

# JUNGMIN MAH

Address: Mapo-gu, Seoul, Korea  
Phone: +82-10-8715-1721 / Email: jeongminmah@gmail.com

## RESEARCH INTERESTS

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Soft Robotics, Bio-inspired Robotics, Health and Medical Condition Tracking or Diagnosis, Biomedical and Biomechanical Devices, Implantable Devices, Micromachining, Fabricate Micro-device

## EDUCATION

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### University of Science and Technology (UST)

Daejeon, Korea

M.S., Biomedical Engineering

Sep. 2014 – Aug. 2018

- Thesis: “A Study of Micro-milling to Fabricate Microfluidic Device for Applying Automated Immunoassay”

### Kyung Hee University (KHU)

Yongin, Korea

B.S., Mechanical Engineering

Mar. 2009 – Feb. 2014

- Thesis: “Effects on Live Cells Adjacent to Cancer Cells Inducing Apoptosis through Ultraviolet Irradiation”

### San Diego State University (SDSU)

San Diego, CA

Overseas Training Program

Jan. 2010 – Feb. 2010

- Completed “Mechanical Engineering” winter course with scholarship support from KHU

## RESEARCH EXPERIENCE

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### Osstem Implant Co., Ltd.

Seoul, Korea

Research Assistant, Implant R&D Center, Implant Development Team

Apr. 2019 – May. 2024

- Developed key dental implant line-up and user-centric surgical process, set to launch soon
- Redesigned and adjusted dental implant products focused on user experience to sales and productivity (competitor product research, market analysis, and surveys capturing customer feedback and insights)
- Evaluated titanium’s functionality and productivity as a raw material through comprehensive testing
- Standardized dental implant testing procedures to improve reproducibility and experiment results' reliability
- Managed and updated essential documentation, including risk management for medical devices (ISO14971), clinical evaluation reports, and dental implant user manuals

- [1] “Development of Dental Implant System using Convergent New Technologies to Overcome Clinical Failures”  
(funded by *Ministry of Trade, Industry, and Energy*) Apr. 2021 – Dec. 2023

- Analyzed the failure of dental implant system which combined with prosthetic part through mechanical fatigue testing in an experiment
- Identified and characterized the types of dental implant failures using raw data from various clinics

- [2] “Development of Titanium Alloy Wire Rods with 50μm-or-Less Roundness for Biomedical and Dental/Orthopedic Implant Applications” (funded by *Ministry of Trade, Industry, and Energy*) Apr. 2020 – Dec. 2023

- Applied different types of titanium alloy wire rods to dental implants; evaluated its effectiveness, focusing on productivity, mechanical stability, and biocompatibility

### Korea Institute of Science & Technology (KIST)

Seoul, Korea

Research Assistant, Bionics Research Center (Advisor: Prof. Sangyoun Lee)

Sep. 2014 – Aug. 2018

- [1] “Vascularized 3D Tissue Chips (Liver, Heart, & Cancer) for Evaluating Drug Efficacy and Toxicity”  
(funded by *Ministry of Trade, Industry and Energy*) *Apr. 2016 – Aug. 2018*
- Designed the entire evaluation system, integrating 3D tissue culture on chips with the simultaneous detection of chemically emitted materials from the tissues, all in one process
  - Constructed a pneumatic pump system to drive microfluidics
  - Synthesized magnetic bead-based multiplex immunoassay probes and manipulated them within a microfluidic chip
  - Designed and fabricated a microfluidic-based immunoassay detection chip and 3D tissue culture chips using CNC milling machine and soft lithography
  - Fabricated a sub-microscale channel using a micro-size endmill and several precision machining methods
- [2] “Development of Automated Diagnostic Equipment for Rapid Multiplexed Molecular Diagnosis based on Isothermal Amplification” (funded by *Ministry of Health and Welfare*) *Apr. 2016 – Aug. 2018*
- Utilized a CNC milling machine to rapidly fabricate and test prototypes, allowing for immediate design adjustments based on iterative feedback
  - Designed the construction of thermal insulation part of a device composed of a peltier module and a flexible thermosensor
- [3] “Development of an Oligonucleotide-Linked Immunosorbent Assay (OLISA)-based Label-free, Real-time Mesenchymal Stem Cell Aging Measurement System”  
(funded by *Ministry of SMEs and Startups*) *Sep. 2014 – Dec. 2017*
- Designed and fabricated a microfluidic-based immunoassay detection chip and microfluidic-based MSCs continuous culture chip using CNC milling machine and soft lithography

