

# Mihaly Voroslakos, MD, PhD

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## EDUCATION

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Ph.D. in Neuroscience	University of Szeged, Hungary	2012 – 2020
Medical Economist	University of Szeged, Hungary	2014 – 2016
M.D.	University of Szeged, Hungary	2006 – 2012

## PROFESSIONAL EXPERIENCE

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Postdoctoral Fellow	New York University, New York	2018 – present
Visiting Researcher	University of Michigan, Ann Arbor	2016 – 2018
Graduate student	University of Szeged, Hungary	2012 – 2016
Production manager	Amplipex Ltd., Hungary	2012 – 2016

## PUBLICATIONS

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(\* denotes shared first authorship)

### Refereed Journal Articles

- 2023 G. Buzsáki, **M. Vöröslakos**, "Brain rhythms have come of age." *Neuron*
- 2023 C. Böhler, M. Vomero, M. Soula, **M. Vöröslakos**, M. Porto-Cruz, R. Liljemalm, G. Buzsaki, T. Stieglitz, M. Asplund, "Multilayer Arrays for Neurotechnology Applications (MANTA): chronically stable thin-film intracortical implants." *Advanced Sciences*

- 2022 O. Yaghmazadeh\*, **M. Vöröslakos\***, L. Alon, G. Carluccio, C. Collins, D. K. Sodickson and G. Buzsáki, "Neuronal activity under transcranial radiofrequency stimulation in metal-free rodent brains in-vivo." *Nature Communications Engineering*
- 2022 P. C. Petersen\*, **M. Vöröslakos\***, G. Buzsaki, "Brain temperature affects quantitative features of hippocampal sharp wave ripples." *J. Neurophysiology*
- 2022 **M. Vöröslakos\***, K. Kim\*, N. Slager, E. Ko, S. Oh, S. S. Parizi, B. Hendrix, J. P. Seymour, K. D. Wise, G. Buzsáki, A. Fernández-Ruiz, E. Yoon, "HectoSTAR  $\mu$ LED Optoelectrodes for Large-Scale, High-Precision In Vivo Opto-Electrophysiology." *Advanced Sciences*
- 2022 Y. Lin, H. Song, S. Oh, **M. Vöröslakos**, K. Kim, X. Chen, D. D. Wentzloff, G. Buzsáki, S. Park, "A 3.1-5.2GHz, Energy-Efficient Single Antenna, Cancellation-Free, Bitwise Time-Division Duplex Transceiver for High Channel Count Optogenetic Neural Interface." *IEEE Trans. Biomed. Circuits Syst.*
- 2021 **M. Voroslakos**, H. Miyawaki, S. Royer, K. Diba, E. Yoon, P. Petersen, G. Buzsáki, "3D-printed Recoverable Microdrive and Base Plate System for Rodent Electrophysiology." *Bio-Protocol*
- 2021 **M. Vöröslakos\***, P. C. Petersen\*, B. Vöröslakos\*, G. Buzsáki, "Metal microdrive and head cap system for silicon probe recovery in freely moving rodent" *Elife*
- 2021 S. Y. Park, N. Kyoungwan, **M. Voroslakos**, H. Song, N. Slager, S. Oh, J. P. Seymour, G. Buzsaki, E. Yoon, "A Miniaturized 256-Channel Neural Recording Interface with Area-Efficient Hybrid Integration of Flexible Probes and CMOS Integrated Circuits." *IEEE Trans. Biomed. Eng.*
- 2020 K. Kim, **M. Vöröslakos**, J. P. Seymour, K. D. Wise, G. Buzsáki, E. Yoon, "Artifact-free, high-temporal-resolution in vivo opto-electrophysiology with microLED optoelectrodes." *Nature Communications*
- 2020 K. Na, Z. J. Sperry, J. Lu, **M. Vöröslakos**, S. S. Parizi, T. M. Bruns, E. Yoon, J. P. Seymour, "Novel diamond shuttle to deliver flexible bioelectronics with reduced tissue compression." *Nature Microsystems & Nanoengineering*
- 2018 K. Kampasi, D. F. English, J. Seymour, E. Stark, S. McKenzie, **M. Vöröslakos**, G. Buzsáki, K. D. Wise, E. Yoon, "Dual color optogenetic control of neural populations using low-noise, multishank optoelectrodes." *Nature Microsystems & Nanoengineering*
- 2018 A. Liu, **M. Vöröslakos**, G. Kronberg, S. Henin, M. R. Krause, Y. Huang, A. Opitz, A. Mehta, C. C. Pack, B. Krekelberg, A. Berényi, L. C. Parra, L. Melloni, O. Devinsky, G. Buzsáki, "Immediate neurophysiological effects of transcranial electrical stimulation." *Nature Communications*

