Shuzo Kato / 加藤 修三

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EDUCATION

Department of Physics, Kyushu University — Fukuoka, Japan
Doctoral Program in Physics — Apr. 2022 - Present

Department of Physics, Kyushu University — Fukuoka, Japan
Master of Science — Apr. 2020 - Mar. 2022
GPA: 3.94/4.00

Department of Mechanical Engineering, Keio University — Tokyo, Japan
Bachelor of Engineering — Apr. 2015 - Mar. 2020
GPA: 3.28/4.00

Department of Physics, Technical University of Munich — Munich, Germany
Exchange program (Physics) — Oct. 2018 - Aug. 2019

RESEARCH EXPERIENCES

Department of Physics, Kyushu University — Apr. 2020 - Present
Graduate student, under Prof. Yusuke T. Maeda
Master thesis: "Liquid-liquid phase separation and gene expression regulation in synthetic cells"
- developed a synthetic cell using a cell-free expression system (TXTL) to study the dynamics of cytoplasmic phase separation and gene expression in cell-sized compartments
- investigated cell-size effects on intracellular phase separation with experiments and theoretical modeling
- developed microfabricated devices to investigate droplet growth dynamics with wetting in TXTL phase separation
- analyzed droplet shape relaxation to investigate salt-dependent viscoelasticity of TXTL droplets

Center for Biosystems Dynamics Research, RIKEN — Sep. - Nov. 2021
Research Assistant (Employment: Research Part Time Worker II), under Dr. Kyogo Kawaguchi
- analyzed physical properties of nuclear condensates (nuclear speckles) using live-cell imaging and fluorescence recovery after photobleaching (FRAP)
- investigated the dynamics of synthetic condensates (Corelets and optoDroplets) in cell nucleus
- developed a prototype of an automated pipeline of confocal imaging and FRAP experiments

Department of Mechanical Engineering, Keio University — Apr. 2018 - Sep. 2018, Sep. 2019 - Mar. 2020
Undergraduate researcher, under Prof. Kenji Yasuoka
Bachelor thesis: "Adsorption dynamics of pyruvic acids on struvite mineral surface: molecular dynamics study"
- developed customized molecular dynamics (MD) simulation with GROMACS to investigate the adsorption dynamics of pyruvic acids on struvite surfaces

Department of Physics, Technical University of Munich — Jan. - Aug. 2019
Visiting student researcher, under Prof. Martin Zacharias
- developed customized MD simulation with AMBER and GROMACS to investigate the dynamics of MHC class I molecules

FELLOWSHIPS & GRANTS

JSPS Research Fellowship DC1 — Apr. 2022 - Mar. 2025
from Japan Society for the Promotion of Science
- Prestigious scholarship for PhD study ($72,000 stipend and $25,000 research grant for 3 years)
- Project title: "Non-equilibrium physics of cytoplasmic phase separation and wetting" [Link]

International Human Resources Development Fund — 2019
from Faculty of Science and Technology, Keio University
- Scholarship for exchange program to Technical University of Munich ($2,000)

International Human Resources Development Fund — 2017
from Faculty of Science and Technology, Keio University
- Scholarship for short-term study abroad ($500)

AWARDS

Student Presentation Award Mar. 2022
The Physical Society of Japan 2022 (77th) Annual Meeting

Student Presentation Award Nov. 2021
The 59th annual meeting of the Biophysical Society of Japan

Best Student Presentation Award Sep. 2021
The 61st Summer School of Japan Biophysics Young Researchers Association

Poster Presentation Award Jun. 2021
The 1st Molecular Engine Workshop

Fujiwara Award Mar. 2020
Faculty of Science and Technology, Keio University
- For achievements both in academic performances and extracurricular activities (athletic activities in triathlon and para-triathlon)

PUBLICATIONS

- Original Article

Shuzo Kato, David Garenne, Vincent Noireaux and Yusuke T. Maeda, "Phase Separation and Protein Partitioning in Compartmentalized Cell-Free Expression Reactions", *Biomacromolecules*, **22**, 8, 3451 (2021). doi:10.1021/acs.biomac.1c00546

- Review Article

Yusuke T. Maeda, **Shuzo Kato** and Tatsuya Fukuyama, "ソフトマターで分子を運び、選り分ける (Spatio-temporal control of molecules in soft matter)", **607**, 現代化学 (*Chemistry Today*) (2021). (in Japanese)

PRESENTATIONS

- Oral Presentation

Shuzo Kato, David Garenne, Vincent Noireaux and Yusuke T. Maeda, "The dynamics of droplet coarsening in confined cell-free expression reactions", STATPHYS28, Tokyo, Japan, Aug. 2023 (Scheduled).

Shuzo Kato, David Garenne, Vincent Noireaux and Yusuke T. Maeda, "The dynamics of phase separation and wetting in cell-free expression system", MIAPbP Workshop "Engineering life: unifying concepts from system chemistry, biophysics and theoretical physics", Munich, Germany, Mar. 2023.

