

## Curriculum Vitae Edward Marten Merricks, Ph.D.

Associate Research Scientist  
Department of Neurology, Columbia University  
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### Work Experience

Month/Year	Description	Institution
04/2021 – present	Associate Research Scientist <ul style="list-style-type: none"><li>Managing research recordings in epilepsy patients undergoing resective surgery</li><li>Leading computational analyses of human single neuron population data</li><li>Training and mentoring students on research projects using patient data</li></ul>	Columbia University, New York, NY
05/2016 – 04/2021	Post-Doctoral Research Scientist <ul style="list-style-type: none"><li>Conducting electrophysiology in epilepsy patients undergoing resective surgery</li><li>Analyzing single cell activity in the peri-ictal period by neuronal subtype and location</li></ul>	Columbia University, New York, NY
11/2015 – 05/2016	Research Assistant <ul style="list-style-type: none"><li>Project title: “Co-ordination of Anti-Epileptic Inhibitory Mechanisms in Neocortex”</li><li>Developed software for analyses of in vitro paired electrophysiological and calcium imaging data</li></ul>	Newcastle University, UK

### Education

Month/Year	Degree	Field	Institution
09/2012 – 02/2016	Ph.D.	Neuroscience	Newcastle University, UK
	Thesis:	Single unit action potential recordings in humans: implications for epilepsy	
	Supervisor:	Andrew J. Trevelyan, M.A., M.B.B.Ch., D.Phil.	
09/2011 – 09/2012	M.Res.	Neuroscience	Newcastle University, UK
10/2007 – 06/2010	B.Sc. (Hons)	Artificial Intelligence & Cybernetics	University of Reading, UK

### Awards

09/2011 – 09/2015	Wellcome Trust 4-year Ph.D. / M.Res. Scholarship Grant “Systems Neuroscience: From Networks to Behaviour” Total direct funding: £168,795 GBP (~\$270,000 USD at date of award) Grant IDs: Wellcome Trust 096973/Z/11/Z & 096973/Z/11/A
11/2013	Sixth International Workshop on Seizure Prediction (San Diego, CA) Selected to give talk based on submitted abstract, titled: “Single unit firing patterns preceding human seizures” 1 of 3 young investigators selected.
08/2010	Commendation for best undergraduate final year robotics research project: “Significant analysis and implementation for the complex reproduction of paintings”

## Professional Memberships

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2025 – <i>present</i>	Associate Member, Institute of Physics (IOP)
2020 – <i>present</i>	Member, New York Academy of Sciences
2017 – <i>present</i>	Member, American Epilepsy Society
2015 – 2016	Member, British Neuroscience Association
2012 – 2013; 2019 – 2020	Member, Society for Neuroscience

## Talks

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2024	“Human seizures at the scale of single neurons” <b><i>De Jager Research Group, Columbia University Medical Center.</i></b> March. New York, NY
2023	“Macro & micro EEG: Human seizures at the scale of single neurons” <b><i>American Clinical Neurophysiology Society Annual Meeting.</i></b> March. Austin, TX
2022	“Seizures at the scale of single neurons” <b><i>American Epilepsy Society Annual Meeting.</i></b> December. Nashville, TN
2022	“Human single neuron activity underlying spontaneous seizures” <b><i>Burke Neurological Institute, Weill Cornell Medicine.</i></b> June. ( <i>Virtual</i> )
2020	“Neuronal firing and action potential changes during ictal recruitment in humans” <b><i>Epilepsy Research Seminar, Columbia University Medical Center.</i></b> January. New York, NY
2013	“Single unit firing patterns preceding human seizures” <b><i>Sixth International Workshop on Seizure Prediction.</i></b> November. San Diego, CA

## Academic Service

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Editorial board:	<i>Frontiers in Neurology: Epilepsy</i>	(Review Editor)
Ad hoc peer reviewer:	<i>Brain</i> <i>Epilepsia</i> <i>Journal of Neural Engineering</i> <i>Brain Communications</i> <i>eNeuro</i> <i>Translational Neuroscience</i> <i>Frontiers in Neuroscience</i> <i>Frontiers in Neuroinformatics</i> <i>Biomedical Physics &amp; Engineering Express</i>	
Collaborating reviewer:	<i>Journal of Neuroscience</i>	
Institute of Physics (IOP):	“Trusted Reviewer Status”	

