

SUNGHEE ESTELLE PARK

CURRICULUM VITAE

11/10/2023

Assistant Professor
Weldon School of Biomedical Engineering
Purdue University
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EDUCATION & TRAINING

- 2023 – 2023 **University of Pennsylvania**
Postdoctoral Research Fellow
- 2017 – 2023 **University of Pennsylvania**
Ph.D. in Bioengineering, CEMB Fellow (Advisor: Dr. Dan Dongeun Huh)
Thesis project: Engineering stem cell-derived lung organoids on a chip for the study of human lung development
Other projects: Intestinal organoids-on-a-chip, retina-on-a-chip
- 2015 – 2017 **Korea University**
M.S. in Mechanical Engineering (Advisor: Dr. Seok Sid Chung)
Thesis project: Three-dimensional in vitro modeling of the peripheral nervous system
- 2010 – 2015 **Korea University**
B.S. in Mechanical Engineering

ACADEMIC APPOINTMENTS

- 1/2024 – present **Assistant Professor**
Weldon School of Biomedical Engineering, Purdue University

RESEARCH EXPERIENCE

- 2010 – 2017 **Researcher, Biomedical Research Institute,
Korea Institute of Science and Technology (PI: Dr. Inchan Youn)**
- Project 1: Developed a mouse model of different stages of Parkinson's disease to study behavioral and electrophysiological characteristics.
 - Project 2: Developed rodent models of acute and chronic stress to study differential heart rate variability and physiological responses associated with accumulated stress.

AWARDS AND HONORS

- 2023 SEED 2023 Best Presentation Award (2nd place)
- 2023 2023-2024 Graduate Women in Science (GWIS) National Fellowship Program (Honorable mention)

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| 2023 | 2023 Graduate Awards Recipient (Outstanding research) |
| 2022 | 2022 IEEE EMBS MNM Speaker Recognition |
| 2022 | 2022 Collegiate Inventors Competition Finalist (Team leader) |
| 2016 | Best Paper Award, <i>International Biomedical Engineering Conference</i> |
| 2015 | Best Poster Presentation Award, <i>International Biomedical Engineering Conference</i> |
| 2014 | Student Paper Award, <i>International Biomedical Engineering Conference</i> |
| 2014 | Best Paper Award, <i>Korean Society for Precision Engineering</i> |
| 2013 | Best Paper Award, <i>Korean Society for Precision Engineering</i> |

PUBLICATIONS

1. **S.E. Park**, S. Kang, J. Paek, A. Georgescu, J. Chang, A.Y. Yi, B.J. Walkins, T. Karakasheva, K.E. Hamilton, D.D. Huh* (2022) "Geometric engineering of organoid culture for enhanced organogenesis in a dish," **Nature Methods** <https://doi.org/10.1038/s41592-022-01643-8>.
2. **S.E. Park**, S. Kang, R. Truitt, W. Yang, D. Stambolian, D.D. Huh* (2023) "Microengineering patient-derived induced pluripotent stem cells to model blood-retina barrier tissue dynamics and pathological phenotypes in age-related macular degeneration," **submitted**.
3. S. Kang, **S.E. Park**, D.D. Huh* (2021) "Organ-on-a-chip technology for nanoparticle research," **Nano Convergence** 8, 20.
4. **S.E. Park**, J. Ahn, H. Jeong, I. Youn, D.D. Huh*, S. Chung* (2021) "A three-dimensional in vitro model of the peripheral nervous system," **NPG Asia Materials** 13, 1-11.
5. **S.E. Park**, A. Georgescu, D.D. Huh* (2019) "Organoids-on-a-chip," **Science** 364, 960-965.
6. J. Paek[†], **S.E. Park**[†], Q. Lu, K.T. Park, M. Cho, J.M. Oh, K.W. Kwon, Y.S. Yi, J.W. Song, H.I. Edelstein, J. Ishibashi, W. Yang, J.W. Myerson, R.Y. Kiseleva, P. Aprelev, E.D. Hood, D. Stambolian, P. Seale, V.R. Muzykantov, D.D. Huh* (2019) "Microphysiological engineering of self-assembled and perfusable microvascular beds for the production of vascularized three-dimensional human microtissues," **ACS Nano** 13, 7627-7643 ([†]co-first authors).
7. **S.E. Park**[†], A. Georgescu[†], J.M. Oh, K.W. Kwon, D.D. Huh* (2019) "Polydopamine-based interfacial engineering of extracellular matrix hydrogels for construction and long-term maintenance of living three-dimensional tissues," **ACS Applied Materials & Interfaces** 11, 23919-23925.
8. **S.E. Park** and T.P. Schaer. Pre-Clinical Animal Models. Academic Entrepreneurship for Medical and Health Scientists, Gooneratne, N., McGarrigle, R., and Winston, F (eds), Version 1.0, October 1, 2019 (in press), URL: <https://repository.upenn.edu/ace/>
9. S. Paik, S. Erdogan, Z. Phillips, Y. Kim, K. Song, **S.E. Park**, Y. Choi, I. Youn, B. Kim* (2019) "Hemodynamic correlation imaging of the mouse brain for application in unilateral neurodegenerative diseases," **Biomedical Optics Express** 10, 1736-1749.
10. K. Song, **S.E. Park**, D. Hwang, I. Youn* (2018) "Compact neural interface using a single multichannel cuff electrode for a functional neuromuscular stimulation system," **Annals of Biomedical Engineering** 1-13.
11. K. Song, **S.E. Park**, S. Lee, H. Kim, S.H. Lee, I. Youn* (2018) "Compact optical nerve cuff electrode for simultaneous neural activity monitoring and optogenetic stimulation of peripheral nerves," **Scientific Reports** 8, 1-11.

