YOON, JAE YOUNG

Research Fellow in Neurology
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EMPLOYMENT

Boston Children's Hospital (BCH), Harvard Medical School (HMS) — Aug 2023 -
Research Fellow, F.M. Kirby Neurobiology Center

Massachusetts Institute of Technology (MIT) — Aug 2019 - Jul 2023
Postdoctoral Fellow, McGovern Institute for Brain Research

Seoul National University (SNU) — Mar 2019 - Jul 2019
Postdoctoral Associate, Medical Research Center

EDUCATION

Ph.D., Seoul National University — Mar 2013 - Feb 2019
"Short-term synaptic plasticity and persistent activity in the prefrontal cortex"
School of Biological Sciences, College of Natural Sciences &
Department of Physiology, College of Medicine
(Joint affiliation; co-advisors: Sukwoo Choi, Suk-Ho Lee)

(2016 - 2019: Research Personnel, Republic of Korea Army; military service)

B.S., Seoul National University — Mar 2009 - Feb 2013
School of Biological Sciences, College of Natural Sciences

PUBLICATIONS

Cho E, Kwon J, Lee G, Shin J, Lee H, Lee SH, Chung CK*, **Yoon J***, Ho WK*. (2024).
Net synaptic drive of fast-spiking interneurons is inverted towards inhibition in human FCD I epilepsy.
Nature Communications, 15(1): 6683. DOI: 10.1038/s41467-024-51065-7 (* co-corresponding author)

Yoon J. (2024). Geometrical determinant of nonlinear synaptic integration in human cortical neurons.
arXiv preprint, arXiv:2408.05633. DOI: 10.48550/arXiv.2408.05633

Yoon JY, Lee HR, Ho WK, Lee SH. (2020). Disparities in short-term depression among prefrontal cortex synapses sustain persistent activity in a balanced network. *Cerebral Cortex*, 30(1): 113-134.
DOI: 10.1093/cercor/bhz076

Yoon JY, Choi S. (2017). Evidence for presynaptically silent synapses in the immature hippocampus.
Biochemical and Biophysical Research Communications, 482(4): 1375-1380.
DOI: 10.1016/j.bbrc.2016.12.044

INVITED TALKS

"Net synaptic drive of fast-spiking interneurons is inverted towards inhibition in human FCD I epilepsy". New England Bioscience Society, Boston, MA, USA. (Sep 2024)

"Synaptic drive of neocortical fast-spiking interneurons supporting attention".
F.M. Kirby Neurobiology Center, BCH. (May 2024)

"Synaptic integration in human dendrites".
Department of Physiology, College of Medicine, SNU. (Dec 2023)

"Subcellular connectivity and synaptic integration in cortical pyramidal neurons".
Yang-Tan Center for Molecular Therapeutics in Neuroscience & Tan-Yang Center for Autism Research, McGovern Institute for Brain Research (MIBR), MIT. (Jul 2021)

"Short-term synaptic plasticity and persistent activity in the prefrontal cortex".
Department of Physiology, College of Medicine, SNU. (Aug 2018)

MEETING ABSTRACTS

Cho E, Kwon J, Lee G, Shin J, Lee H, Lee SH, Chung CK*, **Yoon J***, Ho WK* (* co-corresponding author). "Net synaptic drive of fast-spiking interneurons is inverted towards inhibition in human FCD I epilepsy". Gordon Research Conference, Waterville Valley, NH, USA. (Aug 2024)

Yoon JY, Lee HR, Ho WK, Lee SH. "Disparities in short-term depression among prefrontal cortex synapses sustain persistent activity in a balanced network". Neuro2019, Niigata, Japan. (Jul 2019)

Yang CH, **Yoon JY**, Ho WK, Lee SH. "Presynaptic mitochondrial calcium release during high-frequency train pulse enhances short-term facilitation." Korean Society for Brain and Neural Science, Goyang, Korea. (Oct 2016)

AWARDS AND HONORS

Best Presenter Award, F.M. Kirby Neurobiology Center, BCH	2024
Molecular Therapeutics Impact Report 2020 - 2022, MIT (featured)	2022
Merit-based Scholarships, SNU	2014 - 2014
Lecture and Research Scholarship, SNU	2013 - 2013
Superior Academic Performance Scholarships, SNU	2009 - 2011