## Code & Software

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Languages:	<i>Fluent:</i> <i>Proficient:</i> <i>Familiar:</i> <i>Tools/frameworks:</i>	MATLAB; JavaScript; PHP; HTML; CSS Python; MySQL; C++ Swift; Julia; Processing BASH; Z shell (Zsh); Git; Maintaining Linux server
Toolboxes:	<i>NSxFile</i> <i>NeuroClass</i> <i>SplitMerge</i> <i>UnitSubclassify</i> <i>PatientDB</i>	Object-oriented approach for working with neural data files Object-oriented classes for single/multi-unit analyses A fast, modern GUI for spike sorting Semi-automatic probabilistic cell-type sub-classification An object-oriented database for managing patient recordings

## Pre-prints

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- 2024 **Merricks, E.M.**, Deshpande, S.S., Agopyan-Miu, A.H., Smith, E.H., Schlafly, E.D., McKhann, G.M., Goodman, R.R., Sheth, S.A., Greger, B., House, P.A., Eskandar, E.N., Madsen, J.R., Cash, S.S., Trevelyan, A.J., Van Drongelen, W., Schevon, C.A. "Aberrant fast spiking interneuronal activity precedes seizure transitions in humans." *medRxiv*. Available at: doi:[10.1101/2024.01.26.24301821](https://doi.org/10.1101/2024.01.26.24301821)
- 2024 Zhu, H., Michalak, A.J., **Merricks, E.M.**, Agopyan-Miu, A.H., Jacobs, J., Hamberger, M.J., Sheth, S.A., McKhann, G.M., Feldstein, N.A., Schevon, C.A., Hillman, E.M.C. "Spectral-switching analysis reveals real-time neuronal network representations of concurrent spontaneous naturalistic behaviors in human brain." *bioRxiv*. Available at: doi:[10.1101/2024.07.08.600416](https://doi.org/10.1101/2024.07.08.600416)

## Peer-Reviewed Journal Articles

(total citations: **819**, h-index: **12**)

- 2025 Goldberg, A.R., Dovas, A., Torres, D., Das Sharma, S., Mela, A., **Merricks, E.M.**, Olabarria, M., Abrishami Shokoo, L., Zhao, H.T., Kotodis, C., Calvaresi, P., Viswanathan, A., Banu, M.A., Razavilar, A., Sudhaker, T.D., Saxena, A., Chokran, C., Humala, N., Mahajan, A., Xu, W., Metz, J.B., Bushong, E.A., Boassa, D., Ellisman, M.H., Hillman, E.M.C., Hargus, G., Bravo-Cordero, J.J., McKhann, G.M., Gill, B.J.A., Rosenfeld, S.S., Schevon, C.A., Bruce, J.N., Sims, P.A., Peterka, D.S., Canoll, P.. "Glioma-induced alterations in excitatory neurons are reversed by mTOR inhibition." *Neuron*, 113 (6), 858–875.E10.
- 2025 Zarr, V.M., Liou, J.Y., **Merricks, E.M.**, Davis, T.S., Thomson, K., Greger, B., House, P.A., Emerson, R.G., McKhann, G.M., Sheth, S.A., Schevon, C.A., Rolston, J.D., Smith, E.H. "Protocol for detecting and analyzing non-oscillatory traveling waves from high-spatiotemporal-resolution human electrophysiological recordings." *STAR protocols*, 6 (1). 103659.
- 2025 Rifkin, R.A., Wu, X., Pereira, B., Gill, B.J.A., **Merricks, E.M.**, Michalak, A.J., Goldberg, A.R., Humala, N., Dovas, A., Rai, G., McKhann, G.M., Slesinger, P.A., Canoll, P., Schevon, C.A. "A selective small-molecule agonist of G protein-gated inwardly-rectifying potassium channels reduces epileptiform activity in mouse models of tumor-associated and provoked seizures." *Neuropharmacology*, 265. 110259.
- 2023 Agopyan-Miu, A.H.<sup>1</sup>, **Merricks, E.M.**<sup>1</sup>, Smith, E.H., McKhann, G.M., Sheth, S.A., Feldstein, N.A., Trevelyan, A.J., Schevon, C.A. "Cell-type specific and multiscale dynamics of human focal seizures in limbic structures." *Brain*, 146 (12). 5209–5223.  
(<sup>1</sup>co-first author)
- 2023 Lee, S., Deshpande, S.S., **Merricks, E.M.**, van Putten, M.J.A.M., Schevon, C.A., van Drongelen, W. "Spatiotemporal spike-centered averaging reveals symmetry of temporal and spatial components of the spike-LFP relationship during human focal seizures." *Communications Biology*, 6 (1), 317.
- 2023 Juan, E., Górska, U., Kozma, C., Papantonatos, C., Bugnon, T., Denis, C., Kremen, V., Worrell, G., Struck, A.F., Bateman, L.M., **Merricks, E.M.**, Blumenfeld, H., Tononi, G., Schevon, C.A., Boly, M. "Distinct signatures of loss of consciousness during focal impaired awareness versus focal to bilateral tonic clonic seizures." *Brain*, 146 (1), 109–123.

