Takashi Inagaki

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Generative Biology EIT DTP · Generative Biology Institute (GBI), Ellison Institute of Technology
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About

I am a DPhil student in Chemistry at the University of Oxford, studying protein engineering and directed evolution in Prof. Chang C. Liu's lab at the Generative Biology Institute, Ellison Institute of Technology. I am part of the Generative Biology EIT Doctoral Training Programme.

An optimist and fanatic to convert our analog body to a digital world to enable us to predict inherently complicated biological systems. Familiar with molecular biology, cell biology, software engineering, and laboratory automation. A firm believer of automation and computation in biological research for better reproducibility, efficiency, and wider exploration of the unknown.

Education

DPhil in Chemistry (Oct. 2026 - Present)

Generative Biology EIT Doctoral Training Programme
Department of Chemistry, University of Oxford, UK
Reuben College
Focus: Protein Engineering, Directed Evolution, Generative Biology, Laboratory Automation

PhD in Biomedical Engineering (2024 - 2026; transferred to Oxford)

Department of Biomedical Engineering, Samueli School of Engineering
University of California, Irvine, US
Focus: Antibody Design, Directed Evolution, Laboratory Automation, Computational Biology
Transferred to the University of Oxford in 2026 to continue PhD research through the Generative Biology EIT DTP.

MSc in Engineering (Apr. 2022 - Mar. 2024)

Department of Mechanical Systems Engineering, Graduate School of Engineering
Nagoya University, Japan
Focus: Biomechanics

BSc in Engineering (Apr. 2018 - Mar. 2022)

Department of Mechanical and Aerospace Engineering, Faculty of Engineering
Nagoya University, Japan
Focus: Biomechanics

Research Experience

DPhil Student, Liu Lab at EIT GBI / University of Oxford, UK (Oct. 2026 - Present)

PI: Prof. Chang C. Liu
Continuing research in protein engineering and directed evolution, with interests in computational approaches and laboratory automation for biological engineering.

PhD Student, Liu Lab at UC Irvine, US (2025 - 2026)

PI: Prof. Chang C. Liu
Worked on antibody engineering, directed evolution, and high-throughput experimental methods.

Graduate Researcher, Biomechanics Lab at Nagoya University, Japan

Master's student (Apr. 2022 – Mar. 2024), then doctoral student (Apr. 2024 – Sep. 2024)
PI: Prof. Takeo Matsumoto
Built a uniaxial compression system and used atomic force microscopy to measure the mechanical properties of spheroids derived from human mesenchymal stem cells. Examined their structure and composition with fluorescence staining and cryosectioning.

Undergraduate Student, Biomechanics Lab at Nagoya University, Japan (Apr. 2021 - Mar. 2022)

PI: Prof. Takeo Matsumoto
Supervised by Prof. Takeo Matsumoto in a leading lab focusing on the mechanical characteristics of biological tissues. Created 3D bone cell aggregates and explored osteoblast/osteocyte differentiation through 3D imaging and Python analysis, culminating in a first-authored publication (Inagaki et al., Integr. Biol., 2023).

Research Assistant, Assistive Robotics Group at Nagoya University, Japan (Aug. 2019 - Mar. 2021)

PI: Prof. Yoji Yamada
Collaborated with Prof. Yoji Yamada's group on human gait stability. Analyzed motion capture data to derive and compare various gait stability indices, establishing their relationship to gait parameters. Authored a first-author publication (Inagaki et al., Nagoya J. Med. Sci., 2023).

Technical Support Staff, Division of Homeostatic Development at National Institute for Physiological Sciences, Japan (Aug. 2020 - Feb. 2021)

PI: Prof. Junichi Nabekura
Worked with Prof. Masakazu Agetsuma and Prof. Junichi Nabekura, assisting in the analysis of two-photon calcium imaging data from mice, enhancing computational efficiency with MATLAB. Supported in creating figures for publication (Agetsuma et al., Nat. Comm., 2023).

Work Experience

Software Engineer at Neuroad, Japan (Part-time, Feb. 2024 - Sep. 2025)

Developed a backend server for a Japanese startup focused on creating a platform for analyzing and visualizing neural data.

Keywords: Python, FastAPI, Linux, Docker, GitHub

Software Engineer at MAP IV, Inc., Japan (Part-time, July 2023 - Jan. 2024)

Engaged in a startup specializing in point cloud mapping technology for autonomous vehicles. Developing a web interface for point cloud data analysis and visualization for autonomous vehicle mapping. Working in a dynamic startup environment to deepen my understanding of the autonomous industry.

