *Sci. Adv*. 2021;7(30):eabg5283. doi: 10.1126/sciadv.abg5283.

Tronolone, J. J., Lam, J., Agrawal, A. & Sung, K. Pumpless, modular, microphysiological systems enabling tunable perfusion for long-term cultivation of endothelialized lumens. *Biomed. Microdevices.* 2021;23:25. doi: 10.1007/s10544-021-00562-3.

Tronolone, J. J., & Jain, A. Engineering new microvascular networks on-chip: ingredients, assembly, and best practices. *Adv. Funct. Mater.* 2021;2007199. doi: 10.1002/adfm.202007199.

Tronolone, J. J., Orrill, M., Song, W., Kim, S. W., Lee., B. Y., & LeBlanc, S. Electric Field Assisted Alignment of Viruses into Colored Films. *Nanomaterials*. 2019;9(9):1310; doi: 10.3390/nano9091310.

CONFERENCE PROCEEDINGS

Mathur, T., **Tronolone, J. J.**, & Jain, A. Vascular Organ-Chips Made from Blood. *Circulation*. 2021;144:A11425. doi: 10.1161/circ.144.suppl_1.11425.

Doktor, D., O'Connor, S. P., **Tronolone, J. J.**, Jain, A., & Yakovlev, V. V. Impulsive stimulated Brillouin spectroscopy for non-invasive microfluidic-based viscoelastic measurements in vitro. *Microfluidics, BioMEMS, and Medical Microsystems XIX*. 2021;11637:116370S. doi: 10.1117/12.2579090.

PATENTS

Jain, A., **Tronolone, J. J.**, & Saha, B. MICROFLUIDIC DEVICE MIMICKING TUMOR MICROENVIRONMENT. U.S. Application No. 63/219,827. Filed July 8, 2021

PRESENTATIONS

Machine-learned vascular networks improve predictive power of organ-chips — December 2021
Tronolone, J. J., Mathur, T., Chaftari, C. P., & Jain, A.
Microphysiological Systems World Summit (oral)
Meeting held virtually

Vascular Organ-Chips Made from Blood — November 2021
Mathur, T., **Tronolone, J. J.**, & Jain A.
American Heart Association Scientific Sessions (oral)
Boston, MA

Impulsive stimulated Brillouin spectroscopy for non-invasive microfluidic-based viscoelastic measurements in vitro. — March 2021
Doktor, D., O'Connor, S. P., **Tronolone, J. J.**, Jain, A., & Yakovlev, V. V.
SPIE BiOS 2021 (oral)
Meeting held virtually

Engineering self-assembled microvascular networks for integration into microphysiological systems. — January 2021
Tronolone, J. J., Chaftari, P., & Jain, A.
Texas A&M Biomedical Engineering Annual Research Symposium (oral)
Meeting held virtually

Development of A Microfluidic Device for Easy Operation of Vasculature-on-a-Chip — June 2019
Tronolone, J. J., Lam, J., Agrawal, A., & Sung, K.
2019 Cellular and Tissue Therapy Branch Meeting (oral)
U.S. Food and Drug Administration – Silver Spring, M.D.

M13 Bacteriophage Alignment in the Presence of an Electric Field — February 2018
Tronolone, J. J., Orril, M., Song, W., Lee, B. Y., & LeBlanc, S.
2018 SEAS R&D Showcase (poster)
The George Washington University – Washington, D.C.

Inkjet Printed, Passive Sensing Networks with Biological Materials
Tronolone, J. J., Brady, J., Wallace, S., Song, W., Orril, M., Lee, B. Y., & LeBlanc, S.
2017 GW Research Days (poster) — April 2017
2017 SEAS R&D Showcase (poster) — February 2017
The George Washington University – Washington, D.C.

