

JEAN CARLOS SERRANO

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EDUCATION

Massachusetts Institute of Technology *September, 2018- June,2021 (Expected)*
Ph.D. in Mechanical Engineering

Massachusetts Institute of Technology *September, 2016- June,2018*
M.S. in Mechanical Engineering
Thesis: Engineering 3D Lymphatic Vasculature On-Chip Through Biochemical and Mechanical Stimuli

University of Puerto Rico at Mayaguez *August, 2012 - May, 2016*
B.S. in Mechanical Engineering (Summa Cum Laude)

RESEARCH EXPERIENCE

Massachusetts Institute of Technology *September 2016 - Present*
Graduate Student Researcher *Advisor: Roger Kamm, Ph.D*

Engineering 3D Lymphatic Vasculature On-Chip

- Systematically studied the angiogenic influence of growth factors, extracellular matrix composition, and interstitial flow on lymphatic vascularization in a tightly-controlled microfluidic system.
- Identified the adequate ranges of angiogenic stimuli to induce the formation of lymphatic capillaries (that mimics their in vivo architecture) in a versatile platform that can be implemented for physiological studies regarding lymphatic function and disease models.

Harvard Medical School *June 2015 - August 2015*
Assistant Researcher *Advisor: Guillermo Garcia-Cardena, Ph.D*

Engineering Mechano-Activated Cellular Sensors

- Developed a transcriptionally-activated cellular sensor capable of exhibiting a quantitative fluorescent response when cells are exposed to different flow patterns (laminar flow and disturbed flow) thus providing a novel approach to evaluate the real-time effects of flow shear stress on cell physiology via fluorescent imaging.

Princeton University *June 2014 - August 2014*
Assistant Researcher *Advisor: Howard Stone, Ph.D*

Characterization of the Mechanical Properties of Bacterial Biofilms Using a Micro-Membrane Rheometer

- Designed a micro-membrane rheometer capable of measuring the elasticity of numerous strains of bacterial biofilms by the application of a fixed pressure to a micro-membrane in contact with the biofilm.
- Developed a COMSOL finite element analysis model capable of quantifying the relative contributions of properties between the membrane and biofilm in order to validate the measurements given by the micro-membrane rheometer.

University of Puerto Rico at Mayaguez *January 2013 - May 2016*
Assistant Researcher *Advisors: Paul Sundaram, Ph.D & Nanette Difffoot, Ph.D*

Expression of Metastatic Characteristics Induced by Cyclic Mechanical Strain

- Cultivated different cell lines on a biocompatible substrate subjected to a cyclical tensional load to

later quantify and analyze the images obtained from immunofluorescent imaging.

· After quantitative and imaging analysis, results elucidate that cells exposed to cyclic tensional loading expressed lower focal adhesion and higher proliferation rate thus enhancing their metastatic efficiency.

University of Puerto Rico at Mayaguez

Assistant Researcher

August 2013 - December 2015

Advisor: Paul Sundaram, Ph.D

Adaptive Responses of Murine Osteoblasts Subjected to Coupled Mechanical Stimuli

· Analyzed the orientational responses of the actin cytoskeleton and the expression of focal adhesion complexes in murine osteoblasts as a results of simultaneous mechanical cues (matrix stiffness and cyclic tensional strain) to induce preferential cellular alignment for functional tissue constructs.

University of Puerto Rico at Mayaguez

Assistant Researcher

August 2013 - December 2013

Advisor: Paul Sundaram, Ph.D

Cortical Bone Fracture Analysis Using the eXtended Finite Element Method from ABAQUS

· Developed a Python language based algorithm which allowed an XFEM crack propagation analysis in the Finite Element Analysis software ABAQUS for a 2D cortical bone model under mode II crack loading.

University of Puerto Rico at Humacao

Assistant Researcher

August 2011 - May 2012

Advisor: Rogerio Furlan, Ph.D

Synthesis and Characterization of Polymeric Fibers with Magnetic Nanoparticles for Magnetically-Assisted Drug Delivery

· Optimized the synthesis of polyethylene oxide nanofibers containing iron oxide nanoparticles by electro-spinning method and characterize them different microscopy techniques (Optical, SEM, AFM).

