

Jaeyoung Yoon, Ph.D.

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EMPLOYMENT

Boston Children's Hospital / Harvard Medical School

Research Fellow, F.M. Kirby Neurobiology Center / Department of Neurology Aug 2023 -

Massachusetts Institute of Technology

Postdoctoral Fellow, McGovern Institute for Brain Research Aug 2019 - Jul 2023

Seoul National University

Postdoctoral Associate, Medical Research Center Mar 2019 - Jul 2019

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). Functional hyperconnectivity offsets neuronal hypoexcitability in human ASD.
(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

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

F.M. Kirby Neurobiology Center, Boston Children's Hospital (BCH) May 2025
"Functional hyperconnectivity of L1 afferents in the human cortex with ASD"
Boston, MA, USA

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

F.M. Kirby Neurobiology Center, Boston Children's Hospital (BCH) May 2024
"Synaptic drive of neocortical fast-spiking interneurons supporting attention"
Boston, MA, USA

<i>Department of Physiology, College of Medicine, Seoul National University (SNU)</i> "Synaptic integration in human dendrites"	Dec 2023 Seoul, Korea
<i>Yang-Tan Center for Molecular Therapeutics in Neuroscience, McGovern Institute for Brain Research (MIBR), Massachusetts Institute of Technology (MIT)</i> "Subcellular connectivity and synaptic integration in cortical pyramidal neurons"	Jul 2021 Cambridge, MA, USA
<i>Department of Physiology, College of Medicine, SNU</i> "Short-term synaptic plasticity and persistent activity in the prefrontal cortex"	Aug 2018 Seoul, Korea

MEETING ABSTRACTS

<i>F.M. Kirby Neurobiology Center Retreat</i> Yoon J* , Ferguson B*. "Functional hyperconnectivity of L1 afferents in the human cortex with ASD"	Mar 2025 Boston, MA, USA
<i>Gordon Research Conference (GRC)</i> Cho E, Kwon J, Lee G, Shin J, Lee H, Lee SH, Chung CK*, Yoon J* , Ho WK*. "Net synaptic drive of fast-spiking interneurons is inverted towards inhibition in human FCD I epilepsy"	Aug 2024 Waterville Valley, NH, USA
<i>Neuro2019</i> Yoon JY , Lee HR, Ho WK, Lee SH. "Disparities in short-term depression among prefrontal cortex synapses sustain persistent activity in a balanced network"	Jul 2019 Niigata, Japan
<i>KSBNS</i> Yang CH, Yoon JY , Ho WK, Lee SH. "Presynaptic mitochondrial calcium release during high-frequency train pulse enhances short-term facilitation"	Oct 2016 Goyang, Korea

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 (featured), MIT	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), in human and rodent neurons:

- Patch clamp in acute brain slice; human neocortex (L2/3, L5); mouse/rat neocortex (L2/3, L5, L4, L6; TeA, PFC, V1, S1, RSC), hippocampus (CA1, CA3, DG), thalamus (MD), amygdala (BLA), and Calyx of Held; whole-cell (somatic, dendritic, paired), excised (outside-out, nucleated, inside-out)
- Human brain slice preparation and electrophysiology; from temporal, frontal, occipital, and parietal cortex, surgically resected from > 60 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)
 - 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)
 - Patch clamp with single-cell RNA sequencing from human neurons (Patch-seq)
 - Patch clamp in human slice culture (prepared from BCH; 2024)
 - Patch clamp in human cortical organoids (prepared from Broad Institute of MIT and Harvard; 2022)

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 and application, for enhanced 2PEF (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
- 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 / Neuropixels setup (MIT MIBR, 46-6171)
- Local field potential (LFP) recordings in acute brain slices
- 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 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)