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- 2022 Gill, B.J.A.<sup>1</sup>, Khan, F.A.<sup>1</sup>, Goldberg, A.R.<sup>1</sup>, **Merricks, E.M.**<sup>1</sup>, Wu, X., Sosunov, A.A., Sudhaker, T.D., Dovas, A., Lado, W., Michalak, A.J., Liou, J.-L., Frankel, W.N., McKhann, G.M., Canoll, P., Schevon, C.A. "Single unit analysis and wide-field imaging reveal alterations in excitatory and inhibitory neurons in glioma." *Brain*, 145 (10), 3666–3680.  
(<sup>1</sup>co-first author)
- 2022 Schlaflly, E., Marshall, F., **Merricks, E.M.**, Eden, U.T., Cash, S.S., Schevon, C.A., Kramer, M.A. "Multiple sources of fast traveling waves during human seizures: resolving a controversy." *Journal of Neuroscience*, 42 (36), 6966–6982.
- 2022 Smith, E.H., Liou, J.Y., **Merricks, E.M.**, Davis, T.S., Thomson, K., Greger, B., House, P.A., Emerson, R.G., Goodman, R.R., McKhann II, G.M., Sheth, S.A., Schevon, C.A., Rolston, J.D. "Human interictal epileptiform discharges are bidirectional traveling waves echoing ictal discharges." *eLife*, 11:e73541.
- 2022 Norman-Haignere, S.V., Long, L.K., Devinsky, O., Doyle, W., Irobunda, I., **Merricks, E.M.**, Feldstein, N.A., McKhann, G.M., Schevon, C.A., Flinker, A., Mesgarani, N. "Multiscale temporal integration organizes hierarchical computation in human auditory cortex." *Nature Human Behaviour*, 6 (3), 455–469.
- 2021 **Merricks, E.M.**, Smith, E.H., Emerson, R.G., Bateman, L.M., McKhann, G.M., Goodman, R.R., Sheth, S.A., Greger, B., House, P.A., Trevelyan, A.J., Schevon, C.A. "Neuronal firing and waveform alterations through ictal recruitment in humans." *Journal of Neuroscience*, 41 (4), 766–779.
- 2020 Smith, E.H., **Merricks, E.M.**, Liou, J.-Y., Casadei, C., Melloni, L., Friedman, D., Doyle, W., Goodman, R.R., Emerson, R.G., McKhann, G.M., Sheth, S.A., Rolston, J., Schevon, C.A. "Dual mechanisms of ictal high frequency oscillations in rhythmic onset seizures." *Scientific Reports*, 10(1), 19166.
- 2019 Tryba, A.K.<sup>1</sup>, **Merricks, E.M.**<sup>1</sup>, Lee, S., Pham, T., Cho, S., Nordli, D.R., Jr., Eissa, T.L., Goodman, R.R., McKhann, G.M., Emerson, R.G., Schevon, C.A., van Drongelen, W. "Role of paroxysmal depolarization in focal seizure activity." *Journal of Neurophysiology*, 122, 1861–1873. PMC6879965.  
(<sup>1</sup>co-first author)
- 2019 Schevon, C.A., Tobochnik, S., Eissa, T.L., **Merricks, E.M.**, Gill, B.J., Bateman, L.M., McKhann, G.M., Emerson, R.G., Trevelyan, A.J. "Multiscale recordings reveal the dynamic spatial structure of human seizures." *Neurobiology of Disease*, 127, 303–311. PMC6588430.
- 2016 Smith, E.H., Liou, J.-Y., Davis, T.S., **Merricks, E.M.**, Kellis, S.S., Weiss, S.A., Greger, B., House, P.A., McKhann, G.M., Goodman, R.R., Emerson, R.G., Bateman, L.M., Trevelyan, A.J., Schevon, C.A. "The ictal wavefront is the spatiotemporal source of discharges during spontaneous human seizures." *Nature Communications*, 711098. PMC4820627.
- 2015 **Merricks, E.M.**, Smith, E.H., McKhann, G.M., Goodman, R.R., Bateman, L.M., Emerson, R.G., Schevon, C.A., Trevelyan, A.J. "Single unit action potentials in humans and the effect of seizure activity." *Brain*, 138(10), 2891–2906. PMC4671476.
- 2015 Trevelyan, A.J., Muldoon, S.F., **Merricks, E.M.**, Racca, C., Staley, K. "The role of inhibition in epileptic networks." *Journal of Clinical Neurophysiology*, 32(3), 227–234.