Keywords: Python, FastAPI, Linux, Ubuntu, ROS, Vue.js, Docker, GPU, CUDA, GitHub, Jira

Research Engineer at Corpy&Co., Inc., Japan (Part-time, June 2022 – Oct. 2023)

Contributed to a Japanese/French startup focused on creating machine learning platforms for industrial applications. Engineered full-stack solutions and integrated advanced deep learning models (e.g., YOLO) within web applications, working in a multicultural startup environment with a focus on machine learning and image analysis technologies.

Keywords: Django, FastAPI, Vue.js, Celery, RabbitMQ, Docker, Windows, Linux, GitLab

Diploma Student / Intern at SAP Japan (Part-time, Oct. 2022 - Mar. 2023)

Worked with a multinational enterprise software corporation to develop demo applications demonstrating software integration capabilities. Contributed to the development of demo applications demonstrating software integration potential, including image object detection with machine learning. Engaged in multinational corporate settings.

Keywords: Python, Java, JavaScript, Object Detection

Summer Internship (Software Engineer) at freee K.K (Full-time, Aug. 2022 - Sep. 2022)

Joined a leading Japanese company offering business and accounting software solutions for a full-time two-week internship. Joined an international team for a full-time, two-week internship to develop an XML decode feature, marking my first exposure to a global team in a large Japanese enterprise.

Keywords: Ruby on Rails, React, TypeScript, Docker

Software Developer at N2i, inc., Japan (Part-time, Apr. 2019 – Apr. 2022)

Initiated professional programming career at a startup delivering AI and HR software solutions to Japanese companies. Focused on backend development for a human resource web application, gaining essential coding skills and professional ethics in a team setting.

Keywords: Node.js, Express, Python, MySQL, Docker, Redis, Vue

Publications (Google Scholar), (ORCID)

Journal Articles and Preprints

1. Y. Tahara-Arai†, **T. Inagaki**†, A. Kato, K. Ochiai, K. Azumi, K. Takahashi, G. N. Kanda, and H. Ozaki, "Constraint-aware labware layout generation from natural language for heterogeneous laboratory robots", Digital Discovery, vol. 5, pp. 2507–2519, 2026 [link]
   † These authors contributed equally.
2. **T. Inagaki**, J. Kim, E. Maeda, T. Adachi, and T. Matsumoto, "Macroscopic and microscopic biomechanical analysis of mineralized spheroids derived by mesenchymal stem cells", Journal of Biomechanics, vol. 195, 113088, 2026 [link]
3. **T. Inagaki**, J. Kim, E. Maeda, and T. Matsumoto, "Macroscopic creep behavior of spheroids derived from mesenchymal stem cells under compression", Journal of the Mechanical Behavior of Biomedical Materials, vol. 161, 106816, 2025 [link]
4. M. Agetsuma, I. Sato, Y. R. Tanaka, L. Carrillo-Reid, A. Kasai, A. Noritake, Y. Arai, M. Yoshitomo, **T. Inagaki**, H. Yukawa, H. Hashimoto, J. Nabekura, T. Nagai, "Activity-dependent organization of prefrontal hub-networks for associative learning and signal transformation", Nature Communications, 14, 5996, 2023 [link]
5. **T. Inagaki**, J. Kim, K. Tomida, E. Maeda, and T. Matsumoto, "3D quantitative assessment for nuclear morphology in osteocytic spheroid with optical clearing technique", Integrative Biology, 15, zyad007, 2023 [link]
6. **T. Inagaki**, Y. Akiyama, S. Okamoto, T. Mayumi, and Y. Yamada, "Relationship between gait stability indices and gait parameters comprising joint angles based on walking data from 288 people", Nagoya Journal of Medical Science, vol. 85, no. 2, pp. 211–222, 2023 [link]
7. **T. Inagaki**, A. Kato, K. Takahashi, H. Ozaki, G. N. Kanda, "LLMs can generate robotic scripts from goal-oriented instructions in biological laboratory automation", arXiv preprint, 2023 [link]
8. J. Kim, **T. Inagaki**, J. Sunaga, T. Adachi, & T. Matsumoto, "Effect of chemically induced osteogenesis supplements on multicellular behavior of osteocytic spheroids", Biochemical and Biophysical Research Communications, 622, 79–85, 2022 [link]

