

# Takumi Matsuzawa

5514 South Blackstone Avenue | Chicago, IL 60637 | +1 (773) 355-9553 | tmatsuzawa@uchicago.edu

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Education	<b>The University of Chicago</b> , Chicago, IL	2016-
	<i>Ph.D. candidate</i> , Physics	
	<b>The University of Chicago</b> , Chicago, IL	2016-17
	<i>Master of Science</i> , Physics	
	<b>Kalamazoo College</b> , Kalamazoo, MI	2013-16
	<i>Bachelor of Arts</i> , Physics with honors and Chemistry, <i>summa cum laude</i> .	
Research Experience	<b>Turbulence through Vortex Ring Collision</b> , University of Chicago	2017-
	- Lead a project to generate controlled turbulence experimentally which involves a cutting-edge 3D flow measurement (Funded by Army Research Office over \$500k)	
	- Design and build any necessary mechanical, and electrical equipment for the experiments from scratch	
	- Develop and manage codes for analysis, flow simulation, and data visualization	
	<b>Splashing of Low Viscosity Fluids</b> , University of Chicago	2016-17
	- Determined how fluids eject a thin sheet prior to splashing in the low-viscosity limit	
	<b>Targeting Studies for Mu2e-II</b> , Fermi National Accelerator Laboratory	2015
	- Assessed the merits of the proposed upgrade of the proton beamline for the Mu2e experiment using a particle tracking simulator called G4beamline. See the report <a href="#">here</a> .	
	<b>Phase Transition Simulation of Yukawa System</b> , Kalamazoo College	2014-16
	- Investigated a solid-liquid phase transition of the Yukawa system through a molecular dynamics simulator (LAMMPS), and a Monte Carlo method	
	- Discovered the 3D melting could be described using a percolation theory	
	<b>Modeling Altered Synaptic Plasticity</b> , Kalamazoo College	2014-16
	- Constructed a mathematical model of the altered synaptic plasticity of Alzheimer's patients which could explain memory loss and disabilities to learn	
	<b>Laser Break-Down Spectroscopy</b> , KEK	2014
	- Conducted laser break-down spectroscopy to evaluate mechanical properties of alloys.	
	<b>A Guide to the Vaccination Debate</b>	2014
	- Led an interdisciplinary study on effectiveness of vaccines to bridge parents and public health offices. See the report <a href="#">here</a> .	
Skills	<b>Programming:</b> C, C++, C#, Java, Python, OpenGL, HTML, CSS, Matlab	
	<b>Computer:</b> Mathematica, Root, LabView, LAMMPS, Houdini, L <sup>A</sup> T <sub>E</sub> X, <a href="#">git</a>	
	<b>Fluid Dynamics:</b> 2D particle image velocimetry, 2D/3D particle tracking velocimetry, superfluid simulation using Gross-Pitaevskii equation	
	<b>Language:</b> English (proficient), Japanese (native) and German (conversational)	
	<b>Others:</b> CAD, 3D printing, laser cutting, machining, laser tomography	
Teaching Experience	<b>Teaching Assistant</b> , The University of Chicago	
	Winter 2019: Experimental Physics (PHYS 211)	
	Fall 2018: Computational Physics with Python (PHYS 250)	
	Spring 2018: Introductory Physics: Waves, Optics, and Heat for Honors (PHYS 143)	
	Spring 2017: Introductory Physics: Waves, Optics, and Heat (PHYS 133)	
	Winter 2017: Introductory Physics: Electricity and Magnetism (PHYS 132)	

Fall 2016: Introductory Physics: Mechanics (PHYS 131)

**Teaching Assistant**, Kalamazoo College  
Spring 2016: Thermal Physics (PHYS 360)  
Fall 2016: Quantum Mechanics (PHYS 420)  
Fall 2016: Astrophysics (PHYS 480)  
Fall 2014: Modern Physics (PHYS 220)  
Spring 2014: Introductory Physics (PHYS 152)  
Winter 2014: Introductory Physics (PHYS 150)

**Peer Consultant**, Kalamazoo College 2014-16  
Tutored the undergraduate level math and physics at the Math-Physics Center

**Publications** **Matsuzawa T**, Zalányi L, Kiss T and Érdi P, Multi-scale modeling of altered synaptic plasticity related to Amyloid  $\beta$  effects, Neural Networks, 2017.

Érdi P, **Matsuzawa T**, John T, Kiss T and Zalányi L.: Connecting Epilepsy and Alzheimers Disease: Modeling of Normal and Pathological Rhythmicity and Synaptic Plasticity Related to Amyloid  $\beta$  Effects. In: Érdi P, Bhattacharya BS and Cochran AI (Eds.): Computational Neurology and Psychiatry (Springer Series in Bio-/Neuroinformatics) 1st ed. 2017 Edition, pp 93-119.

