

Hayato SHIBA, Ph. D.

Affiliation

Institute for Materials Research, Tohoku University
2-1-1 Katahira, Aoba, Sendai 980-8577, Japan
surname_at_imr.tohoku.ac.jp

Nationality – Japan

Date and place of birth – Aomori, Japan, August, 1981

EDUCATION

Ph. D. (Science) July 2010
Department of Physics, Kyoto University (Studentship: Apr. 2007 – Apr. 2009)
Dissertation: “*Studies on Heterogeneities in 2D Particle Systems - Structural Disorder and Dynamics*”
Supervisor - Prof. Akira Onuki

Master of Engineering March 2007
Department of Applied Physics, University of Tokyo, Japan
Supervisor - Prof. Nobuyasu Ito

Bachelor of Science March 2005
Department of Physics, University of Tokyo, Japan

PROFESSIONAL EXPERIENCE

Research Assistant Professor January 2016 –
Institute for Materials Research, Tohoku University, Japan

Research Associate May 2009 – December 2015
Institute for Solid State Physics, University of Tokyo, Japan

Adjunct Lecturer (Classical Mechanics) April 2013 – September 2014
College of Engineering, Shibaura Institute of Technology, Japan

Gastwissenschaftler (Visiting Scientist) August – October 2012
ICS-2/IAS-2, Forschungszentrum Jülich, Germany
August – October 2011

JSPS Research Fellow - DC2 April 2008 – April 2009
At Department of Physics, Kyoto University, Japan

Teaching Assistant (Statistical Thermodynamics Exercise) April 2007 – March 2008
Department of Physics, Kyoto University, Japan

SKILLS

- Numerical simulation
 - C, C++, Python/iPython, MPI
 - Massively parallel simulation coding, performance tuning
 - Molecular dynamics simulation, classical Monte Carlo simulation, computational fluid dynamics
- Language
 - Japanese (mother-tongue)
 - English (fluent)
 - German (basic)

PUBLICATIONS

1. Hayato Shiba, Takeshi Kawasaki, and Kang Kim
“Local Density Fluctuation Governs Divergence of Viscosity underlying Elastic and Hydrodynamic Anomalies in 2D Glass-Forming Liquid”
Physical Review Letters, accepted arXiv:1905.05458 (2019)
2. Hailong Peng, Momoji Kubo, and Hayato Shiba
“Molecular dynamics study of mesophase transitions upon annealing of imidazolium-based ionic liquids with long-alkyl chains”
Physical Chemistry Chemical Physics **20**, 9796-9805 (2018)
3. Hayato Shiba, Peter Keim, and Takeshi Kawasaki
“Isolating long-wavelength fluctuation from structural relaxation in two-dimensional glass: cage-relative displacement”
Journal of Physics: Condensed Matter **30**, 094004/1-9 (2018)
Special issue on Liquid Matter 2017, invited paper
4. Hideyuki Mizuno, Hayato Shiba, and Atsushi Ikeda
“Continuum Limit of the vibrational properties of amorphous solids”
Proceedings of the National Academy of Sciences U.S.A. **114**, E9767-E9774 (2017)
5. Hayato Shiba
“Dynamics of 2D Glass - Infinite Logarithmic Fluctuation and Inherent Relaxation”
Bulletin of the Physical Society of Japan (in Japanese), **72-10**, 717-722 (2017)
6. Hayato Shiba, Yasunori Yamada, Takeshi Kawasaki, and Kang Kim
“Unveiling Dimensionality Dependence of Glassy Dynamics: 2D Infinite Fluctuation Eclipses Inherent Structural Relaxation”
Physical Review Letters **117**, 245701/1-6 (2016)
7. John J. Molina, Kotaro Otomura, Hayato Shiba, Hideki Kobayashi, Masaki Sano, and Ryoichi Yamamoto
“Rheological evaluation of colloidal dispersions using smoothed profile method - formulation and applications”
Journal of Fluid Mechanics **792**, 590-619 (2016)
8. Hayato Shiba, Hiroshi Noguchi, and Jean-Baptiste Fournier
“Monte Carlo study of the frame, fluctuation and internal tensions of fluctuating membranes with fixed area”
Soft Matter **12**, 2373-2380 (2016)

