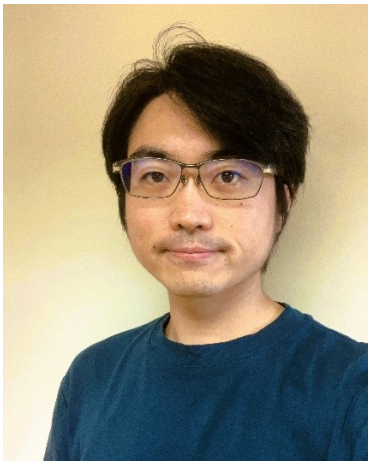
Curriculum Vitae



Name
Ryota Sakamoto

Current Position
Institute of Physics, Academia Sinica

Email address
rsakamoto@as.edu.tw

Education & Professional Experiences

Professional Experiences
since 2025: Assistant Research Fellow, Institute of Physics, Academia Sinica, Taiwan
2022-2025: Postdoctoral Fellow, Department of Biomedical Engineering, Yale University, USA
2019-2020: Visiting Researcher, London Centre for Nanotechnology, University College London, UK

Education
2022: Ph.D. in Physics, Department of Physics, Kyushu University, Japan
2019: M.S. in Physics, Department of Physics, Kyushu University, Japan
2017: B.S. in Physics, Department of Physics, Kumamoto University, Japan

Research Interests
What is Life? Specifically, how do lifeless molecules come together to create something as dynamic and purposeful as living things? In our lab, we seek to answer this fundamental question by investigating how complex life-like behaviors can emerge from the coordinated action of nanoscale biomolecules. We take a bottom-up approach: instead of studying living cells as they are, we rebuild key aspects of life in the lab, piece by piece, using building blocks of life. This enables us to elucidate the core principles of the self-organization of life. In essence, our lab integrates physics, biology, chemistry, and engineering to reveal the beauty and mysteries of life – and to explore how we can harness its principles to create something entirely new.

Selected Publications

[1]. **Ryota Sakamoto**, Zachary Gao Sun, Michael P. Murrell*, Crosslinked F-actin networks regulate load-dependent energy conversion, Communications Biology (2026)

[2]. **Ryota Sakamoto***, Michael P. Murrell*, Mechanical power is maximized during contractile ring-like formation in a biomimetic dividing cell, *Nature Communications* **15**, 9731 (2024)

[3]. **Ryota Sakamoto**, Michael P. Murrell*, F-actin architecture determines the conversion of chemical energy into mechanical work, *Nature Communications* **15**, 3444 (2024)

[4]. **Ryota Sakamoto***, Miyazaki Makito, Maeda Yusuke T.* State transitions of a confined actomyosin system controlled through contractility and polymerization rate, *Physical*

Review Research **5,** 013208 (2023)

[5]. **Ryota Sakamoto***, Ziane Izri, Yuta Shimamoto, Makito Miyazaki, Yusuke T. Maeda* Geometric trade-off between contractile force and viscous drag determines the actomyosin-based motility of a cell-sized droplet. *Proceedings of the National Academy of Science of the U.S.A.* **119,** e2121147119 (2022)

Lecture Title

Mechano-Energetics of the Cytoskeleton: From F-actin Architecture to Cell Division

Abstract (500 words maximum)

Living cells operate in a non-equilibrium state, in which continuous energy flow – the conversion of chemical energy into mechanical work – sustains both flexible morphological changes and structural stability. A prominent example is the actin cytoskeleton, composed of filamentous actin networks and myosin motor proteins, which exhibits diverse structural dynamics and, in turn, drives cell shape changes through force generation. Although much is known about the molecular players involved in cell division, less is understood about how forces generated by the actin cytoskeleton orchestrate the mechanics of division and the associated energetic costs. Using biomimetic model cells composed of purified actin, myosin, and lipid membranes, we demonstrate that stress relaxation is key to enabling faster and deeper cell division. The efficiency of energy conversion peaks just before division and is further modulated by F-actin architecture. Our findings provide quantitative insights into the mechanics and energetics of cell division.