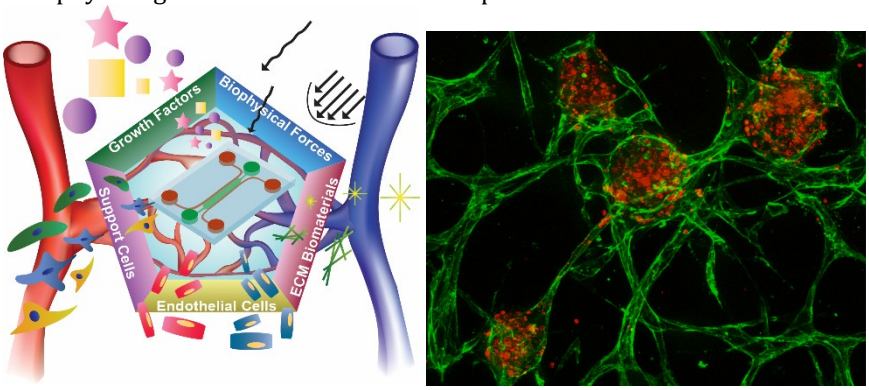
Colorimetric Sensor Fabrication with M13 Bacteriophage — October 2016
Tronolone, J. J., Song, W., Lee, B. Y., & LeBlanc, S.
GWU – KU Research Symposium (oral)
Korea University – Seoul, South Korea

Characterization and Inkjet Printing of Biological Materials — July 2016
Tronolone, J. J., Brady, J., Wallace, S., & LeBlanc, S.
Nanotechnology Fellows Program Final Presentation Sessions (oral)
The George Washington University – Washington, D.C.

RESEARCH PROJECTS

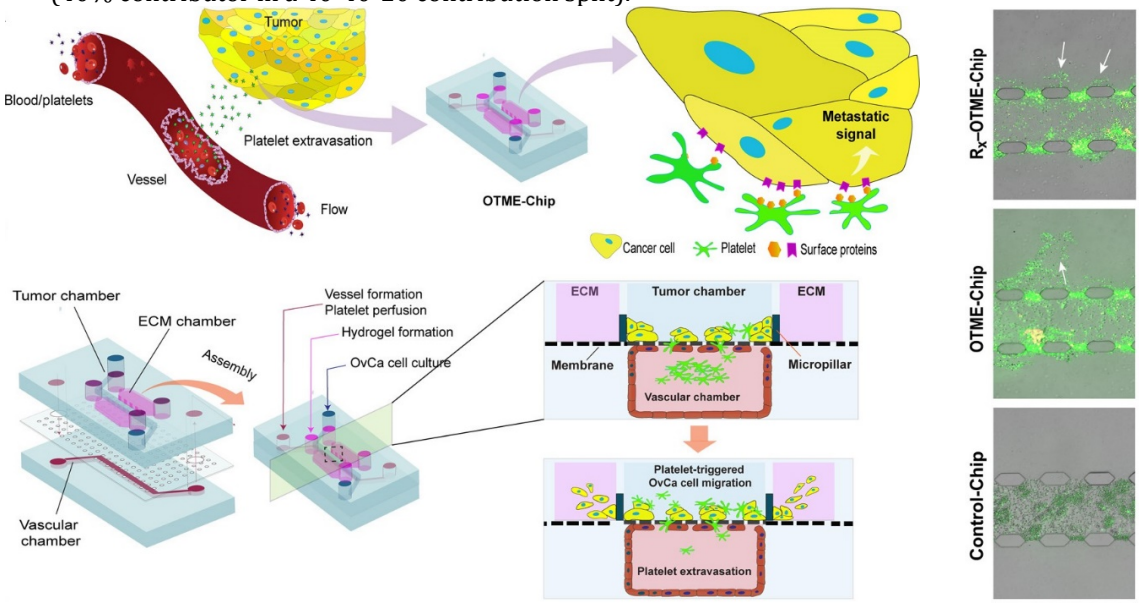
Quantitative Evaluation of Microvascular Networks-on-Chip for Development of a Vascularized Islet-Chip July 2019 - Present

