

# Dr. Patrick Levi Journey

## Contact

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## Education/Training

<i>Years</i>	<i>Degree / Certificate</i>	<i>Institution</i>
August 2016- August 2019	Postdoctoral Fellow	Oregon Health & Science University
August 2011- August 2015	PhD. Mechanical Engineering	The University of Texas at Austin
August 2009 - August 2011	Master of Science in Engineering	The University of Texas at Austin
August 2005- May 2009	Bachelor of Science in Mechanical Engineering	The University of Portland

## Position Title

<i>Years</i>	<i>Position</i>	<i>Institution</i>
August 2019- Present	Assistant Professor of Biomedical Engineering	San José State University

## Research Experience

### Cardiovascular Devices and Endothelial Cell Regulation for Treatment of Cardiovascular Disease

Department of Biomedical Engineering, Oregon Health & Science University.

Supervisor: **Dr. Monica Hinds**                      **August 2016-Present**

- Determined the chemical and topographic effects of reactive ion plasma luminal surface modification of PVA to support endothelialization and reduce thrombogenicity.
- Developing experiments to examine the effect of shear stress on endothelial cell function on synthetic grafts *in vivo*.
- Characterized thrombus formation on small diameter vascular grafts in a baboon model.
- Submitted grant applications as the principle investigator to the American Heart Association and Collins Medical Trust.
- **Collaborations**
  - **Materials characterization:** Portland State University – Center for Electron Microscopy + Nanofabrication

- **Materials Fabrication:** University of Waterloo – Regenerative Nanomedicine Lab
- **Materials Processing:** Oregon State University – Electrical Engineering Fabrication Facility

### **Total Artificial Heart Characterization and Development**

Knight Cardiovascular Institute, Oregon Health & Science University.

Collaborator: **Dr. George Giraud**                      **November 2017-Present**

- Characterized the second generation of the former Oregon Heart total artificial heart.
- Developed experimental procedures to determine the total artificial heart's response to physiological and pathological systemic pressures.

### **Vascularization of 3D artificial tissue constructs**

Department of Biomedical Engineering, Oregon Health & Science University.

Collaborator: **Dr. Luiz Bertassoni**                      **September 2018-present**

- Co-cultured human mesenchymal stem cells and human umbilical vein endothelial cells in photo-crosslinkable collagen matrices.
- Varied the compressive modulus of constructs to determine stem cell differentiation and endothelial cell phenotype.

### **Novel Nanoparticles and Bio-Microfluidic Assays for Improved Drug Delivery Efficacy**

Department of Mechanical Engineering, University of Texas at Austin.

Supervisor: **Dr. Li Shi**                                      **August 2009 – August 2015**

- Showed size-dependent uptake and in vivo-like behavior in a novel in vitro culture of Human Umbilical Vein Endothelial Cells in cylindrical microchannels.
- Manufactured novel microchannels and showed size dependence on margination and adhesion of 60-970 nm spherical particles.
- Calculated the important in-flow and nearfield forces affecting nanoparticle margination and the important factors in shear-adapted endothelial cell uptake of nanoparticles.
- Showed that the geometry of nanoparticles influences their uptake by epithelial, endothelial and primary bone marrow derived dendritic cells and that uptake is cell line dependent.
- Demonstrated the effect of flow on shape-dependent nanoparticle uptake in biomimetic endothelial cell culture compared to static endothelial cell culture.
- Fabricated highly shape- and size-specific hydrogel nanoparticles (36-800nm) at high throughput using Jet and Flash Imprint Lithography (J-FIL™).
- Designed and fabricated a nanopore sensor for detection and characterization of single nanoparticles of various shapes and material properties.
- Contributed to preparation and writing of grant proposals to NSF, NIH, and DARPA.
- **Collaborations**
  - **Materials Fabrication and Characterization:** Georgia Tech – Institute for Electronics and Nanotechnology

## **Passive Tremor Reduction in an Eating Utensil for Parkinson's Disease Patients**

Department of Mechanical Engineering, The University of Portland.