12. D. Park, M. Lee, **S.E. Park**, J. Seong, I. Youn* (2018) "Determination of optimal heart rate variability features based on SVM-recursive feature elimination for cumulative stress monitoring using ECG sensor," **Sensors** 18, 2387.
13. **S.E. Park**, K. Song, H. Kim, S. Chung, I. Youn* (2018) "Graded 6-OHDA-induced dopamine depletion in the nigrostriatal pathway evokes progressive pathological neuronal activities in the subthalamic nucleus of a hemi-parkinsonian mouse," **Behavioural Brain Research** 344, 42-47.
14. K. Song, J. Chu, **S.E. Park**, D. Hwang, I. Youn* (2017) "Ankle-angle estimation from blind source separated afferent activity in the sciatic nerve for closed-loop functional neuromuscular stimulation system," **IEEE Transactions on Biomedical Engineering** 64, 834-843.
15. **S.E. Park**[†], D. Park[†], K. Song, J. Seong, S. Chung, I. Youn* (2017) "Differential heart rate variability and physiological responses associated with accumulated short- and long-term stress in rodents," **Physiology & Behavior** 171, 21-31.
16. **S.E. Park**[†], K. Song[†], J.F. Suh, D. Hwang, I. Youn* (2015) "A time-course study of behavioral and electrophysiological characteristics in a mouse model of different stages of Parkinson's disease using 6-hydroxydopamine," **Behavioural Brain Research** 284, 153-157.
17. S. Han, J. Chu, K. Song, **S.E. Park**, J. Choi, J. Park, K. Choi, I. Youn* (2012) "Alternative mechanical evaluation method for ceramic hip joint implants utilizing finite element analysis under in vivo-like conditions," **Journal of Biomechanical Science and Engineering** 7, 336-348.
18. S. Han, J. Chu, K. Song, **S.E. Park**, J. Choi, J. Kim, J.F. Suh, K. Choi, I. Youn* (2012) "Prediction of stress distribution in the ceramic femoral head after total hip replacement," **Journal of the Korean Society of Precision Engineering** 29, 680-685.
19. S. Han, J. Chu, **S.E. Park**, J. Kim, H. Jun, K. Choi, I. Youn* (2011) "Finite element analysis of mechanical stability of ceramic acetabular components and evaluation of ROM in articulating hip joints," **Journal of Biomechanical Science and Engineering** 6, 173-182.

PATENTS

1. D. Huh, **S.E. Park**, W. Yang, D. Stambolian, "Microengineered models of the human eye and methods of use," **2020**, US 17/074,074
2. D. Huh, **S.E. Park**, "Geometric engineering of organoid culture for enhanced organogenesis," **2020**
3. D. Huh, **S.E. Park**, "Artificial human blood-retina barrier model and methods of preparation," **2020**

GRANTS AND FELLOWSHIPS

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| 2023 | Scientists and Engineers Early Career Development (SEED) workshop and UKC Travel Grant |
| 2019 | Sarla P. Kothary Memorial Travel Grant, Association for Research in Vision and Ophthalmology (ARVO) |
| 2017 – 2022 | Kwanjeong Educational Foundation (KEF) Scholarship |

