



# Ryota Takaki

Postdoctoral researcher (MPIPKS, Germany)

## PERSONAL DETAILS

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## GENERAL RESEARCH INTERESTS

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My research aims to develop theoretical and computational frameworks to understand biological processes at the cellular scale. I specialize in bridging statistical physics, continuum mechanics, and biological modeling to explain phenomena such as DNA loop extrusion, phase separation, and protein aggregation. Where analytical models are intractable, I apply molecular dynamics simulations to test and refine theoretical predictions.

## PROFESSIONAL EXPERIENCE

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**Max Planck Institute for the Physics of Complex Systems** 2021-Present  
*Postdoc under Frank Jülicher*  
Research: Biological condensates, DNA organization, and active glasses.

## EDUCATION

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**The university of Texas at Austin** 2015-2021  
*Ph.D, physics under Dave Thirumalai*  
Ph.D thesis: Physical and Mathematical models for biological machines.

**Kobe university** 2011-2015  
*B.S. Earth and Planetary science under Haruna Taichi*  
Research: Theoretical study on auto-catalytic chemical reaction network.

## PUBLICATIONS

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### First/Corresponding author

- [1] **R. Takaki**, Yahor Savich, Jan Brugués, and Frank Jülicher. “Active Loop Extrusion guides DNA-Protein Condensation”. In: *Physical Review Letters* 134.12 (2025), p. 128401.
- [2] **R. Takaki** and Dave Thirumalai. “Sequence complexity and monomer rigidity control the morphologies and aging dynamics of protein aggregates”. In: *Proceedings of the National Academy of Sciences* 121.50 (2024), e2409973121.
- [3] **R. Takaki**, Louise Jawerth, Marko Popović, and Frank Jülicher. “Theory of Rheology and Aging of Protein Condensates”. In: *PRX Life* 1 (1 Aug. 2023), p. 013006.
- [4] **R. Takaki**, Mauro L Mugnai, and D Thirumalai. “Information flow, gating, and energetics in dimeric molecular motors”. In: *Proceedings of the National Academy of Sciences* 119.46 (2022), e2208083119.

- [5] **R. Takaki**, Atreya Dey, Guang Shi, and Dave Thirumalai. “Theory and simulations of condensin mediated loop extrusion in DNA”. In: *Nature Communications* 12.1 (2021), p. 5865.
- [6] **R. Takaki**, Mauro L Mugnai, Yonathan Goldtzvik, and D Thirumalai. “How kinesin waits for ATP affects the nucleotide and load dependence of the stepping kinetics”. In: *Proceedings of the National Academy of Sciences* 116.46 (2019), pp. 23091–23099.

### Co-author

- [1] Atreya Dey, Guang Shi, **R. Takaki**, and Dave Thirumalai. “Structural changes in chromosomes driven by multiple condensin motors during mitosis”. In: *Cell Reports* 42.4 (2023).

### Under review

- [1] Liru Feng, Muntz Iain, **R. Takaki**, Lionel Ndamb, Martine Ruer-Gruß, Frank Jülicher, and Louise Jawerth. “Glasses and fibers are competing and non-convertible solid states in Fused in Sarcoma”. In: *Under review (Nature Physics)* (2025).
- [2] **R. Takaki** and Frank Jülicher. “Fluctuation-Response Theory of Non-Equilibrium Complex Fluids”. In: *arXiv preprint arXiv:2510.15559; Under review (Physical Review X)* (2025).

### Book chapter

- [1] Mauro L. Mugnai, **R. Takaki**, and D. Thirumalai. “Introduction to Stochastic Kinetic Models for Molecular Motors”. In: *Physics of Molecular and Cellular Processes*. Springer International Publishing, 2022, pp. 117–146.

## TEACHING EXPERIENCES

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Teaching assistant, The university of Texas at Austin	Spring, 2017
<i>Mathematical/computational neuroscience for undergraduate students</i>	
Teaching assistant, The university of Texas at Austin	2015-2016
<i>Physics Lab for undergraduate students</i>	

## CONFERENCES/ PRESENTATIONS

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### Talk

Physics of Life day	2023, Dresden (Germany)
Soft matter seminar at Kyusyu university	2023, Fukuoka (Japan)
APS March Meeting	2023, Las Vegas (USA)
The Molecular Biology Society of Japan (Invited)	2022, Tokyo (Japan)
iPoLS district meeting	2019, Rice university (USA)
Nonlinear science research meeting	2015, Waseda university (Japan)

## **Poster**

Driven and active amorphous matter	2025, Göttingen (Germany)
StatPhys29	2025, Florence (Italy)
Mechanics of Life II Workshop	2023, New York (USA)
7th Edwards Symposium	2023, Cambridge (UK)
Annual Biophysical Society meeting	2020, San Diego (USA)
GRC: Stochastic Physics in Biology	2019, Ventura (USA)

## **FELLOWSHIPS/GRANTS**

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Japan Society for the Promotion of Science: 6,278,000(JPY)/year	2022-2024
Shigeta Kyoiku Zaidan (Japan): 2,400,000(JPY)/year	2017-2018

## **AWARDS**

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Alexei Likhtman Poster Prize	7th Edwards Symposium (2023,UK)
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