Supervisor: **Dr. Timothy Doughty**      **August 2008 – 2015**

- Collected data on the nature of Parkinsonian tremor using fabricated three-axis accelerometer test utensil.
- Designed and fabricated proof-of-concept prototype which successfully reduced the magnitude of tremor.
- Co-Founded **Neptune Biomechanics LLC** in June 2009.

## **Microfluidics applications for single-molecule DNA tethering and unzipping using optical tweezers**

Department of Physics, The University of New Mexico.

Supervisor: **Dr. Steven Koch**      **June 2008 – August 2008**

- Designed microfluidic channel geometries to “trap” biological constructs for DNA unzipping using optical tweezers.
- Aided in the setup and optimization of optical tweezers.
- Designed and fabricated microfluidic chip to increase tethering density of DNA constructs.

## **Teaching Experience**

### **1. BME 115 – Foundations of Biomedical Engineering – Fall 2019**

Introduction to the fundamental principles of biomedical engineering. Core conservation equations are applied to mass, energy, charge, and momentum transfer in biomedical systems. Additional topics provide a breadth of exposure in cell and molecular biology, diagnostics and analytical techniques, statistical analysis of biomedical data, bioinformatics, bioinstrumentation, FDA regulations, and biomedical ethics. 65 Graduate and undergraduate students.

### **2. BME 115L – Foundations of Biomedical Engineering Laboratory – Fall 2019**

Responsible for laboratory development, supervision of adjunct instructors, and instructor of record for one section of 16 graduate and junior-level undergraduate biomedical engineering majors. 65 students.

### **3. EGR 491/591-Biomicrofluidics (Adjunct Assistant Professor, University of Portland) – Spring 2018**

Developed and taught a senior-level mechanical engineering and graduate level biomedical engineering course in biological applications of transport phenomena at the microscale. Split course time between lecturing on biological transport phenomena and current biomedical research. 12 students.

### **4. EGR 110-Introduction to Engineering (Adjunct Assistant Professor, University of Portland) – Fall 2017**

Served as an adjunct faculty member and **Instructor of record** for 29 first-year Computer Science, Mechanical, Civil, and Electrical Engineering students. The course was structured around a design competition for which I provided primary instruction to interdisciplinary teams on the design process, circuits, software, structures, and machines.

## Advising Experience (See also: individuals in Research Experience section)

1. **Research advisor for eleven undergraduate and graduate students. – Fall 2019**
  - a. **Competitive Research Awards:**
    - i. **Undergraduate Research Grant (2X) – Fall 2019**
    - ii. **Davidson Research Scholar (2X) – Fall 2019**
    - iii. **Professional Development Grant – Fall 2019**
2. **Undergraduate Student Mentor, American Heart Association Undergraduate Fellow, Oregon Health & Science University, Summer 2018, 2019**
  - a. **Carlos Marquez**, undergraduate summer research assistant in bioengineering
    - i. **Poster at BMES:** 'Determination of Smooth Muscle Cell Growth on Reactive Ion Plasma Treated Polyvinyl Alcohol Biomaterials'
3. **Undergraduate Student Mentor, MJ Murdock Charitable Trust, Oregon Health & Science University, Summer 2017**
  - a. **Rachel Hills**, mechanical engineering undergraduate student interested in graduate studies in Biomedical Engineering. (*Murdoch Scholars*, <http://www.ohsu.edu/xd/outreach/find-highered.cfm>)
4. **Undergraduate Student Mentor, BUILD EXITO, Oregon Health & Science University, 2017**
  - a. **Amy Kuper**, undergraduate student interested in becoming an MD. (*Exito*, <https://www.pdx.edu/exito/>)
5. **Biotech Advisor (BME 550-Biomedical Engineering & Society Capstone), University of Portland, Spring 2017**

Served as the primary advisor for two MSBME candidates on their capstone project. My primary duties were weekly meetings and progress reports, instruction on data gathering, experimental design, and manufacturing of an access port device.

