

CURRICULUM VITAE

Jae Hoon Jung, Research Assistant Professor

Work: Department of Biology

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Education

Years	Institution and Location	Degree	Field of Study
1992-1998	Korea University, Seoul, South Korea	B.S.	Physics
1999-2000	Korea University, Seoul, South Korea	M.S.	Physics
2001-2009	Stanford University, Stanford, California	Ph.D.	Physics

Positions

1992	Undergraduate student, Department of Physics, Korea University
1993-1994	Military Policemen at 557th MP Company at Camp Humphreys in Korea
1995-1998	Undergraduate student, Department of Physics, Korea University
1998-2000	Graduate student for M.S., Department of Physics, Korea University
2000-2001	Graduate student for Ph.D., Department of Physics, Korea University
2001-2009	Graduate student for Ph.D., Department of Physics, Stanford University
2009-2012	Postdoctoral Research Associate, Department of Biology, Texas A&M University
2012-present	Research Assistant Professor, Department of Biology, Texas A&M University

2018-present Part-time Physics Instructor, Division of Agricultural & Natural Sciences, Blinn College

Fellowships and Grants

AWARDED

- 1997-2001 Baek-woon Fellowship (Department of Physics at Korea University)
- 2002-2004 Kwanjeong Scholarship (Kwanjeong Educational Foundation, South Korea)
- 2008 The Joseph R. McMicking Fellowship Fund (Department of Physics at Stanford University)
- 2017-2019 National Institute of Neurological Disorders and Stroke, "Mapping the macromolecular architecture of the synaptic basal lamina at neuromuscular junctions and localizing the C-terminus of neural agrin in it," (1R21NS102788-01; Project Period, 08/15/2017 to 07/31/2019)

Research Experience

Korea University, Department of Physics, March 1998-August 2001

Advisor: Jinsoo Joo (Department of Physics)

Key achievements (Selected)

- Characterized physical, electrical, and magnetic properties of conducting organic polymer, polyaniline after doping with various cations using techniques that include conductance measurement, X-ray diffraction spectroscopy, electron paramagnetic resonance spectroscopy and X-ray photoelectron spectroscopy.
- Discovered that electrical conductance of poly(3,4-ethylenedioxythiophene) (PEDOT) polymer film increases greatly more than 10-fold by applying various organic solvents.

Stanford University, Department of Physics, September 2001-September 2009

Advisor: Uel J. McMahan (Department of Neurobiology/Structural Biology) and Sebastian Doniach (Department of Physics/Applied Physics)

Key achievements (Selected)

- Developed innovative measurement tools of electron tomography using C++, Java, and IDL (Interactive Data Language) for accurate quantification of observable structures at a few nanometer resolutions.

- Revealed, for the first time, that the docked state of synaptic vesicles with the presynaptic membrane are divided into multiple states in terms of their spatial relationship with the presynaptic membrane from mouse neuromuscular junctions.
- Discovered that the elusive hemifusion states of synaptic vesicles with the presynaptic membrane are present at active zones during synaptic activity.

Postdoctoral Research Associate, Texas A&M University, September 2009 – March 2012

PI: Uel J. McMahan (Department of Biology)

Key achievements (Selected)

- Discovered that the docked stage of a synaptic vesicle from frog neuromuscular junctions in the peripheral nervous system is dynamically variable and regulated by its attached macromolecular structures.
- Discovered that SNARE proteins essential for synaptic transmission regulate the spatial relationship of docked synaptic vesicles with the presynaptic membrane using botulinum neurotoxins and electron tomography.
- Resolved, for the first time, that docked synaptic vesicles at active zones of hippocampal synapses in the central nervous system into two distinctively different populations using his developed measurement tool of electron tomography.

Research Assistant Professor, Texas A&M University, April 2012 – Present.

PI: Uel J. McMahan (Department of Biology)

Key achievements (Selected)

- Constructed a variable priming hypothesis of synaptic vesicle at active zones of frog neuromuscular junctions using electron tomography and surface modeling.
- Developed a stochastic model of synaptic vesicle based on computational modeling studies that is generally applicable to various synapses in different species and types.
- Devised an automatic method for segmentation and rendering of electron tomography that markedly accelerates the processes for efficient extraction of structural information from reconstructed volumes generated by electron tomography.
- Discovered direct evidence supporting that large vesicles containing electron-dense materials dock and fuse with the presynaptic membrane at active zones in a similar manner to synaptic vesicles.

- Improved EM3D, an electron tomography software package, to make it also applicable to inorganic and organic materials such as nanocomposites.

