Jaeyoung Yoon, Ph.D.

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EDUCATION AND TRAINING

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

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

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

Ph.D., Seoul National University — Mar 2013 – Feb 2019
Biological Sciences, College of Natural Sciences / Physiology, College of Medicine (*joint affiliation*)
(2016 – 2019: Military service, Republic of Korea Army)

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

AWARDS AND HONORS

Pioneers Grant, Harvard Brain Science Initiative (HBI), Harvard University (*application under review*)	2025
Travel/Research Award, Mind-Brain-Behavior Initiative, Harvard University (1.99 k USD)	2024
Best Presenter Award, F.M. Kirby Neurobiology Center, Boston Children's Hospital (BCH)	2024
Y. Eva Tan Fellowship, Massachusetts Institute of Technology (MIT) (130.00 k USD)	2021 – 2023
Molecular Therapeutics Impact Report 2020 – 2022, MIT (featured)	2022
BK21 / BK21+ Fellow, National Research Foundation of Korea (NRF) (~21.26 k USD)	2013 – 2017
Lecture and Research Scholarship & Merit-based Scholarships, Seoul National University (SNU)	2013 – 2014
Superior Academic Performance Scholarships, SNU	2009 – 2011

SELECTED PUBLICATIONS

Yoon J*, Terauchi A, Castro Palacin A, Cohen A, Umemori H, Ferguson B*. (2025). Thalamocortical synaptic hyperconnectivity in the human neocortex with ASD. (*under review*) **(* co-corresponding author)**

Yoon J*, Ferguson B*. (2025). Selective modulation of excitation-inhibition balance by human cortical electric stimulation. (*under review*) **(* co-corresponding author)**

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. 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

Yoon J. (2025a). Acute human brain slice preparation for ex vivo electrophysiology and imaging.
protocols.io. DOI: 10.17504/protocols.io.ewov124qogr2/v1 (*embargoed until 2026-05-01*)

Yoon J. (2025b). 2-photon glutamate uncaging with pulse splitter for ex vivo electrophysiology.
protocols.io. DOI: 10.17504/protocols.io.eq2lyxpjwgx9/v1 (*embargoed until 2026-05-01*)

Lee BJ, et al. (2025). A specific association of presynaptic K^+ channels with Ca^{2+} channels underlies K^+ channel-mediated regulation of glutamate release. (*under review*)

He M, et al. (2025). Human cortical neuron-based assays to study axon regeneration. (*in preparation*)

SELECTED INVITED TALKS

"Electrophysiological hallmarks of epilepsy and autism in the human neocortex". *China-Japan-Korea Neuroscience Meeting*. Incheon, Korea. (Aug 2025)

"Thalamocortical synaptic hyperconnectivity in the human neocortex with ASD". *F.M. Kirby Neurobiology Center, BCH & Harvard Medical School (HMS)*. Boston, MA, USA. (May 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 integration in human dendrites". *Department of Physiology, College of Medicine, SNU*. Seoul, Korea. (Dec 2023)

"Subcellular connectivity and synaptic integration in cortical pyramidal neurons". *McGovern Institute for Brain Research (MIBR), MIT*. Cambridge, MA, USA. (Jul 2021)

TECHNICAL EXPERIENCE

Acute human brain slice preparation & *ex vivo* electrophysiology (patch clamp): 2019 – present

- Whole-cell (somatic, dendritic, paired) or excised (outside-out, nucleated, inside-out) patch clamp in human cortex (temporal, frontal, occipital, parietal, insular; L2/3, L5, L6; PN, FSIN, nFSIN, glia)
- Human brain slice preparation, from > 80 adult and pediatric patients diagnosed with tumor or epilepsy; healthy and patched at soma and distal apical dendrite up to 132 h post-resection

***ex vivo* electrophysiology (patch clamp) in general applications:** 2013 – present

- Electrophysiology setup at BCH/HMS (CLS 13052), MIT MIBR (46-6178), SNU medical (2-726), and SNU (504-201)
- Patch clamp in rodent brain slices (mouse, rat), human brain slice culture, and human cortical organoids
- Single-cell RNA (scRNA) sequencing with patch clamp (Patch-seq)
- Computational modeling of cellular and network biophysics, with optogenetic or electric stimulation

2-photon excitation microscopy (2PEF): 2013 – present

- 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), with 8x pulse splitter for enhanced 2PEF; setup and application
- Intracellular calcium imaging, structural imaging, subcellular channelrhodopsin-assisted circuit mapping (sCRACM)

Data analysis and processing: 2013 – present

- Software development for electrophysiology and 2-photon imaging data analysis (https://github.com/flosfor/pvbs)
- Contribution to abfload: MATLAB function for processing .abf file format (https://github.com/fcollman/abfload)

Teaching experience: 2013 – present

- Teaching Assistant, Data Analysis in Neuroscience / Biology Lab 1 & 2 / Biological Sciences Research Lab 1 & 2, SNU
- Laboratory personnel training (SNU, MIT, BCH, HMS)

Other research and laboratory experience: 2013 – present

- *ad hoc* reviewer for *Nature Communications*, *Neuron*, *Cell Reports*, and *Frontiers in Synaptic Neuroscience*
- Technical assistance for *in vivo* patch clamp and Neuropixels setup at MIT MIBR (46-6171)
- Plasmid DNA purification, viral vector packaging, immunohistochemistry, expansion microscopy, stereotaxic surgery

LANGUAGES

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

MEMBERSHIPS

Society for Neuroscience (SfN), Korean Physiological Society, Korean Society for Brain and Neural Sciences (KSBNS), Japan Neuroscience Society, US Chess Federation (USCF; chess.com rating ≤ 2131)

REFERENCES

Suk-Ho Lee, MD PhD (SNU), Won-Kyung Ho, MD PhD (SNU), Sukwoo Choi, PhD (SNU), Brielle Ferguson, PhD (HMS), Chinfei Chen, MD PhD (HMS), Gloria Choi, PhD (MIT)