Jaeyoung Yoon, Ph.D.

Research Fellow, Boston Children's Hospital & Harvard Medical School
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EMPLOYMENT

Boston Children's Hospital / Harvard Medical School — Aug 2023 -
Research Fellow, F.M. Kirby Neurobiology Center / Department of Neurology

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

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

EDUCATION

Ph.D., Seoul National University — Mar 2013 - Feb 2019
School of Biological Sciences, College of Natural Sciences &
Department of Physiology, College of Medicine (joint affiliation)
Thesis: "Short-term synaptic plasticity and persistent activity in the prefrontal cortex"

(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

Yoon J, et al. (2025). Divergent changes in neuronal excitability and cortical connectivity in the human cortex associated with autism and epilepsy. (*in preparation*)

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. 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. 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*. DOI: 10.1093/cercor/bhz076

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

INVITED TALKS

"Electrophysiological hallmarks of epilepsy and autism in the human neocortex".
Korean Society for Brain and Neural Science (KSBNS), Incheon, Korea. (Aug 2025)

"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, Boston Children's Hospital (BCH). (May 2024)

"Synaptic integration in human dendrites".
Department of Physiology, College of Medicine, Seoul National University (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), Massachusetts Institute of Technology (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 (GRC), 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." KSBNS, Goyang, Korea. (Oct 2016)

Awards and Honors

Postdoctoral Travel/Research Award, Mind-Brain-Behavior Interfaculty Initiative, Harvard University (1.99 k USD)	2024
Best Presenter Award, F.M. Kirby Neurobiology Center, BCH	2024
Molecular Therapeutics Impact Report 2020 - 2022, MIT (featured)	2022
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
Merit-based Scholarships, SNU	2014 - 2014
BK21 / BK21+ Fellow, National Research Foundation of Korea (NRF)	2013 - 2017
Lecture and Research Scholarship, SNU	2013 - 2013
Superior Academic Performance Scholarships, SNU	2009 - 2011

Technical Experience

ex vivo electrophysiology (patch clamp):
- Patch clamp in acute brain slice; in neocortex, hippocampus, thalamus, amygdala, and Calyx of Held
- Human brain slice preparation and electrophysiology; 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 distal apical dendrite up to 120 h post-resection
  (Yoon, 2024; Cho et al., 2024; Yoon et al., 2025)
  (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 with 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; Yoon et al., 2025)

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 / Subcellular channelrhodopsin-assisted circuit mapping (sCRACM)

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*, *Frontiers in Synaptic Neuroscience*
- Technical assistance for *in vivo* patch clamp and Neuropixels setup (MIT MIBR, 46-6171)
- Plasmid DNA purification, viral vector packaging and quantification, immunohistochemistry
- Stereotaxic surgery for virus injection, cannulation, and intracranial electroencephalography (iEEG)

ENDORSED PROJECTS

"Human cortical hierarchy characterized by the synaptic drive scaling rules of fast-spiking interneurons", Rosamund Stone Zander Translational Neuroscience Center, 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

TEACHING EXPERIENCE

Teaching Assistant, Data Analysis in Neuroscience Workshop, Interdisciplinary Program in Neuroscience, SNU	2018 - 2018
Teaching Assistant, Biological Sciences Research Lab 1 & 2, School of Biological Sciences, College of Natural Sciences, SNU	2014 - 2014
Teaching Assistant, Biology Lab 1 & 2, School of Biological Sciences, College of Natural Sciences, SNU	2013 - 2014

LANGUAGES

English (bilingual), Korean (bilingual), Italian (proficient, C2), French (intermediate), MATLAB (proficient)

MEMBERSHIPS

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