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- 2015 Alfonsa, H., **Merricks, E.M.**, Codadu, N.K., Cunningham, M.O., Deisseroth, K., Racca, C., Trevelyan, A.J.. "The contribution of raised intraneuronal chloride to epileptic network activity." *Journal of Neuroscience*, 35(20), 7715–7726. PMC4438123.

### **Peer-Reviewed Book Chapters**

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- 2024 **Merricks, E.M.**, Schevon, C.A. "Human Single Neuron Recordings in Epilepsy." *In: Jasper's Basic Mechanisms of the Epilepsies* (eds.: Noebels, J.L., Avoli, M., Rogawski, M.A., Vezzani, A., Delgado-Escueta, A.V.). Oxford University Press.

### **Conference presentations (see above for Talks)**

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#### Oral platform presentations

- 2020 **Merricks, E.M.**, Agopyan-Miu, A.H., Smith, E.H., Bozdemir, E., Emerson, R.G., Bateman, L.M., McKhann, G.M., Goodman, R.R., Sheth, S.A., Greger, B., House, P.A., Sosunov, A.A., Trevelyan, A.J., Schevon, C.A. "Interneuronal firing patterns through ictal recruitment in humans." *American Epilepsy Society Annual Meeting. Platform presentation. (Virtual)*
- 2019 **Merricks, E.M.**, Smith, E.H., McKhann, G.M., Goodman, R.R., Sheth, S.A., Greger, B., House, P.A., Trevelyan, A.J., Schevon, C.A. "Action potential alterations and cell-type specific activity through ictal recruitment in humans." *Society for Neuroscience Annual Meeting. Chicago, IL Dynamic platform presentation.*

