

MARION PANG

Research Officer at Institute of Bioengineering & Nanotechnology, A*STAR |
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Profile

Biomedical engineer with a focus in Instrumentation and Imaging, and a minor in Applied Mathematics and Statistics interested in pursuing a PhD in the field of Bioengineering.

Research Interests: Medical Devices, Imaging and Instrumentation, Data Science

Education

Johns Hopkins University • Aug 2017 - Present

Major in Biomedical Engineering (focus Instrumentation and Imaging)

Minor in Applied Mathematics and Statistics

GPA: 3.97/4.0 (Graduated with General and Departmental Honors)

NUS High School of Mathematics and Science • Jan 2011 - Dec 2016

Honours in Biology, Chemistry and Physics

Major in Mathematics

GPA: 4.9/5.0 (Graduated with High Distinction)

Skills

CAD & Simulations (PTC Creo 7.0)

Python/C/C++/Java

MATLAB/Mathematica

LaTeX/Basic HTML/CSS

Adobe Illustrator/Photoshop

Adobe AE/Sony Vegas Pro

Research Experience

Yu Lab, Institute of Bioengineering and Nanotechnology (IBN), Singapore • June 2020 - Present

Transfer learning using convolutional neural networks for screening of marbled scaffolds for cell-based meat cuts

Used transfer learning to retrain a CNN model to screen through pictures of meat marbling, assigning meat marbling scores with high accuracy. Applied model to screen through plant candidates for potential in replicating natural marbling in meat cuts.

(Deep Learning, Machine Learning, Food Science)

Additive Manufacturing of Edible Bird's Nest

Designed and optimized value-added workflow to process dirty birds nest fragments into regellable bioink for printing into full bird's nest cup using a 3D printer. Characterization and authentication of bioink performed using SDS-PAGE, Western Blots and LC MS/MS.

(Nanotechnology, Polymer Chemistry, Drug Delivery Therapeutics, Molecular Biology)

Mao Lab, JHU Institute for NanoBioTechnology (INBT), Baltimore MD • December 2017 - May 2020

Synergistic Effect of Combinatorial Surface Functionalization on PEI-g-PEG nanoparticles

Developed reaction chemistry and a high throughput in vitro screening protocol for library screening of surface functionalization on PEI-g-PEG/DNA nanoparticles as an enhanced, non-toxic, biodegradable nanoparticle to target and improve the efficiency of drug delivery to better treat prostate cancer.

(Nanotechnology, Polymer Chemistry, Drug Delivery Therapeutics, Molecular Biology)

Rapid Determination of Nanoparticle Morphology via Automated Image Analysis

Developed an image analysis program to automatically detect and characterize nanoparticles in a TEM image with higher accuracy and flexibility than conventional image analysis programs. The developed program is in industrial use for quality control of synthesized nanoparticles.

(Computational Image Analysis, Polymer Chemistry)

Research Experience (continued)

Kinetic Control in Assembly of Plasmid DNA/Polycation Complex Nanoparticles

Achieved explicit control of the kinetic conditions for pDNA/IPEI nanoparticle assembly using a kinetically controlled mixing process, termed flash nanocomplexation (FNC), that accelerates the mixing of pDNA solution with polycation IPEI solution to match the PEC assembly kinetics through turbulent mixing in a microchamber. (Nanotechnology, Polymer Chemistry, Drug Delivery Therapeutics, Molecular Biology)

Use of Free PEI and PEI-g-PEG for Synthesis of Nanoparticles for in vitro and in vivo gene delivery

Characterized transfection efficiency and cytotoxicity in several cancer cell lines (PC3/MDA-MB231) with alternative polymer PEI-g-PEG synthesized nanoparticles of varying N/P ratios using DLS, Luciferase/BCA and free PEI assays and TEM. Also studied the effect of varying surface functionalization order on optimized PEI-g-PEG nanoparticles.

(Nanotechnology, Polymer Chemistry, Drug Delivery Therapeutics, Molecular Biology)

LifeSprout Inc, Baltimore MD • March 2019 - December 2019

Automated quantification of hydrogel fragments using Computational Image Analysis

Developed an image analysis program to provide quantitative characterization of hydrogel fragments images by automatically segmenting and measuring the size and aspect ratio of gel fragments. Program was used to generate supporting material for submitted patent, and for further quality control checks in the product line. (Material Science, Computational Image Analysis)

High throughput assessment of nanofiber diameter for quality control checks

Developed an image analysis program to automatically detect and provide qualitative statistical characterization of nanofiber diameter within an SEM image for quality control of fabricated nanofiber batches. Program was then scaled up for parallel processing of multiple image sets, and rolled out onto product line.

(Material Science, Computational Image Analysis)

DSO National Laboratories, Singapore • June 2014 - June 2016

Paint on Power

Studied the novel use of graphene paint to fabricate lightweight ultracapacitors on varying substrates, characterizing ultracapacitor performance, cycle life and damage resistance using cyclic charge-discharge (CCD) techniques. Also characterized ultracapacitor surface morphology using SEM.

(Material Science, Electrical Engineering)

MIT Physics of Living Systems, Massachusetts Institute of Technology, Boston MA • June 2015 - August 2015

Tribotactic Microwalkers: A Novel Biosensor System

Studied and characterized the effect of a magnetic field used to induce rolling of paramagnetic beads as a novel means of measuring binding affinity between a ligand-receptor pair using automated image analysis. Research conducted under the guidance of Professor Alfredo-Katz at the CEE-RSI Annual Program.