PEER-REVIEWED PUBLICATIONS

· **J.C. Serrano**, J. Cora-Cruz, N. Diffoot, P. Sundaram, Adaptive Responses of Murine Osteoblasts Subjected to Coupled Mechanical Stimuli. *Journal of the Mechanical Behavior of Biomedical Materials*. (2018)

· T. Osaki, **J.C. Serrano**, R.D. Kamm, Cooperative Effects of Vascular Angiogenesis and Lymphangiogenesis. *Regenerative Engineering and Translational Medicine*. (2018)

· R. Li, **J.C. Serrano**, H. Xing, T.A. Lee, H. Azizgolshani, M. Zaman, R.D. Kamm, Interstitial flow promotes macrophage polarization toward an M2 phenotype. *Molecular Biology of Cell*. (2018)

MEETINGS AND CONFERENCE PRESENTATIONS

· **Serrano, J.C.**, Cora Cruz, J., Diffoot, N., Sundaram, P., “Expression of Focal Adhesions in Response to Cyclic Loading of Substrate in MCF12A cells”. **39th ACS Senior Technical Meeting**, November 7, 2015, poster forum, Ponce, PR.

· **Serrano, J.C.**, Cora Cruz, J., Diffoot, N., Sundaram, P., “Expression of Focal Adhesions in Response to Cyclic Loading of Substrate in MCF12A cells”. **Biomedical Engineering Society Annual Conference**, October 8, 2015, Tampa, Florida, USA.

· **Serrano, J.C.**, Slegtenhorst, B., Garcia-Cardena, G., “Engineering Mechano-Activated Cellular Sensors”. **Leadership Alliance National Symposium**, July 25, 2015, Stamford, Connecticut, USA.

· **Serrano, J.C.**, Cora Cruz, J., Diffoot, N., Sundaram, P., “Expression of Focal Adhesions in Response to Cyclic Loading of Substrate in MCF12A cells”. **5th Undergraduate Research Symposium**, May 2, 2015, oral presentation forum, University of Puerto Rico at Mayaguez, PR.

· **Serrano, J.C.**, Ingremeau, F., Stone, H.A., “Characterization of the Mechanical Properties of Bacterial Biofilms using a Micro-membrane Rheometer” . **38th ACS Senior Technical Meeting** , November 7, 2014, poster forum, San Juan,PR.

· **Serrano, J.C.**, Ingremeau, F., Stone, H.A., “Characterization of the Mechanical Properties of Bacterial Biofilms using a Micro-membrane Rheometer” . **Leadership Alliance National Symposium**, July 26, 2014, Stamford,Connecticut,USA.

AWARDS AND HONORS

National Science Foundation (NSF) Graduate Research Fellowship *2017*

A highly competitive national fellowship awarded annually by the National Science Foundation to a selected 2,000 students to pursue graduate school in a STEM-related field. Awardees are chosen upon the student’s ability to impact their specific field of research, as well as their outreach to underrepresented minorities to increase their participation in STEM.

MIT Office of the Dean for Graduate Education (ODGE) Diversity Fellowship *2016*

A full year internal fellowship awarded in recognition of excellence in academia as an effort to increase diversity of the graduate student body at MIT.

MIT University Center for Exemplary Mentoring (UCEM) Sloan Scholar *2016*

A prestigious award in recognition of outstanding academic performance and a promising professional future in academia. (Part of the second cohort at MIT to be awarded this scholarship) (Funded by the Alfred P. Sloan Foundation and supported by the Institute of Teaching and Mentoring)

NIH RISE 2 BEST Program Award *2013-2016*

Research assistantship awarded to promising students among the Natural Science and Engineering Departments at the UPR at Mayaguez due to outstanding academic achievements with an interest in pursuing a Ph.D degree within a Biomedical related field.

TECHNICAL STRENGTHS

Programming Languages	Python, MATLAB, LaTeX
Finite Element Analysis Softwares	COMSOL Multiphysics, ABAQUS, ANSYS
Characterization Techniques	Microscopy(Confocal,SEM,AFM),Tensile Strength Testing, FTIR Spectroscopy, Flow Cytometry,Immunofluorescence
Microfabrication	Soft-lithography
Culturing and Handling	Cells & Tissue, Bacteria
Languages	Spanish,English(native languages) & French(elementary proficiency)