

Jaeyoung Yoon, Ph.D.

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EDUCATION AND TRAINING

Research Fellow, Boston Children’s Hospital / Harvard Medical School F.M. Kirby Neurobiology Center / Department of Neurology	Aug 2023 – present
Postdoctoral Fellow, Massachusetts Institute of Technology McGovern Institute for Brain Research	Aug 2019 – Jul 2023
Postdoctoral Associate, Seoul National University Medical Research Center	Mar 2019 – Jul 2019
Ph.D., Seoul National University Biological Sciences, College of Natural Sciences / Physiology, College of Medicine (<i>joint affiliation</i>) (2016 – 2019: Military service, Republic of Korea Army)	Mar 2013 – Feb 2019
B.S., Seoul National University Biological Sciences, College of Natural Sciences	Mar 2009 – Feb 2013

AWARDS AND HONORS

Pioneers Grant, Harvard Brain Science Initiative (HBI), Harvard University (<i>application under review</i>)	2025
Travel/Research Award, Mind-Brain-Behavior Initiative, Harvard University (2.0 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) (130.0 k USD)	2021 – 2023
Molecular Therapeutics Impact Report 2020 – 2022, MIT (featured)	2022
BK21 / BK21+ Fellow, National Research Foundation of Korea (NRF) (21.3 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 A, Cohen A, Umemori H, Ferguson B*. (2025). Human cortical and thalamocortical synaptic dysconnectivity in ASD. (*in preparation; preview available upon request*) (* **co-corresponding author**)

Yoon J*, Silva R, Mensah E, Wang C, Ferguson B*. (2025). Selective modulation of excitation-inhibition balance by human cortical electric stimulation. (*in preparation*) (* **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 Ca²⁺ 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 neuronal dendrites". *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)

WORK EXPERIENCE

Research Fellow, BCH / HMS

2023 – present

- Identification of human synaptic dysfunction in autism spectrum disorder (ASD), with patch clamp electrophysiology in acute human brain slices, along with immunohistochemistry (IHC) and functional magnetic resonance imaging (fMRI)
- Human brain slice preparation, from > 30 adult and pediatric patients (at Human Neuron Core (HNC), Zander & Wyss Translational Neuroscience Center (TNC), BCH)
- Characterization of human cortical electric stimulation effects in epilepsy with respect to excitation-inhibition balance
- Transcriptomic analysis of human neurons by single-cell RNA sequencing combined with patch clamp (Patch-seq)
- Evaluation of genetically engineered connexin mutants in cultured human cells for neurotherapeutic applications (in collaboration with The Collective for Psychiatric Neuroengineering, Duke University; Oct 2025)
- Contribution to abfload: MATLAB function for processing .abf file format (<https://github.com/fcollman/abfload>)
- Postdoctoral mentor, Postdoctoral Fellow-Student Mentorship Program, BCH

Postdoctoral Fellow, MIT

2019 – 2023

- Biophysical analysis of nonlinear synaptic integration in human neurons, with patch clamp in acute human brain slices
- Human brain slice preparation, from > 30 adult patients with brain tumor or intractable epilepsy (as Research Non-Employee Collaborator, Massachusetts General Hospital (MGH); 2021 – 2023)
- 2-photon glutamate uncaging (2PGU), with 8x pulse splitter for enhanced 2PEF; setup and application (http://flosfor.github.io/pulse_splitter.pdf - provided to University of Ottawa in 2022)
- 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)
- Software development for electrophysiology and imaging data analysis (<https://github.com/flosfor/pvbs>)
- Subcellular channelrhodopsin-assisted circuit mapping (sCRACM) in the association cortex
- Technical assistance for in vivo patch clamp and Neuropixels setup (MIT MIBR, 46-6171)
- ad hoc reviewer for *Nature Communications*, *Neuron*, and *Cell Reports*

Ph.D. Student / Postdoctoral Associate, SNU

2013 – 2019

- Characterization of epileptogenic synaptic mechanism in human cortex, with patch clamp in acute human brain slices
- Biophysical analysis of short-term synaptic plasticity supporting persistent activity and working memory
- Computational modeling of cellular and network dynamics in response to optogenetic or electric stimulation trains
- Plasmid DNA purification, viral vector packaging, immunohistochemistry, stereotaxic surgery
- Teaching Assistant, Data Analysis in Neuroscience Workshop / Biology Lab 1-2 / Biological Sciences Research Lab 1-2

LANGUAGES

English (bilingual), Korean (bilingual), Italian (proficient), French (intermediate), German (beginner), MATLAB (proficient)

MEMBERSHIPS

Society for Neuroscience (SfN), Federation of European Neuroscience Societies (FENS), Italian Society for Neuroscience (SINS), Korean Society for Brain and Neural Sciences (KSBNS), Korean Physiological Society, Japan Neuroscience Society, US Chess Federation (USCF; chess.com rating \leq 2131)