(Biophysics, Computational Image Analysis, Material Science)

Temasek LifeScience Laboratories, Singapore • November 2014 - December 2014

DMARF1: An Essential Gene for Oogenesis

Conducted a functional study on the protein Marf1 in *Drosophila melanogaster*, including dissection of fruit flies and isolation and purification of protein. Immunostaining also used to visualize spatial function of Marf1 protein. Research conducted under the guidance of Professor Toshie Kai at the Fruit Fly Genetics Lab.

(Germline, Immunology, Molecular Biology)

Publications and Patents

1. Hu, Y., He, Z., Hao, Y., Gong, L., **Pang, M.**, Howard, G. P., ... Mao, H. Q. (2019). Kinetic Control in Assembly of Plasmid DNA/Polycation Complex Nanoparticles. *ACS Nano*, 13(9), 10161–10178.
2. **Pang, M.**, Wang, S., Song, Y., ... Yu, H. A method for regellation of solubilized Edible Bird's Nest. (Pending)
3. Ong, S.J., Loo, L., **Pang, M.**, ... Yu, H. Marbled Scaffolds for Cell-based Meat Cuts. (Pending)

Conferences and Presentations

Pang, M., Hu, Y., Liu A., and Mao, H.Q. Rapid Determination of Nanoparticle Morphology via Automated Image Analysis. Poster presented at BMES 2019 Annual Meeting; Philadelphia PA, USA; October 2019. Poster presented at 13th Annual Nano-Bio Symposium; Baltimore MD, USA; May 2019. Abstract accepted as oral presentation at BMES Mid-Atlantic Research Day; Baltimore MD, USA; April 2019. Poster presented at 4th Annual INBT Undergraduate Research Symposium; Baltimore MD, USA; November 2018.

Hu, Y., He, Z., Hao, Y., Gong, L., **Pang, M.**, Howard, G. P., ... Mao, H. Q. Kinetic Control in Assembly of Plasmid DNA/Polycation Complex Nanoparticles. Poster presented at 17th International Nanomedicine and Drug Delivery Symposium (NanoDDS); Boston MA, USA; September 2019.

Pang, M.*, Ang, J.*, Arumuganainar, S.*, Koh, H.Q., Tan, A. Paint on Power: Enhanced Durability and Processability (*equal contributions). Project accepted as a global finalist and presented at **Google Science Fair 2016**; Palo Alto CA, USA; September 2019. Poster presented at the Singapore Science & Engineering Fair; Singapore; March 2016 and March 2015. Abstract accepted as oral presentation at NUS High Research Congress; Singapore; November 2016. Poster presented at Youth Science Conference; Singapore; June 2014.

Pang, M., Steimel, J., and Katz, A. Tribotactic Microwalkers: A Novel Biosensor System. Abstract accepted as oral presentation at Sakura Science Exchange Program; Tokyo, Japan; November 2016. Poster presented at International Science Fair; Australia; September 2016. Abstract accepted as oral presentation at CEE-RSI Research Conference; Boston MA, USA; August 2016.

Pang, M., and Kai, T. DMARF1: An Essential Gene for Oogenesis. Abstract accepted as oral presentation at NUS High Research Congress; Singapore; May 2015.

Teaching/Mentoring Experience

Johns Hopkins University • Spring 2019 - Present

EN.510.311 Biomaterials I (Head TA)	EN.580.241 Models and Simulations (Grader)
EN.530.414 Computer Aided Design (TA)	EN.580.221 Molecules and Cells (Grader)
EN.510.311 Biomaterials I (TA)	EN.580.241 Statistical Physics (Grader)

Mao Lab • Jan 2020 - May 2020

Mentored sophomore undergraduate student Brendan Lee, introducing him basic cell culture and aseptic techniques, as well as basic nanoparticle synthesis and characterization techniques.

NUS High School • March 2016 - July 2016

Singapore National Team for the International Biology Olympiad (Alumni Trainer)

Scholarships

A*STAR National Science Scholarship (PhD)	2021 - 2026
A*STAR National Science Scholarship (BS)	2017 - 2020
MOE Pre-University Scholarship	2015 - 2016
NUS High Tay Eng Soon Scholarship	2014

Awards and Honors

Johns Hopkins Dean's List	Fall' 17 - Spring' 20
Richard J. Johns Award for Outstanding Academic Achievement	May 2020
Tom and Lois Fekete Undergraduate Award Winner	May 2019
Biomedical Engineering Research Day Award	Apr 2019
INBT Undergraduate Research Symposium (2nd Runner Up)	Nov 2018
International Biology Olympiad (National Training Team)	Jun 2016
Singapore Science & Engineering Fair (Silver)	Mar 2016
CEE-Research Science Institute (RSI) Scholar	Aug 2015

Relevant Courses

Biomedical Data Science, Neuroengineering Lab, Computational Medicine: Cardiology, Computational Molecular Medicine, Biological Models and Simulations, Systems and Controls, Optimization, Probability and Statistics, Biosensing & BioMEMS, Introduction to Biophotonics, Electronics & Instrumentation, Robot Sensors & Actuators

Professional Memberships and Co-curriculars

Tau Beta Pi National Engineering Honor Society • Member	Oct 2019 - Present
Biomedical Engineering Society • Student Member	Oct 2017 - Present
JHU Singaporean Students' Association	Fall '17 - Spring '20
	(Co-President) Fall '19 - Spring '20
	(Director of Programs) Fall '18 - Spring '19
JHU Cubing Club	Fall '17 - Spring '20
	(Exco [Events]) Fall '19 - Spring '20