- 2018 A. E. Mendrela, S. Y. Park, **M. Vöröslakos**, M. P. Flynn, E. Yoon. "A Battery-Powered Opto-Electrophysiology Neural Interface with Artifact- Preventing Optical Pulse Shaping." *IEEE Symposium on VLSI Circuits*
- 2018 **M. Vöröslakos**, Y. Takeuchi, K. Brinyiczki, T. Zombori, A. Oliva, A. Fernández-Ruiz, G. Kozák, Z. T. Kincses, B. Iványi, G. Buzsáki, A. Berényi. "Direct Effects of Transcranial Electric Stimulation on Brain Circuits in Rats and Humans." *Nature Communications*

### Conference proceedings

- 2022 **M. Voroslakos\***, T. M. Arefin\*, J. Zhang, L. Alon, G. Buzsaki, "Whole brain mapping of transcranial electrical stimulation-induced effects by BOLD-fMRI in rats." *Proceedings of the 31st Annual Meeting of ISMRM*
- 2022 O. Yaghmazadeh\*, **M. Voroslakos\***, M. Mattingly, Z. B. Y. Gironda, Y. Z. Wadghiri, S. Dehkharghani, L. Alon, "In-vivo Absolute Multinuclear Thermometry (AMT) in a Rat Model." *Proceedings of the 31st Annual Meeting of ISMRM*
- 2022 Z. Gironda, **M. Vöröslakos**, Y. Wadghiri, O. Yaghmazadeh, L. Alon, "Open-source modular 3D printed platform for in-vivo MRI experiments in awake mice and anesthetized mice and rats." *Proceedings of the 31st Annual Meeting of ISMRM*
- 2022 E. Ko, K. Kim, **M. Vöröslakos**, S. Oh, G. Buzsáki, K. D. Wise, E. Yoon, "Optogenetic Neural Probes: Fiberless, High-Density, Artifact-Free Neuromodulation." *2022 International Electron Devices Meeting (IEDM), IEEE*

### Preprints

- 2023 N. R. Kinsky, **M. Vöröslakos**, J. R. Lopez Ruiz, L. Watkins de Jong, N. Slager, S. McKenzie, E. Yoon, K. Diba, "Simultaneous Electrophysiology and Optogenetic Perturbation of the Same Neurons in Chronically Implanted Animals using  $\mu$ LED Silicon Probes.", *bioRxiv*
- 2022 **M. Vöröslakos\***, O. Yaghmazadeh\*, L. Alon, D. K. Sodickson, G. Buzsáki, "Brain-implanted conductors amplify radiofrequency fields in rodents: advantages and risks." *bioRxiv*
- 2022 E. Ko, **M. Voroslakos**, G. Buzsaki, E. Yoon. "flexLiTE: flexible micro-LED integrated optoelectrodes for minimally-invasive chronic deep-brain study.", *bioRxiv*

## Media Coverage

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Cadaver study casts doubts on how zapping brain may boost mood, relieve pain, *Science*, 2016

<https://www.sciencemag.org/news/2016/04/cadaver-study-casts-doubts-how-zapping-brain-may-boost-mood-relieve-pain>

Brain Stimulation Is All the Rage--but It May Not Stimulate the Brain, *Scientific American*, 2018

<https://www.scientificamerican.com/article/brain-stimulation-is-all-the-rage-but-it-may-not-stimulate-the-brain1/>

Improved neural probe can pose precise questions without losing parts of the answers, 2020

<https://news.engin.umich.edu/2020/05/improved-neural-probe-can-pose-precise-questions-without-losing-parts-of-the-answers/>

Next generation neural probe leads to expanded understanding of the brain, 2022

<https://news.engin.umich.edu/2022/08/next-generation-neural-probe-leads-to-expanded-understanding-of-the-brain/>

## TEACHING EXPERIENCE

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**Teaching Assistant, New York University, New York**

Fall 2021

Course: Brain and Behavior

**Workshop instructor, University of Michigan, Ann Arbor**

2018 – 2021

Course: Multimodal Integrated NeuroTechnology (MINT) workshop

Responsibilities: Developed and taught how to perform optogenetic experimentation using  $\mu$ LED optoelectrodes. Created training videos for the workshop:

[https://www.youtube.com/channel/UCdvYlo8MudbP35X\\_S4nmQ-A](https://www.youtube.com/channel/UCdvYlo8MudbP35X_S4nmQ-A)

**Lecturer, University of Szeged, Faculty of Medicine, Hungary**

2010 - 2016

Course: Medical Physiology for medical students

Responsibilities: Gave an outline of the most important processes of the human body to a group of 15 medical students in a small seminar type (2 hours/week during fall and spring semesters).