- Reviewed the previous 10 years of literature involving methods of developing microfluidic models of microvascular-on-chip in *Advanced Functional Materials*.
- Optimized protocols for developing angiogenesis- and vasculogenesis-on-chip by tuning endothelial cell and stromal cell densities, sources, and cell types, as well as extracellular matrix composition and growth factors, resulting in the aggregation of 500+ imaging samples for downstream processing.
- Utilized machine learning to develop a multiple regression model relating vascular network morphological characteristics extracted from images to biological function (mass transport) measured using numerical simulation, and subsequently isolated the morphological metrics most significantly influencing the mass transport measurements.
- Combined optimal ingredients of a vasculogenesis-chip with insulin-secreting pancreatic pseudo-islets, resulting in a microphysiological model of the endocrine pancreas.



Fabrication of a Novel Microfluidic Device to Recapitulate Ovarian Tumor Epithelial-to-Mesenchymal Transition November 2019 – July 2021

- Used SolidWorks to design a 4-channel microfluidic device that allowed latitudinal and longitudinal cross-talk and cell migration. The device consisted of two microchannels situated atop each other but separated by a thin, porous membrane, and the top channel was flanked by two microchannels with a semi-permeable barrier made of collagen hydrogel.
- Fabricated devices using traditional soft-lithography practices and initiated cell culture within the devices using multiple ovarian cancer lines and industry-standard vascular cell lines in order to recapitulate the platelet-mediated ovarian cancer epithelial-to-mesenchymal transition.
- Collaborated with other lab groups to knock-out surface proteins observed to be involved in the metastatic trigger and evaluated pharmacological methods of inhibiting tumor metastasis.
- Results of the project reported in *Science Advances* and a patent for the microfluidic device was recently filed (40% contributor in a 40-40-20 contribution split).



Lung-on-a-Chip for Gene Editing Strategies to Treat Cystic Fibrosis September 2020 – Present

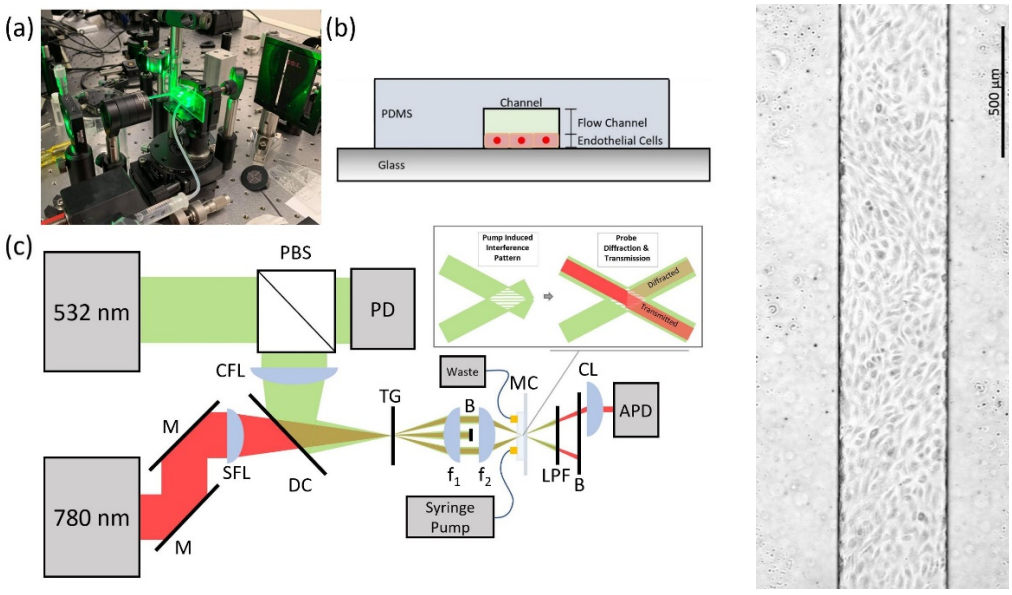
- Used soft-lithography to replicate previously published lung-on-a-chip devices consisting of two latitudinal channels separated by a thin, porous PDMS membrane.
- Tested different ECM-protein mixes to optimize primary lung epithelial cell line and iPSC generated cell line attachment to PDMS.
- Cultivated co-cultured devices (lung epithelium and blood endothelium) and initiated an air-liquid culture mimicking the *in vivo* state of the air-blood interface of the human air sac.

