Curriculum Vitae

Shotaro Otsuka

Personal Information

Nationality :	Japan
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Research Experience

2025-	**Associate Professor** (tenured) *Max Perutz Labs, a joint venture of the University of Vienna and the Medical University of Vienna, Vienna Biocenter*
2019-2024	**Group Leader** *Max Perutz Labs, a joint venture of the University of Vienna and the Medical University of Vienna, Vienna Biocenter*
2017-2019	**Research scientist** *Laboratory of Dr. Jan Ellenberg, Cell Biology and Biophysics Unit, European Molecular Biology Laboratory (EMBL), Heidelberg, Germany*
2011-2017	**Postdoctoral fellow** (EMBL Interdisciplinary Postdoc programme, shared by two laboratories) *Main Lab.: Dr. Jan Ellenberg, Cell Biology and Biophysics Unit, Associated Lab.: Dr. Martin Beck, Structural and Computational Biology Unit, EMBL, Heidelberg, Germany*
2005-2011	**Bachelor, Master, and PhD student** *Laboratory of Prof. Kunio Takeyasu and Shigehiro Yoshimura, Graduate School of Biostudies, Kyoto University, Kyoto, Japan*

Academic Qualifications

Education

4/2006-3/2011	Kyoto University, Graduate School of Biostudies
4/2002-3/2006	Kyoto University, Faculty of Integrated Human Studies

Degrees

3/2011	Doctoral degree at Kyoto University (Life science)
3/2008	Master's degree at Kyoto University (Life science)
3/2006	Bachelor’s degree at Kyoto University (Natural Sciences)

Main areas of research and main scientific results

During my postdoctoral research, working with Jan Ellenberg's and Martin Beck's groups at EMBL, I established a novel correlative light and electron microscopy (CLEM) method which enables visualizing cellular structures in situ in human cells at high temporal and spatial resolution. By combining this CLEM approach with super-resolution microscopy and FCS-calibrated live imaging, I demonstrated that nuclear pores assemble via structurally and molecularly distinct mechanisms in mitosis and interphase.

Since establishing my independent research group at the Max Perutz Labs (Vienna BioCenter) in 2019, my research has focused on the structural mechanisms that govern communication between the endoplasmic reticulum (ER) and the nucleus. Together with my team, we implemented the CLEM workflow here at Vienna Biocenter. Using our time-resolved EM approach, we showed that ER-nuclear envelope junctions have a distinct ultrastructure, with specialization beginning in early telophase. We are now investigating the molecular mechanisms that regulate ER-nuclear envelope junctions and ER contact sites with mitochondria and centrosomes by integrating conditional proteomics, quantitative live-cell imaging, CLEM, electron tomography, and targeted molecular perturbations.

Funding

Research Grant

2024-2029	European Research Council (ERC) Consolidator Grant. "Understanding of the Membrane Connection Linking the Nucleus to the Endoplasmic Reticulum".
2023-2024	Austrian Research Fund (FWF) Project. "How do endoplasmic reticulum and nucleus communicate?" P36743-B.
2021-2025	Austrian Research Fund (FWF) Doctoral Program "Signaling Mechanisms in Cellular Homeostasis."
2020-2024	Vienna Science and Technology Fund (WWTF). "Elucidating the mechanics of mitotic chromosome assembly by light-, electron-, and atomic force microscopy." LS19-001.

Fellowships and Awards

Fellowships

4/2013-3/2016	Interdisciplinary Postdoctoral fellowship (EMBL and Marie Curie Actions COFUND)
4/2011-3/2013	Postdoctoral fellowship for research abroad (the Japan Society for the Promotion of Science (JSPS))
4/2008-3/2011	JSPS research fellowship for young scientists

Awards

2024	Kazato Research Foundation - Kazato Prize for excellent scientific achievements
2024	European Microscopy Society - Outstanding Paper Award
6/2011	JSPS travel Grant for 61th Lindau Nobel Laureate Meeting