### **KHU Optofluidic Nanobio Engineering Lab**

**Yongin, Korea**

*Undergraduate Researcher* (Advisor: Prof. Won Gu Lee)

*Mar. 2013 – Feb. 2014*

- Tested cell sensitivity to both physical stimuli and a culture environment to analyze the effects of induced apoptosis on live cells through an experiment

## **PRESENTATIONS**

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### **Oral Presentations (Conferences)**

- [1] “Bead-based Immunoassay in an Automated Microfluidic System,” *The 20th Korean Micro-Electro-Mechanical Systems (KMEMS) Conference*, Jeju Island, Korea, 2018
- [2] “Optimization of Mechanical Micro-Machining Conditions for Micro Mold Fabrication,” *Korean Society of Mechanical Engineers (KSME) Department of Micro/Nano Engineering Spring Conference*, Busan, Korea, 2017
- [3] “Automated Bead-based Immunoassay via Microfluidic Chip Fabricated with CNC Milling Machine,” *Korean Society of Mechanical Engineers (KSME) 2016 Conference*, Gangwon, Korea, 2016
- [4] “Bead-Based Multiplex Immunoassay in an Automated Microfluidic System,” *Korean Society of Mechanical Engineers (KSME) Department of Micro/ Nano Engineering Spring Conference*, Busan, Korea, 2016
- [5] “Fully Automated Microfluidic System for Multiplexed Immunoassays,” *Korean Society of Mechanical Engineers (KSME) Conference*, Jeju Island, Korea, 2015
- [6] “Size-Selective Microfluidic Valve,” *The 2nd International ASME-JSME-KSME Joint Conference on Fluids Engineering Dynamics (AJK2015-FED)*, Seoul, Korea, 2015

### **Poster Presentations (Conferences)**

- [1] “A Study to Demonstrate the Improvement of KS Implant System Durability,” *International Dental Symposium*

*Osstem Meeting*, Seoul, Korea, 2022

- [2] “Optimization of Micro-Milling Conditions & Post-Processing for Micro Mold Fabrication,” *KSME Department of Micro/Nano Engineering Conference*, Busan, Korea, 2018
- [3] “Microfluidic Valve for Size-Dependent Selection,” *KSME Department of Micro/Nano Engineering Conference*, Busan, Korea, 2015
- [4] “DNA Translocation in Nanochannel-Combined Two-Dimensional Nanopore,” *The 2nd SPIE International Conference on Nano-Bio Sensing, Imaging, & Spectroscopy (NBSIS 2015)*, Jeju Island, Korea, 2015
- [5] “Role of Micro Post Structures in Cell Rolling Dynamics,” *KSME Department of Bio-Engineering Conference*, Gyeongju, Korea, 2014

## Research Talks

- [1] “Principle and Application of Computer Numerical Control (CNC),” *Korea Institute of Science and Technology (KIST), Bionics Research Center, Laboratory of Prof. Sangyoun Lee*, 04-Jun-2015
- [2] “Streaming Potential Measurement Technique,” *Korea Institute of Science and Technology (KIST), Bionics Research Center, Laboratory of Prof. Sangyoun Lee*, 17-Sep-2015
- [3] “Principle of Particle Image Velocimetry (PIV) and Micro-PIV,” *Korea Institute of Science and Technology (KIST), Bionics Research Center, Laboratory of Prof. Sangyoun Lee*, 12-Feb-2015

## PATENTS

- [1] Kim, I.H., **Mah, J.M.**, “Ampoule Bottle for Storing Fixture, and Fixture Packaging Ampoule Having the Same,” International Patent (IPC), Application No. 10-2021-0036790 (Mar. 2021)
- [2] Kim, I.H., **Mah, J.M.**, “Package Design for Implant Fixture,” Korea Patent, Application No. 30-2021-0008267 (Feb. 2021)
- [3] Chang, K.S., **Mah, J.M.**, “Implant Fixture,” Korea Patent, Application No. 30-2020-0006962 (Jul. 2020)
- [4] Chang, K.S., **Mah, J.M.**, “Implant Fixture,” Korea Patent, Application No. 30-2019-0063317 (Dec. 2019)