Development of a Microfluidic Attachment Assay for Evaluation of Cancer Cell Knock-Outs March 2021 – August 2021

- Used microfluidic straight channel devices to culture mouse ovarian endothelial cells under perfusion.
- Stimulated endothelial cells with tumor necrosis factor α (TnF-α), live stained and then perfused a collaborator's ovarian cancer wild type and knock-out cell lines to determine the degree of cancer cell attachment to the endothelium.
- Results of the project are under preparation for submission to peer-reviewed journals.

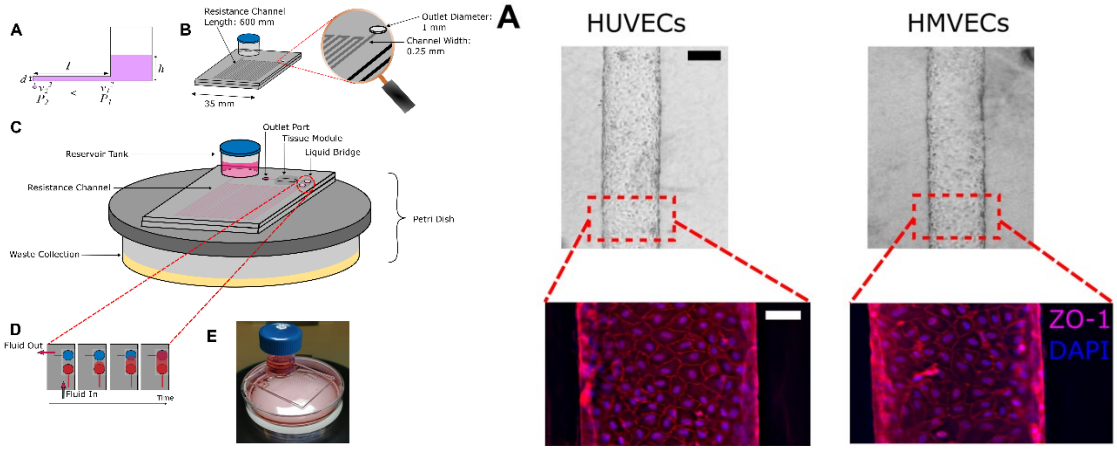
Assessment of Viscoelastic Properties and Cell-ECM Interactions Using Impulsive Stimulated Brillouin Scattering (ISBS) March 2020 – Present

- Fabricated blood vessel-chips for measurement using a collaborator's novel spectroscopy tool that measures viscoelastic properties.
- Optimized culturing techniques to improve integration with a spectroscopy tool that requires a large footprint.
- Preliminary results of the project have been presented at SPIE 2021 and more recent results are under preparation for submission to peer-reviewed journals.



Pumpless, Endothelial Cell-Coated Lumens June 2018 – June 2019

- Designed a pumpless microfluidic device for a hollow endothelial cell-coated lumen, featuring a reservoir tank and resistance channel for long-term, easy operation of a constant flow system.
- Fabricated lumens by crosslinking collagen hydrogel around an acupuncture needle within a PDMS chamber while preventing leakage to resistance circuit.
- Optimized protocols involving hydrogel crosslinking and cell seeding to achieve repeatable lumen structure and diameter.
- Tested different endothelial cell types in order to achieve cell spreading, verified by fluorescence imaging after staining of tight junctions.
- Results of the project published in *Biomedical Microdevices*

