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Born: December 11, 1980
Place of Birth: Toyama, Japan
Nationality: Japanese

Current position

Associate Professor, Department of Physics, Kyushu University

Areas of specialization

Soft Matter Physics, Fluid Mechanics, Statistical Mechanics, Biophysics, Synthetic Biology

Appointments

2015-present Associate Professor with tenure
Department of Physics, Graduate School of Science, Kyushu University

2012-2017 PRESTO Research Investigator
Japan Science and Technology Agency

2012-2015 Assistant Professor
The Hakubi Center for Advanced Research, Kyoto University

2008-2012 Postdoctoral Fellow
Center for Studies in Physics and Biology, The Rockefeller University
supervisor: Prof. Albert Libchaber

Education

2005-2008 The University of Tokyo, Graduate School of Science, Department of Physics. PH.D in Physics
supervisor: Prof. Masaki Sano

2003-2005 The University of Tokyo, Graduate School of Science, Department of Physics. MSc in Physics
supervisor: Prof. Masaki Sano

1999-2003 The University of Tokyo, Faculty of Science, Department of Biophysics and Biochemistry. BSc in Biology

Honors & Awards

2023 FOREST Research Investigator, Japan Science and Technology Agency

2015 Human Frontier Science Program Research Grant (Co-PI)

2015 Young Physicist Award (Statistical Physics), Japan Physical Society
2013 TOYAMA Award in Genome Science, Toyama Foundation
2012 HAKUBI Research Fellow, Kyoto University
2011 PRESTO Research Investigator, Japan Science and Technology Agency
2011 Poster presentation award, Gordon Conference on Soft matter far from equilibrium
2010 Marie Josee-Henry Kravis Fellowship, The Rockefeller University
2008 JSPS Fellowship for Research Abroad, Japan Society for Promotion of Science
2005 JSPS Fellowship DC1, Japan Society for Promotion of Science

Selected publications

(*co-correspondence)

1. Fukuyama T, Lu-can Y, Tanaka M, Yamamoto M, Saito K, Liao C-C, Hsia K-C, Maeda YT*, and Y. Shimamoto*
Morphological growth dynamics, mechanical stability, and active microtubule mechanics underlying spindle self-organization
*Proc. Natl. Acad. Sci. USA*119, e2209053119 (2022).

2. Sakamoto R, Izri Z, Shimamoto Y, Miyazaki M, and Maeda YT
Geometric trade-off between contractile force and viscous drag determines the actomyosin-based motility of a cell-sized droplet
Proc. Natl. Acad. Sci. USA 119, e2121147119 (2022).

3. Araki S, Beppu K, Kabir AMR, Kakugo A*, and Maeda YT*
Controlling collective motion of kinesin-driven microtubules via patterning of topographic landscapes
Nano Letters 21, 10478-10485 (2021).

4. Beppu K, Izri Z, Sato T, Yamanishi Y, Sumino Y, and Maeda YT
Edge current and pairing order transition in chiral bacterial vortices
Proc. Natl. Acad. Sci. USA 118, e2107461118 (2021).

5. Sakamoto R, Tanabe M, Hiraiwa T, Suzui K, Ishiwata S-i, Maeda YT, and Miyazaki M
Tug-of-war between actomyosin-driven antagonistic forces determines the positioning symmetry in cell-sized confinement
Nature Communications 11, 3063 (2020).

6. Beppu K, Izri Z, Gohya J, Eto K, Ichikawa M, and Maeda YT
Geometry-driven collective ordering of bacterial vortices
Soft Matter 13, 5038-5043 (2017).

7. Maeda YT, Tlusty T, and Libchaber A
Effects of long DNA folding and small RNA stem-loop in thermophoresis
Proc. Natl. Acad. Sci. USA 109, 17972-17977 (2012).

8. Maeda YT, Buguin A, and Libchaber A
Thermal separation: Interplay between the Soret effect and entropic force gradient
Physical Review Letters 107, 038301 (2011).

9. Shimamoto Y, Maeda YT, Ishiwata S, Libchaber AJ, and Kapoor TM
Insights into the micromechanical properties of the metaphase spindle
Cell 145, 1062-1074 (2011).

10. Noireaux V, Maeda YT, and Libchaber A
Development of an artificial cell, from self-organization to computation and self-reproduction
Proc. Natl. Acad. Sci. USA 108, 3473-3480 (2011).