Skills and Certifications

Programming languages: C++, IDL, Matlab and Java

Certifications: JEOL 1200EX Transmission Electron Microscope

FEI Tecnai G2 F20 Transmission Electron Microscope

Teaching Experience

Fall/2003 Teaching Assistant of physics 52 (Light and Heat Laboratory)

Spring/2003 Teaching Assistant of physics 55 (Electricity and Magnetism)

Fall/2004 Teaching Assistant of physics 52 (Light and Heat Laboratory)

Spring/2004 Teaching Assistant of physics 26 (Modern Physics Laboratory)

Winter/2004 Teaching Assistant of physics 23 (Electricity and Optics)

Fall/2005 Teaching Assistant of physics 46 (Light and Heat Laboratory)

Winter/2005 Teaching Assistant of physics 53 (Mechanics)

Spring/2005 Teaching Assistant of physics 121 (Intermediate Electricity and Magnetism)

Fall/2006 Teaching Assistant of physics 21 (Mechanics and Heat)

Winter/2006 Teaching Assistant of physics 120 (Intermediate Electricity and Magnetism)

Spring/2006 Teaching Assistant of physics 221 (Classical Electrodynamics)

Summer/2006 Teaching Assistant of physics 28 (Mechanics, Heat and Electricity)

Spring/2007 Teaching Assistant of physics 212 (Statistical Mechanics)

Summer/2018 Instructor of physics 2426 (University Physics II)

Fall/2018 Instructor of physics 2426 (University Physics II)

Selected Presentations

Jae Hoon Jung, Joseph A. Szule, Robert M. Marshall, and Uel J. McMahan (February 2-6, 2008). Spatial relationship between docked synaptic vesicles to the presynaptic membrane and to the active zone material at the frog's neuromuscular junction. Biophysical Society 52nd annual meeting, Long Beach, CA.

Jae Hoon Jung, Joseph A. Szule, Robert M. Marshall, and Uel J. McMahan (February 20-24, 2010). Changes in macromolecular arrangement of active zone material and vesicle-presynaptic-membrane relationship that regulate the docking and fusion of synaptic vesicles on the presynaptic membrane. Biophysical Society 54th annual meeting. San Francisco, CA.

Jae Hoon Jung, Joseph A. Szule and Uel J. McMahan (September 6-10, 2010). Macromolecular regulation of transmitter release at the neuromuscular junction: Mechanical forces applied by active zone material macromolecules to docked vesicles and calcium channels. Molecular and Cell Biology of the Neuromuscular System Meeting. Guard, Switzerland.

Jae Hoon Jung, Joseph A. Szule and Uel J. McMahan (September, 2011). Physical Changes in Macromolecules of Active Zone Material that regulate the Docking and Fusion of Synaptic Vesicles on the Presynaptic Membrane. Texas A&M Student- Post-doc Research Conference. College Station, TX.

Jae Hoon Jung, Joseph A. Szule, Robert M. Marshall, and Uel J. McMahan (October 17-21, 2015). The structural basis of priming of docked synaptic vesicles at the frog's neuromuscular junction. Society for Neuroscience 45th annual meeting, Chicago, IL.

Jae Hoon Jung, Joseph A. Szule and Uel J. McMahan (January 11-13, 2016). Developing High-Throughput Methods for Structural Analysis of Macromolecular Assemblies in Cells, as Imaged by Electron Tomography. College of Science Big Data Workshop, College Station, TX.

Jae Hoon Jung (February 12, 2016). Generating a large-volume stack of serial electron microscope images that provides multi-spatial resolutions. 2nd Texas A&M Big Data Workshop, College Station, TX.

Jae Hoon Jung, Joseph A. Szule, Robert M. Marshall, and Uel J. McMahan (February 27-March 2, 2016). The structural basis of priming of a docked synaptic vesicle. Biophysical Society 60th annual meeting. Los Angeles, CA.

Jae Hoon Jung, Joseph A. Szule, Kylee Stouder, and Uel J. McMahan (November 12-16, 2016). Oriented docking of dense core vesicles at active zones on the presynaptic membrane of neuromuscular junctions. Society for Neuroscience 46th annual meeting, San Diego, CA.

Jae Hoon Jung (November 11-15, 2017). A stochastic model of active zone material mediated synaptic vesicle docking and priming. Society for Neuroscience 47th annual meeting, Washington, DC.