## Service

- Manuscript Reviewer: *Journal of Controlled Release* (2019-present)
- Manuscript Reviewer: *ACS Biomaterials Science & Engineering* (2019-present)
- Abstract Reviewer: BMES (2017-present)
- Manuscript Reviewer: *Open Life Sciences* (2018)
- Lead mechanical engineer and Spanish translator for Engineers Without Borders, University of Portland chapter.
  - Agua Negra, Guatemala (2009)
  - Guadalupe Carney, Honduras (2009)
- *Graduates Linked with Undergraduates in Engineering* mentor for sophomore Chemical Engineering student (2010-2011)
- Colombian Food Bank Foundation, Vice President of International Relations (2015-present)
- Fundación Barquitos de Papel, Ambassador in Tolú, Colombia (2015)
- Biomedical Engineering Society abstract reviewer for 2017 and 2018 annual meetings
- Invited talk: “*The Nanoworld and You*” Albuquerque Academy. Albuquerque, NM (2017)

- Biomedical Engineering Advisory Board Member at The University of Portland (2017-2018)

### Awards and Achievements

- Adjunct Faculty Member, The University of Portland (2017-2018)
- NIH T-32 Postdoctoral Fellow (2016-2018)
- David Bruton, Jr. Graduate School Fellowship (2013-2014)
- NSF Graduate Research Fellowship Honorable Mention (2010)
- Graduate Presidential Scholar (2010)
- The Outstanding Mechanical Engineering Student (Donald P. Shiley School of Engineering, 2009)
- Karel and Marta Tietze Endowed Scholar (2005-2009)
- University of Portland Men's Soccer Cumulative GPA Award (2006-2008)
- NCAA All-West Region Academic All American (2007 and 2008)
- University of Portland Dean's List (5X)
- West Coast Conference Commissioner's Honor Roll (4X)
- Presidential Scholarship (2005-2009)
- AP Scholar with Distinction (2005)

### Languages

- English (Native Speaker)
- Spanish (Fluent)

### Publications and Patents

(<https://scholar.google.com/citations?user=yZFa0zoAAAAJ&hl=en&oi=ao>)

1. **Journey, P.**, Glynn, J., Dykan, I., Hagen, M., Kaul, S., Wampler, R., Hinds, M., Giraud, G., Characterization of a Second Generation Pulsatile Rotary Total Artificial Heart **Circulation: Heart Failure** (submitted)
2. **Journey, P.\***, Parthiban, S. P.\*, Athirasala, A., Franca, C., Tahayeri, A., Menezes, P., Bertassoni, L., (2019) '3D Bioprinting of Blood Vessels and Vascular Networks: Progress and Challenges Toward Biofabrication of Functional Vascularized Tissues and Organs', *Emerging Technologies for Biofabrication and Biomanufacturing*. World Scientific Publishing. (2019)
3. **Journey, P.**, Anderson, D., Pohan, G., Yim, E., Hinds, M., Reactive ion plasma modification of poly(vinyl-alcohol) increases primary endothelial cell affinity and reduces thrombogenicity **Macromolecular Bioscience** 18(9) (2018)
4. **Journey, P.**, Agarwal, R., Singh, V., Roy, K., Sreenivasan, S.V., Shi, L., Unique Size and Shape-Dependent Uptake Behaviors of Non-Spherical Nanoparticles by Endothelial Cells due to a Shearing Flow **Journal of Controlled Release** 245, 170–176 (2017).
5. **Journey, P.**, Agarwal, R., Roy, K., Sreenivasan, S.V., Shi, L., Size-Dependent Nanoparticle Uptake by Endothelial Cells in a Capillary Flow System **Journal of Nanotechnology in Engineering and Medicine** 6(1) 011007 (2015)