Full list of publications

(*co-correspondence)

1. Kato S, Garenne D, Noireaux V, and Maeda YT
   Cytoskeletal wetting and shape instability in synthetic cells
   in preparation

2. Beppu K, Sumino Y, and Maeda YT
   Frustrated bacterial vortices and geometric rule of pairing order transition
   in preparation

3. Shigeta K, Ienaga R, Beppu K, Hiraiwa T, and Maeda YT
   Active turbulence and vortex order transition in epithelial cell monolayer
   in preparation

4. Hagihara S, Shimokawa R, Wada H, and Maeda YT
   Spinning elastic bubble
   in preparation

5. Fukuyama T, Ebata H, Kondo Y, Kidoaki S, Aoki K, and Maeda YT
   Why epithelial cells collectively move along a traveling signal wave
   arXiv:2008.12955 under revision

6. Ienaga R, Beppu K, and Maeda YT
   Geometric confinement guides topological defect pairings and emergent flow in nematic cell populations
   Soft Matter 19, 5016-5028 (2023)

7. Negi A, Beppu K, and Maeda YT
   Geometry-induced dynamics of confined chiral active matter
   Physical Review Research 5, 023196 (2023)

8. Sakamoto R, Miyazaki M, and Maeda YT
   State transitions of a confined actomyosin system controlled through contractility and polymerization rate
   Physical Review Research 5, 013208 (2023).

9. Fukuyama T, Lu-can Y, Tanaka M, Yamamoto M, Saito K, Liao C-C, Hsia K-C, Maeda YT*, and Y. Shimamoto*
   Morphological growth dynamics, mechanical stability, and active microtubule mechanics underlying spindle self-organization
   Proc. Natl. Acad. Sci. USA 119, e2209053119 (2022).

10. Sakamoto R, Izri Z, Shimamoto Y, Miyazaki M, and Maeda YT
    Geometric trade-off between contractile force and viscous drag determines the actomyosin-based motility of a cell-sized droplet
    Proc. Natl. Acad. Sci. USA 119, e2121147119 (2022).

11. Shigeta K, Fukuyama T, Takahashi R, Beppu K, Tanaka A, and Maeda YT
    Collective motion of epithelial cells along a wrinkled 3D-buckled hydrogel
    RSC Advances 12, 20174-20181 (2022).

12. Maeda YT
    Negative autoregulation controls size scaling in confined gene expression reactions
    Scientific Reports 12, 10516 (2022).

13. Beppu K and Maeda YT
    Exploring order in active turbulence: Geometric rule and pairing order transition in confined bacterial vortices
    Biophysics and Physicobiology 19, e190020 (2022).

14. Kikuchi K, Fukuyama T, Uchihashi T, Furuta T, Maeda YT, and Ueno T
Protein needles designed to self-assemble through needle tip engineering
Small 18, 210641 (2022).

15. Araki S, Beppu K, Kabir AMR, Kakugo A*, and Maeda YT*
Controlling collective motion of kinesin-driven microtubules via patterning of topographic landscapes
Nano Letters 21, 10478-10485 (2021).

16. Beppu K, Izri Z, Sato T, Yamanishi Y, Sumino Y, and Maeda YT
Edge current and pairing order transition in chiral bacterial vortices
Proc. Natl. Acad. Sci. USA 118, e2107461118 (2021).

17. Kato S, Garenne D, Noireaux V, and Maeda YT
Phase separation and protein partitioning in compartmentalized cell-free expression reactions
Biomacromolecules 22, 3451-3459 (2021).

18. Fukuyama T and Maeda YT
Optothermal diffusiophoresis of soft biological matters: From physical principle to molecular manipulation
Biophysical Reviews 12, 309-315 (2020).

19. Sakamoto R, Tanabe M, Hiraiwa T, Suzui K, Ishiwata S-i, Maeda YT, and Miyazaki M
Tug-of-war between actomyosin-driven antagonistic forces determines the positioning symmetry in cell-sized confinement
Nature Communications 11, 3063 (2020).

20. Shiraki T, Kamei K, and Maeda YT
Randomness and optimality in enhanced DNA ligation with crowding effects
Physical Review Research 2, 013360 (2020).