Work in Progress

Jung, J. H., Ian, S., McMahan, U. J., and Thompson, W. Schwann cell involved synapse elimination: a model of synapse elimination at developing neuromuscular junctions. (manuscript in preparation)

Jung, J. H., Bourne, J. N., Marshall, R. M., McMahan, U. J., and Harris, K. M. The spatial relationship of synaptic vesicles with the presynaptic plasma membrane and the active zone material at nerve terminals of rat hippocampal synapses before and after long term potentiation. (manuscript in preparation)

Publications

Jung, J. H., Szule, J. A., Stouder, K., Marshall, R. M., and McMahan, U. J. (2018) Active Zone Material-directed orientation, docking and fusion of dense core vesicles alongside synaptic vesicles at neuromuscular junctions. *Front. Neuroanat.* doi:10.3389/fnana.2018.00072

Jung, J. H. and Szule, J. A. (2017) Automatic optimization method for segmentation and surface model generation in electron tomography. *IEEE Life Sciences Letters* 3:5-7, doi:10.1109/LLS.2017.2756886

Jung, J. H. and Doniach, S. (2017) A stochastic model of active zone material mediated synaptic vesicle docking and priming at resting active zones. *Sci. Rep.* 7:278. doi:10.1038/s41598-017-00360-z

Jung, J. H., Szule, J. A., Marshall, R. M., and McMahan, U. J. (2016) Variable Priming of a Docked Synaptic Vesicle. *PNAS* 113:E1098-E1107. doi:10.1073/pnas.1523054113

Recommended in F1000Prime as being of special significance in its field by F1000 Faculty Member Robert Zucker: <http://f1000.com/prime/726131981?subscriptioncode=ae7e7bef-4b85-4fb7-8e39-6b5513bb20f6>

Szule, J.A., Jung, J. H., and McMahan, U. J. (2015) The structure and function of 'active zone material' at synapses. *Phil. Trans. R. Soc. B* doi:10.1098/rstb.2014.0189

Harlow, M. L., Szule, J. A., Xu, J., Jung, J. H., Marshall, R. M., and McMahan, U. J. (2013) Alignment of synaptic vesicles with the macromolecules in active zone material that direct vesicle docking. PLoS ONE 8(7):e69410. doi: 10.1371/journal.pone.0069410

Szule, J. A., Harlow, M. L., Jung, J. H., De-Miguel, F. F., Marshall, R. M. and McMahan, U. J. (2012) Regulation of synaptic vesicle docking by different classes of macromolecules in active zone material. PLoS ONE 7(3): e33333.

Nagwaney, S., Harlow M. L., Jung, J. H., Szule, J. A., Ress, D., Xu, J., Marshall, R. M., and McMahan, U. J. (2009) Macromolecular connections of active zone material to docked synaptic vesicles and presynaptic membrane at neuromuscular junctions of mouse. J. Comp. Neurol. 513:457-468.

Jung, J. H., Kim, J. Y., Kim, B. H., Moon, B. W., Joo, J., Chang, S. H. and Ryu, K. S. (2002) Inhomogeneous doping of polyaniline doped with sodium-hexafluorophosphate (NaPF₆). J. Korean Phys. Soc. 40:898-902.

Ryu, K. S., Jung, J. H., Joo, J. and Chang, S. H. (2002) Improved conducting states induced by an electrochemical charging process in polyaniline film doped with new dopants. J. Electrochem. Soc. 149:A478-A482.

Kim, J. Y., Jung, J. H., Lee, D. E., and Joo, J. (2002) Enhancement of electrical conductivity of poly(3,4-ethylenedioxythiophene)/poly(4-styrenesulfonate) by a change of solvents. Synth. Met. 126:311-316.

Jung, J. H., Kim, B. H., Moon, B. W., Chang, S. H., Kwang, K.S., and Joo, J. (2001) Charge transport of lithium-salt-doped polyaniline. Phys. Rev. B. 64:035101.

Ryu, K. S., Kim, K. M., Park, G. N., Park, Y. J., Jung, J. H., Joo, J., and Chang, S. H. (2001) A new approach to prepare highly conducting polyaniline films. Synth. Met. 119:355-356.

Jeong, C. K., Jung, J. H., Kim, B. H., Lee, S. Y., Lee, D. E., Jang, S. H., Ryu, K. S., and Joo, J. (2001) Electrical, magnetic, and structural properties of lithium salt doped polyaniline. Synth. Met. 117:99-103.

Kim, B. H., Jung, J. H., Kim, J. W., Choi, H. J., and Joo, J. (2001) Effect of dopant and clay on nanocomposites of polyaniline (PAN) intercalated into Na⁺-montmorillonite (Na⁺-MMT). Synth. Met. 121:1311-1312.

Kim, B. H., Jung, J. H., Kim, J. W., Choi, H. J., and Joo, J. (2001) Physical characterization of polyaniline-Na⁺-montmorillonite nanocomposite intercalated by emulsion polymerization. Synth. Met. 117:115-118.

Jung, J. H., Kim, B. H., Lee, D. E., Lee, S. Y., Moon, B. W., and Joo, J. (2000) Charge Transport and Applications to the Secondary Batteries of Lithium Salt Doped Polyaniline. J. Korean Phys. Soc. 37:396-401.

Kim, B. H., Jung, J. H. and Joo, J. (2000) Charge Transport and Structural of Nanocomposites of Polyaniline and Inorganic Clay. J. Korean Phys. Soc. 36:366-370.