6. **Journey, P.**, Agarwal, R., Singh, V., Roy, K., Sreenivasan, S.V., Shi, L., Size-Dependent Nanoparticle Margination and Adhesion Propensity in a Microchannel. **Journal of Nanotechnology in Engineering and Medicine** 4(3) 031002 (2013)
7. Agarwal, R., Singh, V., **Journey, P.**, Shi, L., Sreenivasan, S.V., Roy, K., Mammalian Cells Prefer Nanodiscs over Nanorods and Use Shape-specific Uptake Mechanisms. **PNAS** 110 17247-17252 (2013)
8. Agarwal, R., Singh, V., **Journey, P.**, Shi, L., Sreenivasan, S.V., Roy, K., Scalable Imprinting of Shape-Specific Polymeric Nanocarriers Using a Release Layer of Switchable Water Solubility. **ACS Nano** 6 2524-2531 (2012)
9. Agarwal, R., **Journey, P.**, Raythatha, M., Singh, V., Sreenivasan, S.V., Shi, L., Roy, K., Effect of Shape, Size and Aspect Ratio on Nanoparticle Penetration and Distribution Inside Solid Tissues using 3D Spheroid Models. **Advanced Healthcare Materials** 4(15) 2269-2280 (2015)
10. Singh, V., Agarwal, R., Marshall K., **Journey, P.**, Roy K., Shi, L., Sreenivasan, S.V., Scalable Fabrication of Low Elastic Modulus Polymeric Nanocarriers with Controlled Shapes for Diagnostics and Drug Delivery. **Journal of Micro and Nano-Manufacturing** 3(1) 011002 (2015)

### Conference Presentations

1. **Journey, P.**, Yim, E., Hinds, M., “Reactive Ion Plasma Treatment of Poly(Vinyl-Alcohol) (PVA) to Study the Mechanisms of Cell Attachment, Migration, and Proliferation” Biomedical Engineering Society Annual Meeting.: October 2019; Philadelphia, Pennsylvania. Poster
2. **Journey, P.**, Glynn, J., Dykan, I., Hagen, M., Kaul, S., Wampler, R., Hinds, M., Giraud, G., “Characterization of a Pulsatile Rotary Total Artificial Heart” Biomedical Engineering Society Annual Meeting.: October 2019; Philadelphia, Pennsylvania. Poster
3. **Journey, P.**, Anderson, E.J., Pohan, G., Yim, E., Hinds, M., “Has Your Biocompatible Surface Changed? Reactive Ion Plasma Introduces Unstable Functional Groups onto the Surface of Poly(vinyl alcohol)” Biomedical Engineering Society Annual Meeting.: October 2018; Atlanta, Georgia. Poster
4. **Journey, P.**, Anderson, E.J., Pohan, G., Yim, E., Hinds, M., “Reactive Ion Surface Modification of Poly(vinyl alcohol) Affects Endothelial Colony Forming Cell Affinity and Thrombogenicity” International Vascular Biology Meeting.: June 2018; Helsinki, Finland. Poster
5. **Journey P.**, Anderson D., Pohan G., Yim E., Hinds M., “Reactive Ion Plasma Modification of Poly(vinyl alcohol)” Canadian Biomaterials Society Annual Meeting.: May 2018, Victoria, Canada. Poster
6. **Journey P.**, Anderson D., Hagen M., Yim E., Hinds M., “Reactive Ion Surface Modification of Poly(vinyl alcohol) to Enhance Endothelialization and Preserve non-Thrombogenicity” International Society of Thrombosis and Haemostasis International Congress.: July 2017; Berlin, Germany. Poster
7. **Journey, P.**, Anderson, E.J., Hagen, M., Yim, E., Hinds, M., Reactive Ion Surface Modification of Vascular Graft Materials Enhances Endothelialization. North American Vascular Biology Organization.: October 2017; Pacific Grove, CA. Poster
8. **Journey, P.**, Reactive Ion Surface Modification of Vascular Graft Materials to Enhance Endothelialization and Prevent Neointimal Hyperplasia OHSU Knight Cardiovascular Institute Scientific Retreat.: April 2017; Portland, OR. Podium