Fellowships obtained by lab members

2023-2025	Postdoctoral fellowship from EU H2020 - Vienna International PostDoc Program - (VIP2) to Pallavi Deolal
2021-2023	The Austrian Academy of Sciences (ÖAW) Ph.D. fellowship to Helena Bragulat Teixidor
2021	Max Perutz PhD fellowship to Helena Bragulat Teixidor

Mentoring and Teaching Experience

Lecturer

2026	Lecture Series: Vienna BioCenter PhD program PyP lecture
2024-present	Lecture Series: Propedeutics: Molecular and Cell Biology for Medics
2024	Lecture Series: The Modern Concepts of Structural Biology
2023	Workshop: Advanced confocal laser scanning microscopy and live cell imaging
2023-present	Lecture Series: Advanced Cell Biology
2023-present	Lecture Series: Concepts in Molecular Biology
2020-present	Lecture Series: Methods in Molecular Biology and Biochemistry
2019-2023	Lecture Series: Molecular Medicine II
2019, 2024	Lecture Series: Chromosome Biology I

Supervisor

2015-	4 PhD students, 6 Master students, 32 internship Master students, and 6 undergraduate students

Course instructor

2011, 2016	EMBL Cell Biology and Biophysics Ph.D. Course
2011, 2015	EMBO practical course “Current Methods in Cell Biology”

Professional Training

2026	Leadership workshop "Hiring the right people", organized by Vienna BioCenter Scientific Training
2022	EMBO workshop on Research Integrity, organized by European Molecular Biology Organization (EMBO)
2021	Leadership program "Thinking Your Way Into Leading a Research Group", organized by Dr. Iain Patten
2021	Leadership workshop "Empowering your team", organized by Vienna BioCenter Scientific Training
2019	PhD student supervision course, organized by Vienna BioCenter Scientific Training
2018	EMBO Lab Management Course, organized by European Molecular Biology Organization (EMBO)

Conferences and Seminars

Invited lecturer at EMBL advanced course

4/2016 EMBL course, High-Accuracy Correlated Light and Electron Microscopy: Applications at Room Temperature and in Cryo, Heidelberg, Germany

Invited speaker at international and domestic conferences

11/2025 BINDS Symposium 2025, Tokyo, Japan.

6/2025 The 81th Annual Meeting of the Japanese Society of Microscopy, Fukuoka, Japan.

8/2024 The European Microscopy Congress (EMC) 2024, Copenhagen, Denmark.

6/2024 21st IUPAB Congress 2024, Kyoto, Japan

6/2024 RIKEN Symposium, Challenges in Bioimaging: beyond the scales and beyond the borders, Kobe, Japan

11/2023 The 46th Annual Meeting of the Molecular Biology Society of Japan, Kobe, Japan, online participation

6/2023 The 79th Annual Meeting of the Japanese Society of Microscopy, Shimane, Japan.

6/2023 The 75th Annual Meeting of the Japan Society for Cell Biology, Nara, Japan.

10/2019 COST (European Cooperation in Science and Technology) Workshop on Nuclear Architecture, Lipids, and Phase Separation, Prague, Czech Republic.

9/2019 2nd Symposium on Recent Advances in Cryo-Electron Microscopy, Krakow, Poland.

5/2018 The 74th annual meeting for the Japanese Society of Microscopy, in an organized session entitled “Application of Correlative Light and Electron Microscopy”, Kurume, Japan.

Invited seminars

12/2022 Kyoto-Vienna BioMath Workshop “Mathematical Methods for the Study of Self-organization in the Biological Sciences”, the Erwin Schrödinger International Institute for Mathematics and Physics of the University of Vienna, Vienna, Austria

10/2022 Center for Anatomy and Cell Biology, Medical University of Vienna, Austria

5/2022 A virtual Seminar Series on the Nuclear Pore and Nuclear Envelope, organized by Dr. Marry Dasso at NIH, USA

2016- Invited seminars in Japan (Kyushu University, National Institute of Genetics, Tokyo Institute of Technology, the Juntendo University School of Medicine, Tokushima University, RIKEN in Kobe, Kyoto University, National Institutes of Natural Sciences, RIKEN in Saitama, Osaka University, and National Institute of Information and Communications Technology).