International Conference Presentations

1. J. Kim, **T. Inagaki**, E. Maeda, and T. Matsumoto, "Macroscopic and microscopic biomechanical analysis of scaffold-free bone spheroids", 10th World Congress of Biomechanics (WCB 2026), poster P1-019, Vancouver, Canada, July 2026
2. J. Kim, **T. Inagaki**, E. Maeda, and T. Matsumoto, "Multi-scale biomechanical analysis of mineralized spheroids derived from human mesenchymal stem cells", TERMIS-EU 2026 Conference, Palma de Mallorca, Spain, April 2026
3. **T. Inagaki**, Y. Tahara-Arai, A. Kato, K. Ochiai, K. Azumi, K. Takahashi, G. N. Kanda, and H. Ozaki, "Constraint-aware labware layout generation from natural language for heterogeneous laboratory robots", SLAS2026 International Conference & Exhibition, poster 1233-D, Boston, MA, USA, February 10, 2026
4. **T. Inagaki**, J. Kim, E. Maeda, and T. Matsumoto, "Mechanical characterization of human mesenchymal stem cell-derived osteocytic spheroids by uniaxial compression testing", 2024 Summer Biomechanics, Bioengineering, and Biotransport Conference (SB3C), poster P57, Lake Geneva, WI, USA, June 2024
5. **T. Inagaki**, J. Kim, E. Maeda, and T. Matsumoto, "Evaluation of elastic and viscoelastic properties of spheroids with uniaxial compression test", 2023 Melbourne-Nagoya Joint Research Workshop, University of Melbourne, Australia, September 21, 2023
6. J. Kim, **T. Inagaki**, E. Maeda, T. Adachi, and T. Matsumoto, "Biomechanical analysis of osteocytic spheroids for bone tissue engineering applications", International Conference on Precision Engineering and Sustainable Manufacturing (PRESM 2023), W4-FJ3, Okinawa, Japan, July 2023

7. J. Kim, **T. Inagaki**, T. Adachi, T. Matsumoto, "Modulation of mechanical environment to induce osteocyte differentiation of mesenchymal stem cells", The 9th World Congress of Biomechanics, Taipei, Taiwan, July 2022
8. T. Iwasaki, S. Okamoto, Y. Akiyama, **T. Inagaki**, and Y. Yamada, "Kinematic gait stability index highly correlated with the margin of stability: Concept and interim report", 2021 IEEE/SICE International Symposium on System Integration (SII), pp. 347–350, online, January 2021
9. T. Iwasaki, S. Okamoto, Y. Akiyama, **T. Inagaki**, and Y. Yamada, "Walking motions with high margin-of-stability values", 2021 IEEE International Conference on Intelligence and Safety for Robotics (ISR), pp. 224–228, Nagoya, Japan, March 2021
10. **T. Inagaki**, S. Okamoto, T. Iwasaki, Y. Akiyama, and Y. Yamada, "Comparison of gait variability and stability indices", 2020 IEEE 2nd Global Conference on Life Sciences and Technologies (LifeTech), pp. 72–74, Kyoto, Japan, March 2020

Conference Presentations in Japan

Japanese titles are translated where a published English title is unavailable.

1. **T. Inagaki**, J. Kim, E. Maeda, and T. Matsumoto, "Measuring local mechanical properties and surface topography in cross-sections of mineralizing spheroids derived from human mesenchymal stem cells", 2024 Symposium of the Japanese Society for Medical and Biological Engineering, poster A-25, Tokyo, Japan, September 2024
2. J. Kim, **T. Inagaki**, E. Maeda, and T. Matsumoto, "Mechanical response of human mesenchymal stem cell-derived spheroids to compression", 47th Annual Meeting of the Japanese Society of Biorheology, OS4-5, Tokyo, Japan, June 2024
3. **T. Inagaki**, J. Kim, E. Maeda, and T. Matsumoto, "Measuring local mechanical properties in cross-sections of human mesenchymal stem cell-derived spheroids to estimate the mechanical environment at sites of calcification", 36th Bioengineering Conference of the Japan Society of Mechanical Engineers (JSME), poster 1P30, Nagoya, Japan, May 11, 2024
4. **T. Inagaki**, J. Kim, E. Maeda, and T. Matsumoto, "Mechanical Characterization of Human Mesenchymal Stem Cell-Derived Osteocytic Spheroids by Uniaxial Compression Testing: Elucidation of Plastic Deformation Mechanism of Spheroids", 34th JSME Conference on Frontiers in Bioengineering, 2B02, Ube, Japan, December 2023
5. **T. Inagaki**, J. Kim, E. Maeda, and T. Matsumoto, "Evaluation of Elastic and Viscoelastic Properties of Spheroids Derived from Human Mesenchymal Stem Cells during Ossification Process with Uniaxial Compression Test", Kinshachi Biomechanics Study Group meeting, talk 8, Nagoya, Japan, September 25, 2023
6. **T. Inagaki**, J. Kim, E. Maeda, and T. Matsumoto, "Evaluation of Elastic and Viscoelastic Properties of Spheroids Derived from Human Mesenchymal Stem Cells during Ossification Process with Uniaxial Compression Test", 2023 Annual Meeting of the Japan Society of Mechanical Engineers, S021p-01, Tokyo, Japan, September 2023
7. **T. Inagaki**, "LLMs can generate robotic scripts from goal-oriented instructions in biological laboratory automation", AI Robot-Driven Science Symposium 2023, poster P-8, Tokyo, Japan, July 6, 2023
8. J. Kim, **T. Inagaki**, E. Maeda, T. Adachi, and T. Matsumoto, "Measurement of multicellular behavior and mechanical properties in 3D osteocytic spheroids", 62nd Annual Conference of the Japanese Society for Medical and Biological Engineering, OS3-6-1-3, Nagoya, Japan, May 2023
9. **T. Inagaki**, J. Kim, E. Maeda, and T. Matsumoto, "Evaluation of mechanical properties of spheroids derived from human mesenchymal stem cells with compression test", 33rd JSME Conference on Frontiers in Bioengineering, 1E16, Kobe, Japan, December 2022
10. **T. Inagaki**, "Mechanical characterization of human mesenchymal stem cell-derived spheroids by glass-plate compression testing", joint biomechanics workshop of Nagoya University and Nagoya Institute of Technology, talk 18, September 28, 2022
11. **T. Inagaki**, J. Kim, E. Maeda, and T. Matsumoto, "3D Image Analysis for Nuclear Morphology in Osteocytic Spheroids with Optical Clearing Technique", 61st Annual Conference of the Japanese Society for Medical and Biological Engineering, O1-4-3-6, Niigata, Japan, June 2022
12. **T. Inagaki**, J. Kim, E. Maeda, and T. Matsumoto, "Evaluation of cell nuclear morphology in 3D osteocytic spheroids using optical clearing technique", 53rd Undergraduate Research Conference, JSME Tokai Student Section (Tokai Engineering Complex 2022), TEC22-47, online, March 2022
13. **T. Inagaki**, Y. Akiyama, S. Okamoto, T. Mayumi, and Y. Yamada, "Relationship between gait stability indices and gait parameters comprising joint angles using walking data of 300 people", JSME Conference on Robotics and Mechatronics 2021 (ROBOMECH 2021), 2P3-J02, online, June 2021

