JUNGMIN MAH

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RESEARCH INTERESTS

Human-Centric Design, Wearable Biomedical Devices, Advanced Sensor Technology, Sensing-feedback system, Soft Sensor Fabrication, Human-Machine Interaction System, Bio-Inspired Biomechanics & Robotics, Microfluidic Systems

EDUCATION

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

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, *Minimal Invasive Dental Implant System*, 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*

- A large-scale national research project involving six institutions, including hospitals, small and medium-sized enterprises (SMEs), and universities
- Applied different types of titanium alloy wire rods to dental implants; evaluated its effectiveness, focusing

on productivity, mechanical stability, and biocompatibility

- Managed the allocation and expenditure of $380K in project funding for a $760K national research project, ensuring compliance and efficient use of resources

Korea Institute of Science & Technology (KIST) **Seoul, Korea**

Research Assistant, Bionics Research Center (Advisor: Prof. Sangyoup 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*

- Contributed to a large-scale national project with six institutions and eight teams, spanning universities, research institutes, and industries.
- 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 multi-scale channel using a micro-size endmill and several precision machining methods
- Managed the allocation and expenditure of $380K in project funding for a $760K national research project, ensuring compliance and efficient use of resources

[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

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. Sangyoup Lee,* 04-Jun-2015

[2] "Streaming Potential Measurement Technique," *Korea Institute of Science and Technology (KIST), Bionics Research Center, Laboratory of Prof. Sangyoup 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. Sangyoup 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

Research Fellowship, UST & KIST — *Sep. 2014 – Aug. 2018*

Best Research Paper Award, Korea Institute of Science and Technology — *Dec. 2016*

Young Investigator Award, Woman in Science, Engineering, and Technology (WISET) & KSME — *Sep. 2016*

Best Oral Presentation Award, Micro/Nano Division, Korean Society of Mechanical Engineers — *May. 2016*

- "Bead-Based Immunoassay in an Automated Microfluidic System"

Academic Excellence Scholarship, Kyung Hee University — *Feb. 2012*

Student Representative Scholarship, Kyung Hee University — *Oct. 2010*

Overseas Training Program Scholarship, Kyung Hee University — *Jan. 2010*

PUBLICATIONS

**denotes equal contribution with first author*

[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 70th 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 2nd 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

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 21st 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
Amateur Band: 'Rump', Electric Guitarist & Backup Vocalist, GEEK Live House Rock Concert Dec. 2009
Volunteer in Rural Area, Assist with farming tasks, KHU May. 2010

TECHNICAL SKILLS

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 INFORMATIONS

Certificate

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