## AWARDS & SCHOLARSHIPS

<i>Research Fellowship</i> , UST & KIST	<i>Sep. 2014 – Aug. 2018</i>
<i>Best Research Paper Award</i> , Korea Institute of Science and Technology	<i>Dec. 2016</i>
<i>Young Investigator Award</i> , Woman in Science, Engineering, and Technology (WISET) & KSME	<i>Sep. 2016</i>
<i>Best Oral Presentation Award</i> , Micro/Nano Division, Korean Society of Mechanical Engineers	<i>May. 2016</i>
• “Bead-based Immunoassay in an Automated Microfluidic System”	
<i>Academic Excellence Scholarship</i> , Kyung Hee University	<i>Feb. 2012</i>
<i>Student Representative Scholarship</i> , Kyung Hee University	<i>Oct. 2010</i>
<i>Overseas Training Program Scholarship</i> , Kyung Hee University	<i>Jan. 2010</i>

## PUBLICATIONS

*\*denotes equal contribution*

- [1] Nguyen, T.Q., **Mah, J.M.\***, Park, W.T., Lee, S.Y. (2019). “Rapid and Versatile Micromold Fabrication using Micro-milling and Nano-polishing for Microfluidic Devices,” *Proceedings of the ASME Fluids Engineering Division Summer Meeting*, AJKFluids2019-5398, V004T06A011 <https://doi.org/10.1115/AJKFluids2019-5398>
- [2] **Mah, J.M.**, Nguyen, T.Q., Mukim, M.S.I., Lee, S.Y. (2018). “Bead-based Immunoassay in an Automated Microfluidic System,” *Proceedings of the 20th Korean Micro-Electro-Mechanical Systems (KMEMS) Conference*, TO-1-04
- [3] **Mah, J.M.**, Nguyen T.Q., Lee, C.J., Park, W.T., Lee, S.Y. (2018). “Optimize micro-milling condition and post process for micro-mold fabrication,” *Proceedings of the 2018 Spring Conference of the Micro/Nano Engineering Division, The Korean Society of Mechanical Engineers*, Vol.2018, No.5, pp.49

- [4] Nguyen, T.Q., **Mah, J.M.\***, Lee, D.W., Mukim, M.S.I., Park, W.T., Lee, S.Y. (2018). "AC electromagnet field for manipulation magnetic beads," *Proceedings of the 2018 Spring Conference of the Micro/Nano Engineering Division, The Korean Society of Mechanical Engineers*, Vol.2018, No.5, pp.53
- [5] **Mah, J.M.**, Lee, S.Y. (2017). "Optimize mechanical micro-machining condition to fabricate micro mold," *Proceedings of the 2017 Spring Conference of the Micro/Nano Engineering Division, The Korean Society of Mechanical Engineers (Joint Conference of Two Societies)*, Vol.2017, No.5, pp.15
- [6] Nguyen, T.Q., **Mah, J.M.\***, Park, W.T., Lee, S.Y. (2017). "Microfluidic hanging drop device for controlling cell spheroids density," *Proceedings of the 2017 Spring Conference of the Micro/Nano Engineering Division, The Korean Society of Mechanical Engineers (Joint Conference of Two Societies)*, Vol.2017, No.5, pp.8
- [7] **Mah, J.M.**, Lee, D.W., Lee, S.Y. (2016). "Automated Bead-based immunoassay through microfluidic chip fabricated with Computer Numerical Control milling machine," *Proceedings of the 2016 Conference of the Korean Society of Mechanical Engineers*, Vol.2016, No.12, pp.1024-1026
- [8] Nam, K.H., **Mah, J.M.**, Lee, D.W., Lee, S.Y. (2016). "Development of detection for single molecule into nanofluidic by using active optical grating system," *Proceedings of the 2016 Conference of the Korean Society of Mechanical Engineers*, Vol.2016, No.12, PP.2953-2956
- [9] **Mah, J.M.\***, Lee, S.Y. (2016). "Bead-Based Multiplex Immunoassay in an Automated Microfluidic System," *Proceedings of the 2016 Spring Conference of the Micro/Nano Engineering Division, The Korean Society of Mechanical Engineers*, Vol.2016, No.5, pp.8
- [10] Nam, K.H., **Mah, J.M.**, Lee, D.W., Kim, K.Y., Lee, S.Y. (2016). "Active optical grating system for high-throughput single molecule detection," *Proceedings of the 2016 Spring Conference of the Micro/Nano Engineering Division, The Korean Society of Mechanical Engineers*, Vol.2016, No.5, pp.13
- [11] Maeng, J.H., **Mah, J.M.\***, Lee, D.W., Ahn, D.R., Lee, S.Y. (2015). "Fully automated microfluidic system for multiplexed immunoassay," *Proceedings of the KSME 70<sup>th</sup> Anniversary Conference*, Vol.2015, No.11, pp.2229-2231
- [12] Nam, K.H., **Mah, J.M.**, Maeng, J.H., Lee, D.W., Kim, K.Y., Lee, S.Y. (2015). "Development of High-resolution Interference Pattern System for detection of the single molecule in Nanofluidic Channel," *Proceedings of the 70th Anniversary Conference of the Korean Society of Mechanical Engineers*, Vol.2015, No.11, pp.3268-3270
- [13] Maeng, J.H., **Mah, J.M.\***, Lee, S.Y. (2015). "Size-Selective Microfluidic Valve," *Proceedings of ASME-JSME-KSME Joint Fluids Engineering Conference 2015*, AJK2015-FED, S18-4-4, 18184.
- [14] Maeng, J.H., **Mah, J.M.\***, Cha, B.J., Shin, H.J., Lee, S.Y. (2015). "DNA translocation in nanochannel-combined two-dimensional nanopore," *Proceedings of SPIE's the 2<sup>nd</sup> Nano-Bio-Sensing imaging & Spectroscopy Conference*, NBSIS 2015, W-PT-I
- [15] Kim, K.S., **Mah, J.M.\***, Koo, J.M., Lee, W.G. (2014). "Role of Micro Post Structures in Cell Rolling Dynamics," *Proceedings of the 2014 Spring Conference of the Bioengineering Division, The Korean Society of Mechanical Engineers*, Vol.2014, No.4-4, pp.72