**In Preparation** **T. Matsuzawa** and W.T.M. Irvine. Realization of confined turbulence through vortex Ring Collision  
**T. Matsuzawa** and W.T.M. Irvine. Decay of a turbulence induced by vortex ring collision

**Awards and Scholarships** Research & Personal Development Fund 2021  
[Sidney Nagel Prize for Creativity in Research](#) 2020  
John Wesley Hornbeck Prize for Excellence in Physics 2016  
Senior Leadership Recognition Award for Excellence in Teaching Physics 2016  
The 39th Lower Michigan Mathematics Competition, 2nd Place 2015  
Lee Teng Undergraduate Fellowship in Accelerator Science and Engineering 2015  
Anne W. S. Scholarship for the Sciences 2014-16  
J. Ward and Mary Greiner Grant 2014  
The ACSJL Interdisciplinary Research Grant 2014  
Dean's List, Kalamazoo College 2013-16  
The 36th Professor Harry Messel International Science School 2011  
- One of the eight winners of the Prime Minister scholarship

**Talks and Presentations** American Physical Society March Meeting, *Talk* Mar. 2022  
"Localized Turbulence Sustained by Vortex Ring Injection"  
American Physical Society March Meeting, *Talk* Mar. 2021  
"Creation of an Isolated Turbulent Blob Sustained by Vortex Ring Injection"  
American Physical Society, Division of Fluid Dynamics, *Talk* Oct. 2020  
"Realization of Confined Turbulence Through Multiple Vortex Ring Collision"  
Simons Foundation, Turbulence Across Vast Scales, *Poster* Dec. 2019  
"Turbulence through Vortex Ring Collisions"  
The University of Chicago, Soft Matter Bag Lunch, *Talk* Sep. 2019  
"How does nature cook and eat up a turbulent puff?"  
American Physical Society March Meeting, *Talk* Mar. 2019

"Realization of Confined Turbulence Through Multiple Vortex Ring Collision"  
 Japanese Researchers Crossing in Chicago, Consulate of Japan, *Talk* Oct. 2018  
 "Topology in Fluids"  
 The University of Chicago, Soft Matter Bag Lunch, *Talk* Oct. 2017  
 "Confinement of Turbulence in Experimental Settings"  
 The University of Chicago, Experimental Physics Project, *Poster* May 2017  
 "Characterization of Thin-Sheet Ejection Using Low-Viscosity Fluids"  
 Kalamazoo College, Conference for Complex Systems, *Invited Talk* May 2017  
 "Multi-Scale Modeling of Altered Synaptic Plasticity Related to Amyloid-Beta Effects"  
 Kalamazoo College, *Talk and Poster* Apr. 2016  
 "Targeting Studies of the Second-Generation Mu2e Experiment"  
 Fermi National Accelerator Laboratory, *Talk and Poster* Aug. 2015  
 "Targeting Studies of the Second-Generation Mu2e Experiment"  
 Annual Meeting of Society for Neuroscience, Chicago *Poster* Oct. 2015  
 "Modeling Altered Synaptic Plasticity due to Amyloid-Beta"  
 KEK, Summer School, *Talk and Poster* Aug. 2014  
 "Laser Break-Down Spectroscopy on Alloys"

## Community Service

**Special education teacher** 2021-  
 Provide educational aid every week for a 9 year-old child with autistic spectral disorder.  
**Kagakusha Network, Writer** 2019-  
 Contribute articles and edit submitted manuscripts for Kagakusha Network that is founded to cultivate scientists and engineers of the next generation who can play an active role on the international stage.  
**Research Experience for Undergraduates** 2020  
 Supervised an undergraduate to visualize the decay of turbulence through motion of 100k particles.  
**Science Outreach**  
 "Physics With A Bang", The University of Chicago Dec 2018, Dec 2019  
 "Science Meets Art", Marwen Art School, June 2017  
 Science demonstrations, Woodward School for Technology and Research 2015  
 Science demonstrations, Maple Street Magnet School for the Arts 2013-14  
**War Memories, Oral History in Liberal Arts** 2015-16  
 "War Memories explores memories of World War II by Japanese-speaking people who lived in the Japanese Empire during the war." The project is guided by Noriko Sugimori at Kalamazoo College. I translated several interviews into English, adding Japanese and English subtitles to the videos. They can be found [here](#).  
**TEDxKalamazooCollege, Speaker** 2016  
**Society of Physics Students, Head of Kalamazoo College Chapter** 2015-16  
**Mentoring Underrepresented Students in Sciences, Mentor** 2015-16  
 Organized a support group at Kalamazoo College, and communicated with the Department heads to enhance academic and mental support for underrepresented students in science.

## Mentoring

Diego Padilla Monroy, an undergraduate at Florida International University (Summer REU 2020)