9. Hayato Shiba and Hiroshi Noguchi
"Coarse-grained simulation of surfactant membranes"
Activity Report 2013 ISSP Supercomputer Center 34-41 (2014, invited article)
10. Hayato Shiba and Takeshi Kawasaki
"Spatiotemporal heterogeneity of local free volumes in highly supercooled liquid"
The Journal of Chemical Physics **139**, 184502/1-8 (2013)
11. Hao Wu, Hayato Shiba, and Hiroshi Noguchi
"Mechanical properties and microdomain separation of fluid membranes with anchored polymers"
Soft Matter **9**, 9907-9917 (2013)
12. Hayato Shiba, Hiroshi Noguchi, and Gerhard Gompper
"Structure formation of surfactant membranes under shear flow"
The Journal of Chemical Physics **139**, 014701/1-11 (2013)
13. Takeshi Kawasaki, Hayato Shiba, and Akira Onuki
"Hierarchical heterogeneous glassy dynamics of configuration changes and vibration modes"
AIP Conference Proceedings **1518**, 784-791 (2013)
14. Hayato Shiba, Takeshi Kawasaki, and Akira Onuki
"Relationship between bond breakage correlations and four-point density correlations in heterogeneous glassy dynamics: Configuration changes and vibration modes"
Physical Review E **86**, 041504/1-14 (2012)
15. Hayato Shiba and Hiroshi Noguchi
"Estimation of the bending rigidity and spontaneous curvature of fluid membranes in simulations"
Physical Review E **84**, 031926/1-13 (2011)
16. Hayato Shiba and Akira Onuki
"Jammed Particle Configurations and Dynamics in High-Density Lennard-Jones Binary Mixtures in Two Dimensions"
Progress of Theoretical Physics Supplement **184**, 232-247 (2010)
17. Hayato Shiba and Akira Onuki
"Plastic deformations in crystal, polycrystal, and glass in binary mixtures under shear: Collective yielding"
Physical Review E **81**, 051501/1-15 (2010)
18. Hayato Shiba, Akira Onuki, and Takeaki Araki
"Structural and dynamical heterogeneities in two-dimensional melting"
EPL **86**, 66004/1-6 (2009)
19. Hayato Shiba and Nobuyasu Ito
"Long-Time Tail Problem and Anomalous Transport in Three-Dimensional Nonlinear Lattices"
Progress of Theoretical Physics Supplement **178**, 79-85 (2009)
20. Hayato Shiba and Nobuyasu Ito
"Anomalous Heat Conduction in Three-Dimensional Nonlinear Lattices"
Journal of the Physical Society of Japan **77**, 054006/1-8 (2008)
21. Toshiyuki Hamanaka, Hayato Shiba, and Akira Onuki
"Plastic flow in polycrystal states in a binary mixture"
Physical Review E **77**, 042501/1-4 (2008)

22. Hayato Shiba, Jori Ruppert-Felsot, Yoshiki Takahashi, Yoshihiro Murayama, Qi Ouyang, and Masaki Sano,
“Elastic Convection in Vibrated Viscoplastic Fluids”
 Physical Review Letters **98**, 044501/1-4 (2007)
23. Hayato Shiba and Nobuyasu Ito
“Divergent Thermal Conductivity in Three-Dimensional Nonlinear Lattices”
 Journal of the Physical Society of Japan **75**, 103001/1-4 (2006)