21. Izri Z, Garenne D, Noireaux V, and Maeda YT
Gene expression in on-chip membrane-bound artificial cells
ACS Synthetic Biology 8, 1705-1712 (2019).

22. Takagi J, Sakamoto R, Shirotsuchi G, Maeda YT, and Shimamoto Y
Mechanically distinct microtubule arrays determining the length and force response of the meiotic spindle
Developmental Cell, 49, 267-278 (2019).

23. Beppu K, Izri Z, Maeda YT, Sakamoto R
Geometric effect for biological reactors and biological fluids
Bioengineering 2, 110 (2018).

24. Sakamoto R, Noireaux V, and Maeda YT
Anomalous scaling of gene expression in confined cell-free reactions
Scientific Reports 8, 7364 (2018).

25. Fukuyama T, Nakama S, and Maeda YT
Thermal molecular focusing: Tunable cross effect of phoresis and light-driven hydrodynamic focusing
Soft Matter 14, 5519-5524 (2018).

26. Beppu K, Izri Z, Gohya J, Eto K, Ichikawa M, and Maeda YT
Geometry-driven collective ordering of bacterial vortices
Soft Matter 13, 5038-5043 (2017).

27. Fukuyama T, Fuke A, Mochizuki M, Kamei K, and Maeda YT
Directing and boosting of cell migration by the entropic force gradient in polymer solution
Langmuir 31, 12567-12572 (2015).

28. Ohmura T, Ichikawa M, Kamei K, and Maeda YT
Oscillation and collective conveyance of water-in-oil droplets by microfluidic bolus flow
Applied Physics Letters 107, 074102 (2015).

29. Maeda YT
(2+1)-Dimensional manipulation of soft biological materials by opto-thermal-diffusiophoresis
Applied Physics Letters 103, 243704 (2013).

30. Maeda YT, Tlusty T, and Libchaber A
Effects of long DNA folding and small RNA stem-loop in thermophoresis
Proc. Natl. Acad. Sci. USA 109, 17972-17977 (2012).

31. Maeda YT, Nakadai T, Shin J, Uryu K, Noireaux V, and Libchaber A
Assembly of MreB filaments on liposome membranes: A synthetic biology approach
ACS Synthetic Biology 1, 53-59 (2012).

32. Maeda YT, Buguin A, and Libchaber A
Thermal separation: Interplay between the Soret effect and entropic force gradient
Physical Review Letters 107, 038301 (2011).

33. Shimamoto Y, Maeda YT, Ishiwata S, Libchaber AJ, and Kapoor TM
Insights into the micromechanical properties of the metaphase spindle
Cell 145, 1062-1074 (2011).

34. Noireaux V, Maeda YT, and Libchaber A
Development of an artificial cell, from self-organization to computation and self-reproduction
Proc. Natl. Acad. Sci. USA 108, 3473-3480 (2011).

35. Tokita R, Katoh T, Maeda YT, Wakita J, Sano M, Matsuyama T and Mastushita M
Pattern formation of bacterial colonies by *Escherichia coli*
Journal of Physical Society of Japan 78, 074005 (2009).

36. Maeda YT, Inose J, Matsuo MY, Iwaya S and Sano M
Ordered patterns of cell shape and orientational correlation during spontaneous cell migration
PLoS ONE 3, e3734 (2008).

37. Delanoye-Ayari H, Iwaya S, Maeda YT, Inose J, Rivlere C, Sano M and Rieu J-P
Changes in the magnitude and distribution of forces at the different *Dictyostelium* developmental stages
Cell Motility and the Cytoskeleton 65, 314-331 (2008).

38. Maeda YT
Quantitative Experimental Analysis of Synthetic Gene Networks
Bussei Kenkyu 85(5), 685-721 (2006).

39. Maeda YT and Sano M
Regulatory Dynamics of Synthetic Gene Networks with Positive Feedback
Journal of Molecular Biology 359, 1107-1124 (2006).

Teaching

2015 - 2018	Electromagnetism and Thermodynamics
2016 - 2023	Experimental Physics 1
2016 - 2023	Biophysics
2016, 17	Non-equilibrium Statistical Physics
2017, 19, 21, 23	Nonlinear Dynamics
2018, 19, 22	Introduction to Soft Matter Physics
2019 - 2023	International course for Advanced Physics (in English)
2020	Physics of non-equilibrium transport phenomena (Niigata University, Intensive lecture course)