Invited Talks and Workshops

1. **T. Inagaki**, J. Kim, E. Maeda, and T. Matsumoto, "Local micromechanical property measurement on cross-sections of human mesenchymal stem cell-derived spheroids undergoing mineralization", invited talk, 10th International Conference on Mechanics and Materials in Design (M2D2024), 4B01-06-02, Nagoya, Japan, September 4, 2024
2. **T. Inagaki** and G. N. Kanda, "Robotics and large language models: Generating motion commands for automated pipetting robots", workshop contribution, 2023 Annual Meeting of the Japanese Society for Bioinformatics and 12th Joint Conference on Informatics in Biology, Medicine and Pharmacology (IIBMP 2023), Kashiwa, Japan, September 7, 2023
3. **T. Inagaki**, "Getting GPT-4 to write Python scripts for the OT-2: Exploring new uses of AI", Laboratory Automation Monthly Meetup, Kawasaki, Japan, April 29, 2023

Funding

1. Nagoya University Mechanical and Aerospace Engineering Alumni Association Student Overseas Study Grant, ¥75,000, 2024
2. Japan Student Services Organization (JASSO) Type 1 Scholarship, 2022–2024. Repayment exemption of ¥1,056,000 (half of the ¥2,112,000 loan).
3. Doctoral Research Expense Grant, Graduate School of Engineering, Nagoya University, ¥250,000 x 3 years, 2024 - 2027

Awards and Fellowships

1. Student Paper Competition finalist, 2024 Summer Biomechanics, Bioengineering, and Biotransport Conference (SB3C), for "Mechanical characterization of human mesenchymal stem cell-derived osteocytic spheroids by uniaxial compression testing", June 2024
2. Student Support Fellowship, University of California, Irvine, fall 2024 and winter 2025. Six-month stipend of $2,900 per month and a $2,500 relocation payment.
3. Overall Presentation Award, Kinshachi Biomechanics Study Group, joint workshop of Nagoya University and Nagoya Institute of Technology, September 25, 2023
4. Best Presentation Award, 53rd Undergraduate Research Conference, JSME Tokai Student Section, for "Evaluation of cell nuclear morphology in 3D osteocytic spheroids using optical clearing technique", March 2022
5. Best Student Paper Award (co-author), 2021 IEEE International Conference on Intelligence and Safety for Robotics (ISR), for "Walking motions with high margin-of-stability values", March 2021
6. Outstanding Presentation Award (co-author), 21st Annual Meeting of the System Integration Division, Society of Instrument and Control Engineers (SI2020), for "Developing a kinematic gait stability index that correlates strongly with the mechanical margin of stability", 2F1-03, December 2020

Media

1. "Impressive programming from rough instructions: A capable ‘assistant’ for research automation", GPT Impact series, The Chunichi Shimbun. Article in Japanese