Publications

Research articles

1) Moschella C, Scholz J, Merino-Aceituno S*, Schmeiser C*, **Otsuka S***. “Modeling protein diffusion across ER-nuclear envelope junctions reveals efficient transport via simple diffusion.” *Biophys J.*, (2026). DOI: 10.1016/j.bpj.2026.10.002. *: Co-corresponding author.
2) Jordan MA, Palacio-Rodriguez K, Adakkattil R, Welsch S, Niese L, Dollie LaJoie, von der Weth E, Melo AA, Redlingshoefer L, **Otsuka S**, Diez S, Hummer G, Von Appen A. “Structural mechanism of nuclear membrane sealing by LEM2-ESCRT-III.” *bioRxiv*, (2026). DOI: 10.64898/2026.09.01.748678.
3) Latham AP, Zhang W, Tempkin JOB, **Otsuka S**, Ellenberg J, Sali A. “Integrative spatiotemporal modeling of biomolecular processes: application to the assembly of the Nuclear Pore Complex.” *Proc. Natl. Acad. Sci. USA*, 122 (11):e2415674122, (2025). DOI: 10.1073/pnas.2415674122.
4) Bragulat-Teixidor H*, Ishihara K, Szücs GM, **Otsuka S***. “The endoplasmic reticulum connects to the nucleus by constricted junctions that mature after mitosis.” *EMBO Rep.*, 25(7):3137-3159, (2024). DOI: 10.1038/s44319-024-00175-w. *: Co-corresponding author.
5) Forer A*, **Otsuka S***. “Structural evidence for elastic tethers connecting separating chromosomes in crane-fly spermatocytes.” *Life Sci. Alliance*, 6(11):e202302303, (2023). DOI: 10.26508/lsa.202302303. *: Co-corresponding author.
6) **Otsuka S***, Tempkin JOB, Zhang W, Politi AZ, Rybina A, Hossain MJ, Kueblbeck M, Callegari A, Koch B, Morero NR, Sali A, Ellenberg J*. “A quantitative map of nuclear pore assembly reveals two distinct mechanisms.” *Nature*, 613(7944):575-581, (2023). DOI: 10.1038/s41586-022-05528-w. *: Co-corresponding author.
7) Schneider MWG, Gibson BA*, **Otsuka S***, Spicer MFD, Petrovic M, Blaukopf C, Langer CCH, Batty P, Nagaraju T, Doolittle LK, Rosen MK, Gerlich DW. “A chromatin phase transition protects mitotic chromosomes against microtubule perforation.” *Nature*, 609(7925):183-190, (2022). DOI: 10.1038/s41586-022-05027-y. *Equal contribution.
8) Farrants H, Tarnawski M, Müller TG, **Otsuka S**, Hiblot J, Koch B, Kueblbeck M, Kräusslich HG, Ellenberg J, Johnsson K. “Chemogenetic Control of Nanobodies.” *Nat. Methods*, 17(3):279-282, (2020). DOI: 10.1038/s41592-020-0746-7.
9) **Otsuka S**, Steyer AM, Schorb M, Hériché JK, Hossain MJ, Sethi S, Kueblbeck M, Schwab Y, Beck M, Ellenberg J. “Postmitotic nuclear pore assembly proceeds by radial dilation of small membrane openings.” *Nat. Struct. Mol. Biol.*, 25(1):21-28, (2018). DOI: 10.1038/s41594-017-0001-9.
10) **Otsuka S**, Bui KH, Schorb M, Hossain MJ, Politi AZ, Koch B, Eltsov M, Beck M, Ellenberg J. “Nuclear pore assembly by an inside-out extrusion of the nuclear envelope.” *Elife*, 5:e19071, (2016). DOI: 10.7554/eLife.19071.
11) Lolodi O, Yamazaki H, **Otsuka S**, Kumeta M, Yoshimura SH. “Dissecting in vivo steady-state dynamics of karyopherin-dependent nuclear transport.” *Mol. Biol. Cell*, 27(1):167-76, (2016).