## EXTRACURRICULAR ACTIVITIES

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Company Club Activity, Billiard Club: 'Dangshin-gwa Hamkke', Osstem Implant Co., Ltd.	2023 – 2024
Company Club Activity, Rock Band: 'Osseointegration', Guitarist & Vocalist, Osstem Implant Co., Ltd.	2019 – 2020
Fourth Place, Swimming Contest, The 21 <sup>st</sup> Seodaemun District Mayor's Cup	Sep. 2023
Grand Prize, Safety Transportation Culture, Daegu User Content Creation Contest	Nov. 2018
Researcher Club Activity, Rock band: 'K-band', Electric Guitarist & Vocalist & Drummer, KIST	2016 – 2017
Speaker, "Automata: Science & Art" Seminar for Teenagers, Nanumirak	Oct. 2015
Passed the First Round, "Long-acting Therapeutic Protein," Campus Patent Universiade	Aug. 2013
Sophomore Representative, KHU Department of Mechanical Engineering	2010 – 2011
Mathematics Tutor for High School Students	2009 – 2014
Korean Language and Culture Guide for International Students; Finland, Vietnam, Türkiye, KHU	2009

<i>Amateur Band: 'Rump', Electric Guitarist &amp; Backup Vocalist, GEEK Live House Rock Concert</i>	Dec. 2009
<i>Volunteer in Rural Area, Assist with farming tasks, KHU</i>	May. 2010

## TECHNICAL SKILLS

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**Equipment:** CNC Milling Machine, Manual Lathe, Confocal microscopy, 3D Laser Confocal Profiler, Mechanical Testing System (Instron), SEM, Sand Blasting Machine, Optical setup

**Software:** AutoCAD, SolidWorks, VisualMILL CAM, MATLAB, COMSOL Multiphysics

**Fabrication:** Micromachining, Soft lithography, Photolithograph

**Chemical & Biological:** Nano/Micro-particle synthesis, Primary/Cell-line culture, Live-cell imaging, ELISA, Immunofluorescence, Immunocytochemistry, Quantum Dot-based immunoassay, Oligonucleotide-linked Immunosorbent Assay (OLISA), Electroporation

## ADDITIONAL INFORMATION

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### Certificate

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| [1] <i>Certificate of Completion in ISO 14971:2019/ ISO TR 24971:2020</i><br><i>Risk Management Training Course, DNV Business Assurance Korea Ltd.</i>               | <i>Jun. 2021</i> |
| [2] <i>Certificate of Completion in Basic GMP Training for Medical Devices,</i><br><i>Korea Human Resource Development Institute for Health &amp; Welfare (KoHI)</i> | <i>Nov. 2020</i> |
| [3] <i>Certificate of Completion in SolidWorks Training, Maven Co., Ltd.</i>   | <i>May. 2019</i> |
| [4] <i>Open Water Scuba Diver Certification, Scuba Diving International Korea</i>  | <i>Aug. 2009</i> |