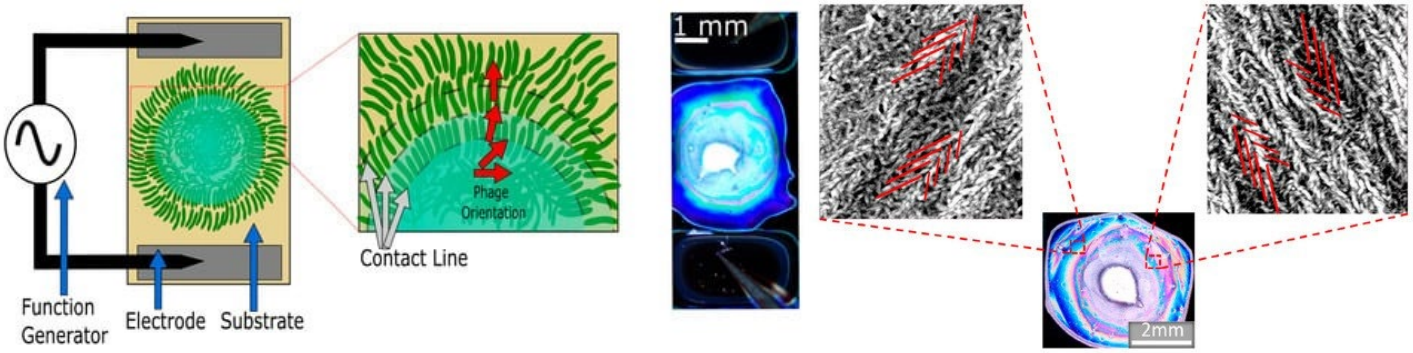


Lymph Node-on-a-Chip to Evaluate NanoART June 2018 – June 2019

- Designed a 5-channel microfluidic device to build an *in vivo*-like *in vitro* lymph node-on-a-chip for evaluation of NanoART drug delivery.
- Derived lymph stroma-like cells from multipotent stromal cells (MSCs) using a differentiation cocktail based on previous work and a review of relevant literature.
- Characterized cells after culturing with pro-lymphogenic growth factors by analyzing cell secretions with ELISA.
- Analyzed immune cell (PBMC) proliferation in response to co-culturing with lymph stroma-like MSCs using flow cytometry.

Electric Field Assisted Alignment of Viruses into Colored Films May 2017 – June 2018

- Conducted a literature review to detail methods of achieving color-changing sensors, termed "phage litmus," that indicate the presence of harmful chemicals.
- Designed an experimental procedure and testing station to achieve smectic helicoidal nanofilament (SHN) structure in bacteriophage films by using an applied voltage on M13 bacteriophage solutions.
- Measured, characterized, and analyzed color-change and structure of bacteriophage molecules after experimentation.
- Results of the project published in *Nanomaterials*



Myoelectrically Controlled Robotic Assistant February 2017 – May 2018

- Designed, simulated, and assembled bioamplifier circuitry that can collect and amplify signals from arm muscle groups (EMGs).
- Worked with four other team members to design a system that uses the outputs of the bioamplifiers as inputs to a microcontroller that can control a robotic assistant.
- Machined and 3D printed parts with other team members to build the robot.

TEACHING EXPERIENCE

Texas A&M University – College Station, TX Fall 2020 and Spring 2021

Graduate Instructional Assistant – Biofluid Mechanics (BMEN 343)

- Responsible for adapting an 80-person course to a virtual format in the wake of the COVID-19 pandemic.
- Held weekly office hours and pre-exam review sessions to tutor students in biofluid mechanic lessons.
- Administered homework and proctored exams with the help of the course grader.
- Designed a final term project that required students to relate fluid dynamic principles and fundamentals to human health and disease such as deep vein thrombosis.

PROFESSIONAL ORGANIZATIONS

American Heart Association August 2021

Biomedical Engineering Society January 2016

Tau Beta Pi – DC Gamma Chapter December 2017

REFERENCES

Abhishek Jain, Assistant Professor of Biomedical Engineering
Texas A&M University – College Station, TX
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Kyung Sung, Senior Staff Fellow
U.S. Food and Drug Administration – White Oak, MD
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Saniya LeBlanc, Associate Professor of Mechanical and Aerospace Engineering
The George Washington University – Washington, DC
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Jason Zara, Associate Professor of Biomedical Engineering
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