INVITED AND REFEREED CONFERENCE PRESENTATIONS

- 25th-28th Jun. 2019 (contributed)
“Identifying relaxation processes in glass-forming liquids in two dimensions”
 2019 International Workshop on Glass Physics in Beijing
 Institute for Theoretical Physics, Chinese Academy of Sciences, Beijing, China
- 10th Jun. 2019 (contributed)
“Identifying relaxation processes in glass-forming liquids in two dimensions”
 International Congress on Glasses 2019, Session 7 *“Mean-Field and Low-Dimensional Theories of Glasses”*
 Boston Park Plaza Hotel and Towers, Boston, Massachusetts, U.S.A.
- 6th Jun. 2018 (contributed)
“Isolating long-wavelength fluctuation from structural relaxation in 2D glassy dynamics”
 Designer Soft Matter 2018
 PARKROYAL Hotel on Beach Road, Singapore
- 27th Mar. 2018 (invited)
“Simulation study of fluctuation and dynamics in low-dimensional systems crystal melting, amorphous solids, and elastic membranes”
 Workshop on Computer Simulation of Glassy Materials
 School of Materials Science and Engineering, Central South University, Changsha, China
- 22nd Mar. 2018 (invited)
“Endeavoring universal fluctuation of molecular assemblies by means of large-scale simulation”
 Award Lecture for the Young Scientist Award, 73rd Annual Meeting of Japan Physical Society (in Japanese)
 Noda Campus, Tokyo University of Science, Chiba, Japan
- 26th Sep. 2017 (invited)
“Dynamics of 2D Glass - Infinite Logarithmic Fluctuation and Inherent Relaxation”
 The 7th Workshop on Computational and Statistical Physics (CSP7) (in Japanese)
 Advanced Institute for Materials Research, Tohoku University, Sendai, Japan
- 17th Jul. 2017 (contributed)
“Unveiling Dimensionality Dependence of Glassy Dynamics: 2D Infinite Fluctuation Eclipses Inherent Structural Relaxation”
 10th Liquid Matter Conference 2017
 Cankarjev dom Cultural and Congress Centre, Ljubljana, Slovenia

- 23rd Mar. 2017 (contributed)
“Unveiling Dimensionality Dependence of Glassy Dynamics: 2D Infinite Fluctuation Eclipses Inherent Structural Relaxation”
 International Workshop on Glasses and Related Nonequilibrium Systems
 Nakanoshima Center, Osaka University, Osaka, Japan
- 21st Sep. 2016 (contributed)
“Apparent Dimensionality Dependence of Glassy Dynamics: Infinite Growth of Acoustic Vibrations in Two Dimensions”
 CECAM workshop “Structure formation in soft colloids”
 CECAM-AT, Technische Universität Wien, Vienna, Austria
- 14th Nov. 2014 (invited)
“Large-scale numerical simulation of supercooled liquid in light of dynamical heterogeneity”
 Annual Workshop for ISSP Supercomputer Center (in Japanese)
 ISSP, University of Tokyo, Chiba, Japan
- 17th Dec. 2012 (contributed)
“In search for spatiotemporal heterogeneity of local density fluctuations in binary glass simulation”
 Workshop on the Open Problems of the Glass Transition and Related Topics
 Nishijin-Plaza, Fukuoka, Japan
- 9th Dec. 2011 (contributed)
“Characterizations of static and dynamic heterogeneities in glass and crystal”
 French-Japanese meeting on “Jamming, Glasses, and Phase Transitions”
 Institut Henri Poincaré, Paris, France

SEMINARS

- 4th Sep. 2019
“Recent Developments in molecular simulation of glassy dynamics” (in Japanese)
 Invited Lecture at 13th Molecular Simulation School, Institute for Molecular Science, Okazaki, Japan
- 15th Aug. 2019
“Revealing local and nonlocal relaxation processes in 2D glass-forming liquids”
 PAP Seminar, School of Physical and Mathematical Sciences, Nanyang Technological University, Singapore
- 28th May 2019
“Divergence of Viscosity underlying Enhanced Fluctuations in 2D Glass-Forming Liquid”
 R-lab Colloquium, Department of Physics, Nagoya University, Nagoya, Japan
- 6th Sep. 2018
“Simulation of glass dynamics - models, calculation, and analysis” (in Japanese)
 Invited Lecture at 12th Molecular Simulation School, Institute for Molecular Science, Okazaki, Japan
- 23rd Sep. 2016
“Apparent Dimensionality Dependence of Glassy Dynamics: Infinite Growth of Acoustic Vibrations in Two Dimensions”
 Soft Matter Seminar at LS Maret, Fachbereich Physik, Universität Konstanz, Germany