## MENTORING EXPERIENCE

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Mentor for Evan Reich, New York University, New York <i>Current status: Undergraduate student at Cornell University</i>	Summer 2022
Mentor for Aryeh Rothstein, New York University, New York <i>Current status: Pre-medical student at Columbia University</i>	2021 – present
Mentor for Yunchang Zhang, New York University, New York <i>Current status: Graduate student at Princeton University</i>	2020 – 2022
Mentor for Iyana Jackson, New York University (SURP), New York <i>Current status: Undergraduate student at Mount Holyoke College</i>	Summer 2021
Mentor for Jolene Chou, New York University, New York <i>Current status: Research technician at Weill Cornell Medicine</i>	2019 – 2021
Mentor for Paola Rioja, University of Michigan (UROP), Ann Arbor <i>Current status: Graduate student at University of Michigan</i>	2017 – 2019
Mentor for Arpad Kormanyos, University of Szeged, Hungary <i>Current status: Associate professor at University of Szeged, Hungary</i>	2013 – 2016

## HONORS & AWARDS

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2022	Most read protocols of 2021 in neuroscience, Bio-protocol
2022	APSselect. Best recently published articles in physiological research.
2020	Travel Award, 43rd annual meeting of Japan Neuroscience Society
2013	Best practice leader of 2 <sup>nd</sup> year medical students', University of Szeged

## PRESENTATIONS

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### Oral Presentations

2022	Spatially and temporally targeted neuromodulation by tES in rats <b>International Network of Neuroimaging Neuromodulation (INNN) Webinar Series</b>
2022	How small electric fields still affect neurons <b>Neuroergonomics Conference &amp; NYC Neuromodulation Conference</b>
2022	Transcranial Electrical Stimulation Induced Synaptic Plasticity in Freely Moving Rats <b>Translational Research in Progress Seminars NYU</b>

- 2021 microLED Optoelectrode virtual training workshop with Q&A  
**The NeuroNex MINT hub**
- 2020 How to Use  $\mu$ LED Optoelectrodes: Surgery, Data Collection and  $\mu$ LED Control  
**NeuroLight Webinar Series**
- 2020 Non-invasive neuromodulation using transcranial radio frequency stimulation in rodents  
**The 43rd Annual Meeting of the Japan Neuroscience Society**
- 2020 Instantaneous neuronal effects of TES in vivo (When and Why do we need it?)  
**NYC Neuromodulation 2020 Online Conference**
- 2020 Spatially and temporally targeted neuromodulation by transcranial Intersectional Short Pulse (ISP) stimulation  
**NYC Neuromodulation 2020 Online Conference**
- 2020 Contactless neuromodulation using transcranial radio frequency stimulation  
**IBRO workshop, Szeged, Hungary**
- 2017 Neuronal circuit control  
**NYU-TES conference, New York**

### Poster Presentations

- 2022 Transcranial electrical stimulation induced synaptic plasticity in freely moving rats; *Society for Neuroscience*
- 2019 Transcranial Radio Frequency Stimulation (TRFS): a novel noninvasive contact less neuromodulation technique based on Radio Frequency waves; *Society for Neuroscience*
- 2019 Effects of transcranial direct current stimulation on ongoing brain activity, *International Conference on Advanced Neurotechnology*
- 2018 Direct Effects of Transcranial Electric Stimulation on Brain Circuits in Rats and Humans, *International Conference on Advanced Neurotechnology*
- 2017 Ground truth dataset for validating extracellular spike sorting algorithms; *Society for Neuroscience*
- 2017 Modular High-Density Optoelectrodes for Local Circuit Analysis; *International Conference on Advanced Neurotechnology*
- 2015 Targeted transcranial electrical stimulation protocols: Spatially restricted intracerebral effects via improved stimulation and recording techniques; *Society for Neuroscience*

- 2015      Conductance measurements and simulations of electrical fields generated by focused transcranial electrical stimulation (TES); *Meeting of the Hungarian Neuroscience Society*
- 2013      Conductance measurements of electrical fields generated by transcranial electrical stimulation (TES); *Society for Neuroscience*