GRANTS AND FELLOWSHIPS

Postdoctoral Travel/Research Award, Mind-Brain-Behavior Interfaculty Initiative, Harvard University (1.99 k USD)	2024
Y. Eva Tan Postdoctoral Fellowship, K. Lisa Yang and Hock E. Tan Center for Molecular Therapeutics in Neuroscience, MIT (130.00 k USD)	2021 - 2023
BK21 / BK21+ Fellow, National Research Foundation of Korea (NRF) (~21.26 k USD)	2013 - 2017

PROJECTS

"Human cortical hierarchy characterized by the net synaptic drive scaling rules of fast-spiking interneurons", BCH.	2024 -
"Neural Mechanisms of Emotional Consciousness", NRF. (PI: Sukwoo Choi; ~1.33 M USD)	2016 - 2019
"Mechanisms of Conscious Fear Memory Formation from Inference-Based Learning", College of Natural Sciences, SNU. (with Gyuryang Heo; ~6.75 k USD)	2016 - 2017

TECHNICAL EXPERIENCE

ex vivo electrophysiology (patch clamp), in humans and rodents:

- Patch clamp in acute brain slice; in neocortex, hippocampus, thalamus, amygdala, and Calyx of Held
- Human brain slice preparation; from temporal, frontal, occipital, and parietal cortex, surgically resected from > 50 adult and pediatric patients diagnosed with tumor or epilepsy, healthy and patched at soma and dendrite up to 120 h post-resection (Yoon, 2024; Cho et al., 2024) (2021 - 2023: Research Non-Employee Collaborator, Massachusetts General Hospital (MGH))
- Slice electrophysiology setup at BCH (CLS 13052), MIT MIBR (46-6178), SNU medical campus (2-726), and SNU main campus (504-201) (throughout 2014 - 2023)
- Patch clamp and single-cell RNA sequencing from human neurons (Patch-seq)
- Patch clamp in human organotypic culture (prepared from BCH, 2024)
- Patch clamp in human cortical organoids (prepared from Broad Institute of MIT and Harvard, 2022)
- Optogenetic or electric stimulation under physiological or therapeutic scenarios, with computational modeling of cellular and network biophysics (Yoon et al., 2020)
- Subcellular channelrhodopsin-assisted circuit mapping (sCRACM)

2-photon excitation microscopy (2PEF):

- MIT MIBR 2-photon core facility (46-6178) setup and management, including user training (6 postdocs from MIT & Broad Institute of MIT and Harvard trained during 2019 - 2023)
- 2-photon glutamate uncaging (2PGU), setup and application (Yoon, 2024)
- 8x pulse splitter setup, for enhanced 2-photon imaging and uncaging (schematics and instructions available at https://flosfor.github.io/pulse_splitter.pdf ; provided to University of Ottawa in 2022)
- Intracellular calcium imaging
- Morphological reconstruction and analysis

Data analysis and processing:

- MATLAB-based GUI development for electrophysiology and 2-photon imaging data analysis (https://github.com/flosfor/pvbs)

Others:

- *ad hoc* reviewer for *Nature Communications*, *Neuron*, *Cell Reports*, and *Frontiers in Synaptic Neuroscience*
- Technical assistance for *in vivo* patch clamp setup (MIT MIBR, 46-6171)
- Technical assistance for Neuropixels setup (MIT MIBR, 46-6171)
- Technical assistance for intracranial electroencephalography (iEEG) setup (BCH, CLS 13054)
- Plasmid DNA purification, viral vector packaging and quantification, immunohistochemistry
- Stereotaxic surgery for virus injection, iEEG, and fiber photometry (FiP)

TEACHING EXPERIENCE

Teaching Assistant, Data Analysis in Neuroscience Workshop, 2018 - 2018
Interdisciplinary Program in Neuroscience, SNU

Teaching Assistant, Biological Sciences Research Lab, 2014 - 2014
School of Biological Sciences, College of Natural Sciences, SNU

Teaching Assistant, General Biology Lab 1 & 2, 2013 - 2014
School of Biological Sciences, College of Natural Sciences, SNU

LANGUAGES

English (bilingual), Korean (bilingual), Italian (advanced, C2), French (intermediate), MATLAB (proficient)
- Freelance translator/interpreter (IT<>EN / KR<>EN / IT<>KR)

MEMBERSHIPS

Society for Neuroscience, Korean Physiological Society, Japan Neuroscience Society,
US Chess Federation (chess.com blitz rating ≤ 2131)