- 2nd June 2015
“Membrane simulation - elasticity, surface tension, and some applications”
 Seminar at Phase Transition Dynamics Group, Department of Physics, Kyoto University, Japan
- 12th Feb. 2015
“Simulation of large-scale structure formation in surfactant membranes under flow”
 Bio-Soft Matter Special Seminar, Fachbereich Physik, Freie Universität Berlin, Germany
- 7th Mar. 2014
“Coarse-grained molecular simulation of multi-lamellar membranes under shear flow”
 Workshop on Non-Equilibrium Surfactant Solution, Tokyo Metropolitan University, Tokyo, Japan
- 24th Jan. 2013
“Structure formation of surfactant membrane under shear flow”
 Informal Seminar at MSC, Université Paris Diderot - Paris 7, France
- 27th Sep. 2012
“Simulation of structure formation in lipid membrane under shear”
 Theorie Seminar, ICS-2/IAS-2, Forschungszentrum Jülich, Germany
- 23rd May 2012
“Relationship between bond-breakage and four-point correlation functions in heterogeneous glassy dynamics”
 Computational Molecular Science Division, Institute for Molecular Science, Okazaki, Japan
- 22nd June 2009
“Structural and Dynamical Heterogeneities in Two-Dimensional Melting”
 IAS Seminar Series on Soft Matter, The Hong Kong University of Science and Technology, Hong Kong, China

FUNDING

- FY 2018 – 2020
 Grant-in-Aid for Young Scientists [MEXT, Japan]
“Computational study of mesoscale cooperative phenomena of ionic liquids - slow relaxation and interface fluctuation”
 Principal Investigator 3,100,000 JPY, Project Number 18K13513
- FY 2018 – 2021
 Grant-in-Aid for Scientific Research (B) [MEXT, Japan]
“Prediction of dramatic slowdown with glass transition on molecular basis - transition state and transport property”
 Co-Investigator 1,600,000 JPY (planned), Project Number 18H01188
- FY 2017 – 2018
 Izumi Science and Technology Foundation, Japan
“Simulation study of nanostructure formation for better dielectric properties of ionic liquid”
 Research Grant 900,000 JPY
- FY 2015 – 2016
 Building Consortia for the Development of Human Resources in Science and Technology [MEXT, Japan]
 Start-up Funding Grant 6,620,000 JPY

- FY 2014 – 2016
Grant-in-Aid for Scientific Research (C) [MEXT, Japan]
“Transversal Analysis of Hierarchical Dynamics of Glasses - Huge-Scale Molecular Simulation”
Co-Investigator 1,000,000 JPY, Project Number 26400428 [PI: Prof. Kang Kim]
- FY 2013 – 2017
Grant-in-Aid for Scientific Research on Innovative Areas [MEXT, Japan]
“Synergy of Fluctuation and Structure: Foundation of Universal Laws in Nonequilibrium Systems”
(Project Leader: Prof. Masaki Sano)
Group A03 *“Nonequilibrium Dynamics of Mesoscopic Structures in Biomembranes”*
Co-Investigator 2,400,000 JPY, Project Number 25103010 [PI: Prof. Shigeyuki Komura]
- FY 2012 – 2013
Grant-in-Aid for Young Scientists (B) [MEXT, Japan]
“Numerical Investigation on Structure Formation of Biomembranes under Shear Flow”
Principal Investigator - 3,380,000 JPY, Project Number 24740285
- FY 2008
Grant-in-Aid for JSPS Research Fellows [MEXT, Japan]
600,000 JPY

PREVIOUS LAB MEMBERS

Apr. 2016 - Jun. 2016

Dr. Yasunori Yamada

now at Beijing Computational Science Research Center

Oct. 2016 - Jan. 2018

Prof. Hailong Peng

now at Department of Materials Processing and Engineering, Central South University

AWARDS

12th Young Scientist Award of the Physical Society of Japan, Division 12 (Mar. 2018)

PCoMS Next Generation Researcher Award (Apr. 2018)

MEMBERSHIPS

The Physical Society of Japan (JPS)

The Molecular Simulation Society of Japan (MSSJ)

Division of Colloid and Surface Chemistry (DCSC), Chemical Society of Japan (CSJ)

Ionic Liquid Research Association, Japan

COMMUNITY SERVICE

- Apr. 2013 – Mar. 2014
Member of Steering Committee, JPS Division 12 (Soft Matter, Chemical Physics, and Biophysics)
- May. 2009 – Dec. 2015
Member of Steering and Judging Committee of ISSP Supercomputers
- Reviewer of
 - Physical Review E
 - New Journal of Physics
 - Scientific Reports
 - Nature Communications
 - Journal of the Physical Society of Japan
 - Molecular Simulation