Shuzo Kato, David Garenne, Vincent Noireaux and Yusuke T. Maeda, "Liquid droplet formation and growth dynamics in cell-free expression system", The Physical Society of Japan 2022 (77th) Annual Meeting, Online, Mar. 2022. (Student Presentation Award)

Shuzo Kato, David Garenne, Vincent Noireaux and Yusuke T. Maeda, "Liquid-liquid phase separation and wetting in compartmentalized cell-free expression reactions", The 59th Annual Meeting of the Biophysical Society of Japan, Online, Nov. 2021. (Student Presentation Award)

Shuzo Kato, David Garenne, Vincent Noireaux and Yusuke T. Maeda, "Liquid-liquid phase separation and wetting in compartmentalized cell-free expression reactions", The Physical Society of Japan 2021 Autumn Meeting, Online, Sep. 2021.

Shuzo Kato and Yusuke T. Maeda, "Liquid-liquid phase separation in cell-free gene expression driven by non-equilibrium interface", The Physical Society of Japan 2021 (76th) Annual Meeting, Online, Mar. 2021.

Ryota Sakamoto, **Shuzo Kato**, Makito Miyazaki and Yusuke T. Maeda, "Dynamics of actomyosin droplet and its control of spacial symmetry", The Physical Society of Japan 2020 Autumn Meeting, Online, Sep. 2020.

- Poster Presentation

Shuzo Kato, David Garenne, Vincent Noireaux and Yusuke T. Maeda, "Phase Separation Dynamics in Cell-Free Expression System", The American Physical Society's March Meeting 2023, Las Vegas, U.S.A., Mar. 2023.

Shuzo Kato, David Garenne, Vincent Noireaux and Yusuke T. Maeda, "Dynamics of phase separation and salt-dependent shape relaxation in cell-free expression system", The 10th Annual Meeting of Soft Matter Society in Japan (ソフトマター研究会), Fukuoka, Japan, Sep. 2022.

Shuzo Kato, David Garenne, Vincent Noireaux and Yusuke T. Maeda, "Dynamics of droplet formation in cell-free expression systems", The 60th Annual Meeting of the Biophysical Society of Japan, Hokkaido, Japan, Sep. 2022.

Shuzo Kato, David Garenne, Vincent Noireaux and Yusuke T. Maeda, "Liquid-liquid phase separation and wetting in compartmentalized cell-free expression reactions", Cell Synth 14.0 meeting, Online, Nov. 2021.

Shuzo Kato, David Garenne, Vincent Noireaux and Yusuke T. Maeda, "Liquid-liquid phase separation and wetting in compartmentalized cell-free expression reactions", The 61st Summer School of Japan Biophysics Young Researchers Association (生物物理若手の会夏の学校), Online, Sep. 2021. (Best Poster Presentation Award)

Shuzo Kato, David Garenne, Vincent Noireaux and Yusuke T. Maeda, "Liquid-liquid phase separation and wetting in compartmentalized cell-free expression reactions", The 1st Molecular Engine Workshop, Online, Jun. 2021. (Poster Presentation Award)

Shuzo Kato, Toshikazu Ebisuzaki and Kenji Yasuoka, "Adsorption dynamics of pyruvic acids on struvite surface", The 33rd Annual Meeting of The Molecular Simulation Society of Japan, Nagoya, Japan, Dec. 2019.

TEACHING EXPERIENCES

University Library Teaching Assistant Apr. 2022 - Present
Kyushu University
- Supported students in their studies and mentoring
- Taught an introductory Python course for students and faculty

Teaching Assistant in Natural Science Experiments Apr. - Jun. 2022
Kyushu University
- Supported an experimental class on magnetic fields for first-year undergraduates

Teaching Assistant in Molecular Dynamics Oct. 2019
Department of Mechanical Engineering, Keio University
- Supported an exercise class on molecular dynamics simulation for third and fourth-year undergraduates

SKILLS

Experimental: General laboratory skills, Microscopy, Microfabrication, Cell culture, Molecular biology

Computational: Python, C, MATLAB, Image Analysis (ImageJ, Zen), Molecular Dynamics (GROMACS, AMBER), Linux, Cloud (AWS, GCP)

Language: English (fluent, TOEFL 95), Japanese (native), German (conversational, A2 level), Chinese(conversational)

EXTRACURRICULAR ACTIVITIES

Biophysics Summer School
The 62nd Summer School of Japan Biophysics Young Researchers Association, Shiga, Sep. 2023 (Planned).
- A staff member responsible for organizing lectures

Science Outreach
Honorable mention
XPLANE CAFÉ 5 MINUTE CHALLENGE, Online, Dec. 2022.
- Private science presentation competition at XPLANE (a Japanese student organization that supports postgraduate study abroad)
- Title: "Synthetic cells: build to understand the subcellular organization (人工細胞: 細胞を作って探る細胞内分子配置メカニズム)"

Triathlon
22nd place in Elite Men's category
Japan Middle Distance Triathlon National Championships, Sado, Japan, Sep. 2018.

the Odyssey of the Mind (a creative problem-solving program)
9th place in Problem 1 Nature Trail'R Division II (as a team leader)
the Odyssey of the Mind 2010 World Finals, East Lansing, MI, May 2010.

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