CONFERENCE ACTIVITY/PARTICIPATION

1. **Geometric engineering of organoid culture for enhanced organogenesis in a dish**, IEEE EMBS Micro and Nanotechnology in Medicine Conference, Disney Aulani Resort, Kapolei, HI, USA, December 5-9, 2022 (*Talk*)
2. **Microengineered model of the human blood-retina barrier for the study of age-related macular degeneration**, IEEE EMBS Micro and Nanotechnology in Medicine Conference, Disney Aulani Resort, Kapolei, HI, USA, December 5-9, 2022 (*Poster presentation*)
3. **Geometric engineering of organoid culture for enhanced organogenesis in a dish**, Penn Institute for Regenerative Medicine (IRM) Retreat, Philadelphia, PA, USA, April 27, 2022 (*Poster presentation*)
4. **Geometric engineering of organoid culture for enhanced organogenesis in a dish**, Keystone Symposia on molecular and cellular biology, Keystone Resort, Keystone, CO, USA, April 3-6, 2022 (*Talk*)
5. **Geometric engineering of organoid culture for enhanced organogenesis in a dish**, Keystone Symposia on molecular and cellular biology, Organoids as Tools for Fundamental Discovery and Translation, Keystone Resort, Keystone, CO, USA, April 3-6, 2022 (*Poster presentation*)
6. **Microengineered model of the human blood-retina barrier for the study of age-related macular degeneration**, Keystone Symposia on molecular and cellular biology, Engineering Multi-Cellular Living Systems, Keystone Resort, Keystone, CO, USA, April 3-6, 2022 (*Poster presentation*)
7. **Microengineered model of the RPE-choroid complex for the study of age-related macular degeneration**, Biomedical Engineering Society (BMES) Annual Meeting, Philadelphia, PA, USA, October 16-19, 2019 (*Poster presentation*)
8. **A microphysiological engineering strategy for the production of perfusable and vascularized human microtissues**, Biomedical Engineering Society (BMES) Annual Meeting, Philadelphia, PA, USA, October 16-19, 2019 (*Poster presentation*)
9. **Inducible pluripotent stem cell (iPSC)-derived in vitro model for the study of cigarette smoking-induced complement activation in the human retinal pigment epithelium**, Biomedical Engineering Society (BMES) Annual Meeting, Philadelphia, PA, USA, October 16-19, 2019 (*Poster presentation*)
10. **Microengineered model of the RPE-choroid complex for the study of age-related macular degeneration**, The Association for Research in Vision and Ophthalmology (ARVO) Annual Meeting, Vancouver, Canada, April 28-May 2, 2019 (*Oral presentation*)
11. **Analysis of heart rate variability and physiological parameters for stress/recovery monitoring**, International Biomedical Engineering Conference, 2016
12. **Analysis of heart rate variability and serum corticosterone level in an animal model of short- and long-term stress**, The Korean Society of Medical & Biological Engineering, 2016
13. **Closed-loop control of functional neuromuscular stimulation using cuff electrode for sit-to-stand maneuver in spinal cord injury animal model**, International Biomedical Engineering Conference, 2015
14. **Implantable functional neuromuscular stimulation system for ankle angle control**, Asian-Pacific Conference on Biomechanics, 2015

15. **Characteristics of the neuronal firing patterns in the subthalamic nucleus with graded dopaminergic cell loss in the nigrostriatal pathway**, IEEE Engineering in Medicine and Biology Conference, 2015 (*Oral presentation*)
16. **An implantable wireless optogenetic stimulation system for peripheral nerve control**, IEEE Engineering in Medicine and Biology Conference, 2015
17. **Optical stimulation parameters in the mouse medial forebrain bundle for operant conditioning reinforcement**, International Biomedical Engineering Conference, 2014
18. **Electrophysiological analysis of Parkinson's disease during optical deep brain stimulation in mouse model**, International Biomedical Engineering Conference, 2014
19. **Closed-loop ankle angle control using nerve cuff electrode with functional electrical stimulation in rabbit**, International Biomedical Engineering Conference, 2014
20. **Control of dopaminergic neurons in mice medial forebrain bundle using optogenetic technology**, Korean Society of Precision Engineering, 2014
21. **Directional cues and rewards for behavior control using optogenetic stimulation in mice**, Korean Society of Precision Engineering, 2014
22. **Optogenetic stimulation in subthalamic nucleus influences motor cortex of Parkinsonian mice**, Asian Pacific Conference on Biomechanics, 2013
23. **Electrophysiological characteristic of optogenetic stimulation in Parkinsonian mice**, Asian Pacific Conference on Biomechanics, 2013
24. **Connectivity between subthalamic nucleus and motor cortex during optical deep brain stimulation in Parkinsonian mice**, Korean Society of Precision Engineering, 2013
25. **Effect of the optical deep brain stimulation in Parkinsonian mouse model**, Korean Society of Precision Engineering, 2013
26. **Prediction of stress distribution in ceramic ball head after total hip replacement using finite element analysis**, The Korean Society of Medical & Biological Engineering, 2011
27. **Three-dimensional lip image acquisition system using stereo camera**, The Korean Society of Medical & Biological Engineering, 2011
28. **Prediction of stress distribution in the ceramic liner under changed loads using finite element analysis**, Korean Society for Precision Engineering, 2011
29. **Biomechanical evaluation of custom made acetabular cup using 3D finite element method**, Korean Society for Precision Engineering, 2011
30. **The three-dimensional lip shape tracking system using stereo camera**, Korean Society for Precision Engineering, 2011

TEACHING EXPERIENCES

- BE551: Biomicrofluidics (Fall, 2021)
- BE551: Biomicrofluidics (Summer, 2020)
- BE551: Biomicrofluidics (Fall, 2019)

MENTORING EXPERIENCES

- Aditya Rao, University of Pennsylvania (2022)
- Shawn Kang, University of Pennsylvania (2019-2022)
- Dennis Jeon, Chadwick International (2019)

Parth Mody, Choate Rosemary Hall (2018)