#### Poster presentations (listing first-author presentations only)

- 2022 **Merricks, E.M.**, Agopyan-Miu, A.H., Smith, E.H., Sheth, S.A., McKhann, G.M., Schevon, C.A. "Single neuron activity in the mesial temporal lobe during human seizures shows reduction of both excitatory and inhibitory firing." *6<sup>th</sup> International Human Single Neuron Meeting. UCLA, Los Angeles, CA*
- 2018 **Merricks, E.M.**, Smith, E.H., McKhann, G.M., Goodman, R.R., Sheth, S.A., Greger, B., House, P.A., Trevelyan, A.J., Schevon, C.A. "Spike sorting and cell-type specific activity through ictal recruitment in humans." *4<sup>th</sup> International Human Single Neuron Meeting. California Institute of Technology, Pasadena, CA*
- 2018 **Merricks, E.M.**, Smith, E.H., McKhann, G.M., Goodman, R.R., Sheth, S.A., Greger, B., House, P.A., Trevelyan, A.J., Schevon, C.A. "Single neuron waveform alterations and cell-type specific activity at seizure onset in humans." *Gordon Conference: Mechanisms of Epilepsy and Neuronal Synchronization. Mount Snow, VT*
- 2017 **Merricks, E.M.**, Smith, E.H., Bateman, L.M., Sheth, S.A., McKhann, G.M., Columbia Comprehensive Epilepsy Center, Schevon, C.A. "Postictal alterations in population single unit spatiotemporal activity." *American Epilepsy Society Annual Meeting. Washington, DC*
- 2017 **Merricks, E.M.**, Trevelyan, A.J., Smith, E.H., Sheth, S.A., McKhann, G.M., Columbia Comprehensive Epilepsy Center, Schevon, C.A. "Longterm and ictal spike shape changes in human microelectrode recordings." *CRCNS PI Meeting. Brown University, Providence, RI*
- 2015 **Merricks, E.M.**, Smith, E.H., McKhann, G.M., Goodman, R.R., Bateman, L.M., Emerson, R.G., Schevon, C.A., Trevelyan, A.J. "Distinct spatial patterns of neuronal firing during human seizures." *British Neuroscience Association. Edinburgh, UK*

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- 2013 **Merricks, E.M.**, Emerson, R.G., McKhann, G.M., Goodman, R.R., Weiss, S.A., Schevon, C.A., Trevelyan, A.J. "Analysis of single unit firing patterns preceding human seizures." *Society for Neuroscience Annual Meeting*. San Diego, CA
- 2013 **Merricks, E.M.**, Emerson, R.G., McKhann, G.M., Goodman, R.R., Weiss, S.A., Schevon, C.A., Trevelyan, A.J. "Single unit firing patterns preceding human seizures." *International League Against Epilepsy*. Glasgow, UK
- 2013 **Merricks, E.M.**, Emerson, R.G., McKhann, G.M., Goodman, R.R., Weiss, S.A., Schevon, C.A., Trevelyan, A.J. "Analysis of single unit firing patterns preceding human seizures." *North East Epilepsy Research Meeting*. Newcastle upon Tyne, UK

## **Mentoring and Training**

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### Post-doctoral trainees:

**Andrew J. Michalak, M.D.**                      2021 – 2023                      Epilepsy Fellow  
*Current position: Clinical Assistant Professor, Dept. of Neurology, NYU School of Medicine*

**Eda Bozdemir, M.D.**                      2020 – 2023                      Post-Doctoral Research Scientist  
*Current position: Hospital Resident, Dept. of Neurology, Yale School of Medicine*

### Students:

**Marcus P. Talke, B.S., M.S.**                      2023 – present                      Medical Student  
*Current position: ongoing mentorship (Summer medical student research projects)*

**Alexander H. Agopyan-Miu, M.D.**                      2020 – 2022                      Medical Student  
*Current position: Neurosurgery Resident, Columbia University Medical Center*

**Farhan A. Khan, M.D.**                      2020 – 2022                      Medical Student  
*Current position: Neurosurgery Resident, Columbia University Medical Center*

**Hart P. Fogel, B.A.**                      2021 (Summer)                      Medical Student  
*Current position: Medical Student, Columbia University Medical Center*

**Hongkun Zhu, Ph.D.**                      2018 – 2024                      Graduate Student  
*Current position: Post-Doctoral Research Scientist, Columbia University Medical Center*

**Nav Ravindranath, M.S.**                      2018 (Summer)                      Master's Student  
*Current position: Senior Software Engineer, Amazon*

**Heather Bixler, B.S.**                      2018                      Undergraduate Student  
*Current position: Medical Laboratory Technician, Columbia University Medical Center*