DOI: 10.1091/mbc.E15-08-0601.

12) Yoshimura SH, **Otsuka S**, Kumeta M, Taga M, Takeyasu K. “Intermolecular disulfide bonds between nucleoporins regulate karyopherin-dependent nuclear transport.” *J. Cell. Sci.*, 126(Pt 14):3141-3150, (2013). DOI: 10.1242/jcs.124172.

13) Asally M, Yasuda Y, Oka M, **Otsuka S**, Yoshimura SH, Takeyasu K, Yoneda Y. “Nup358, a nucleoporin, functions as a key determinant of the nuclear pore complex structure remodeling during skeletal myogenesis.” *FEBS J.*, 278(4):610-621, (2011). DOI: 10.1111/j.1742-4658.2010.07982.x.

14) **Otsuka S**, Iwasaka S, Yoneda Y, Takeyasu K, Yoshimura SH. “Individual binding pockets of importin β for FG-nucleoporins have different binding properties and different sensitivities to RanGTP.” *Proc. Natl. Acad. Sci. USA*, 105(42): pp16101-16106, (2008). DOI: 10.1073/pnas.0802647105.

15) Yoshimura SH, Takahashi H, **Otsuka S**, Takeyasu K. “Development of glutathione-coupled cantilever for the single-molecule force measurement by scanning force microscopy.” *FEBS Lett.*, 580, pp3961-3965, (2006). DOI: 10.1016/j.febslet.2006.06.032.

Reviews

16) Deolal P, Scholz J, Ren K, Bragulat-Teixidor H, **Otsuka S**. “Sculpting nuclear envelope identity from the endoplasmic reticulum during the cell cycle”. *Nucleus*, 15(1):2299632, (2024). DOI: 10.1080/19491034.2023.2299632.

17) **Otsuka S***, Ellenberg J*. “Mechanisms of nuclear pore complex assembly – two different ways of building one molecular machine.” *FEBS Lett.*, 592(4):475-488, (2018). DOI: 10.1002/1873-3468.12905. *: Co-corresponding author.

18) Hirano Y, Takahashi H, Kumeta M, Hizume K, Hirai Y, **Otsuka S**, Yoshimura SH, Takeyasu K. “Nuclear architecture and chromatin dynamics revealed by atomic force microscopy in combination with biochemistry and cell biology.” *Pflugers Arch*, 456(1):139-53, (2008). DOI: 10.1007/s00424-007-0431-z.

Book chapters

19) Bragulat-Teixidor H*, **Otsuka S***. “Correlative light and electron microscopy at defined cell cycle stages in a controlled environment.” *Methods Cell Biol.*, 187:73-97, (2024). DOI: 10.1016/bs.mcb.2024.02.025. *: Co-corresponding author.

20) Bragulat-Teixidor H, Hossain MJ, **Otsuka S**. “Visualizing Nuclear Pore Complex Assembly In Situ in Human Cells at Nanometer Resolution by Correlating Live Imaging with Electron Microscopy.” *Methods Mol. Biol.*, 2502:493-512, (2022). DOI: 10.1007/978-1-0716-2337-4_31.

21) **Otsuka S**, Szymborska A, Ellenberg J. “Imaging the assembly, structure, and function of the nuclear pore inside cells.” *Methods Cell Biol.*, 122:219-238, (2014). DOI: 10.1016/B978-0-12-417160-2.00010-2.

22) Yoshimura SH, Takahashi H, **Otsuka S**, Yokokawa M. “Atomic force microscopy as a single-molecule imaging and force measurement tool for the cell nucleus.” *Tanpakusitsu Kakusan Koso*, Kyoritsu Shuppan, Vol.51, pp1981-1988, (2006). PMID: 17471897.