9. **Journey P.**, Agarwal R., Singh V., Roy K., Sreenivasan S.V., Shi L., "The Effect of Nanoparticle Size on Margination and Adhesion Propensity in Artificial Micro-Capillaries" ASME Micro/Nanoscale Heat and Mass Transfer International Conference 2012, Atlanta, GA. Podium.
10. **Journey P.**, Caldorera-Moore M., Singh V., Agarwal R., Marshal S., Sreenivasan S.V., Roy K., LaBrake D., Shi L., "High Throughput Nanoimprint Manufacturing of Shape-Specific, Stimuli-Responsive Polymeric Nanocarriers for Drug and Imaging Agent Delivery" NSF CMMI Research and Innovation Conference 4-7 January, 2011, Atlanta, GA. Poster
11. **Journey P.**, Singh V., Agarwal R., Marshal S., Caldorera-Moore M., Sreenivasan S.V., Roy K., Shi L., "Nanoimprint Manufacturing of Shape-Specific, Stimuli-Responsive Polymeric Nanocarriers for Drug Delivery in Cancer Therapy" The University of Texas at Austin Graduate recruitment Poster session 4-5 March, 2011 Austin, TX. Poster (**Best poster award**)
12. Anderson D., **Journey P.**, Cutiongco M., Pohan G., Chevallier P., Mantovani D., Yim E., Hinds M., Reactive ion surface modification of vascular graft materials enhances endothelialization without promoting thrombosis. American Heart Association Basic Cardiovascular Scientific Sessions, Portland, OR. May 2017. Poster
13. Agarwal R., Singh V., Marshall S., **Journey P.**, Shi L., Sreenivasan S.V., Roy K. "Shape Matters: Effect of Polymeric Nanocarriers Shape on Epithelial and Endothelial Cell Lines" Society of Controlled Release July 20-24 2013 Annual Meeting, Honolulu, HI. Poster.
14. Agarwal R., Singh V., **Journey P.**, Shi L., Sreenivasan S.V., Roy K. "Geometry Matters: Cellular Uptake of Nanoscale Drug Carriers is Uniquely Dependent on Particle Size and Shape" Society for Biomaterials Apr 10-13 2013 Annual Meeting, Boston, MA. Podium
15. Agarwal R., Singh V., Marshall S., **Journey P.**, Shi L., Sreenivasan S.V., Roy K. "Shape Matters: A Comparison of Nano-Discoids and Nano-Cylinders for Intracellular Drug Delivery" Biomedical Engineering Society Oct 24-27 2012 Annual Meeting, Atlanta, GA. Poster.
16. Agarwal R., Singh V., Marshall S., **Journey P.**, Shi L., Sreenivasan S.V., Roy K. "In Vitro Characterization of Shape-Specific Nano-Hydrogels" Society For Biomaterials Fall Symposium Oct 4-6 2012 Annual Meeting, New Orleans, LA, Poster.
17. Agarwal R., Moore M.C., Singh V., Marshall S., **Journey P.**, Shi L., Sreenivasan S.V., Roy K. "Nanoimprint Lithography to Study Effect of Shape of Nanocarriers for Drug Delivery." Biomedical Engineering Society 2011 Annual Meeting, Hartford, CT. Podium.
18. Caldorera-Moore M.E., Kang M., Singh V., Moore Z., Agarwal R., **Journey P.**, Huang R., Sreenivasan S., Shi L., Roy K. "Characterization of nanoimprinted shape-specific, disease-responsive drug carriers." Biomedical Engineering Society 2010 Annual Meeting, Austin, TX. Poster.

**References Available Upon Request**