Eric D. Melonakos, Ph.D.

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Work History

Brigham Young University, Provo, Utah
Department of Cell Biology and Physiology

2024 - Present — Assistant Professor
- Teaching focus: *Human physiology*
- Research focus: *Neural mechanisms of anesthesia and other states of reversible unconsciousness*

Massachusetts General Hospital, Boston, Massachusetts
Harvard Medical School, Boston, Massachusetts

2017 - 2024 — Postdoctoral Research Fellow and NIH/NIGMS K99 Awardee
- Advisors: Professors Christa J. Nehs and Emery N. Brown
- Research topic: *Mechanisms of anesthetic-induced neural rhythms and altered states of consciousness*

Education

The University of Utah, Salt Lake City, Utah

2017 — Ph.D., Bioengineering
- Advisors: Professors Fernando R. Fernandez and John A. White, Neuronal Dynamics Laboratory
- Thesis Topic: *Gain and firing rate modulation of cholinergic neurons in the medial septum-diagonal band of Broca and the mechanism of cholinergic suppression of hippocampal ripples*

2017 — M.S., Clinical Investigation

2016 — M.S., Bioengineering
- Advisor: Professor Alan D. Dorval, Neural Information Laboratory

New York University, Shanghai, Shanghai, China

2016 — 2016 Computational and Cognitive Neuroscience Summer School
- Organizers: Drs. Xiao-Jing Wang, Zach Mainen, Si Wu, John Murray, and Eric DeWitt
- Project topic: *Dendritic A-current increases mutual information between dendritic synaptic conductance and somatic voltage*

Brigham Young University, Provo, Utah

2010 — B.S., Neuroscience
- Research Advisor: Professor David D. Busath, Biophysics Great Lab
- Research Topic: *Effects of anesthesia on the lateral pressure profile of lipid membranes*

Other Scientific Affiliations

2024 - Present — Neuroscience Center, College of Life Sciences, Brigham Young University, Provo, Utah

2017 - 2021, 2022 - 2024 — Research Affiliate, Department of Brain and Cognitive Sciences, Massachusetts Institute of Technology, Cambridge, Massachusetts

2020 - 2022 Research Affiliate, Department of Psychological and Brain Sciences, Boston University, Boston, Massachusetts

External Research Support

2022 - 2028 NIH/NIGMS Pathway to Independence Award (K99/R00) K99GM141450
The Roles of Genetically Distinct Cortical Neuron Types in General-Anesthesia- and Sleep-Induced Slow Waves

Internal Research Support

2025 - 2027 New faculty startup research funding - 2nd of 3 years, Sponsored by BYU-College of Life Sciences.

2025 - 2026 College Mentoring (CEMENT) 2025 research award, Sponsored by BYU-College of Life Sciences.

2024 - 2026 New faculty startup research funding - 1st of 3years, Sponsored by BYU-College of Life Sciences.

BYU College of Life Science College Undergraduate Research Awards (CURA)

2026 Jackson, Ian, *Using GCaMP8f to Target Parvalbumin in Rats*
Roper, Kyler, *Consistency of The Adhesive Removal Task Across Body Sites During Anesthesia Recovery*

2025 Church, Davis J., *Using 3D Printed Rat Skull Models to Improve Stereotactic Training*

Refereed Journal Publications

**Undergraduate trainee.*

Siegmann MJ, Zachs DP, Kenny JD, Lark ARS, Mir FA, **Melonakos ED**, Hozan M, Kaufmann ST, Goldblum RR, Liu Y, Nolan MA, Cohen G, Choi J, White CG, Crowley EA, Carpenter AH, Toro BA, Syme CE, Brown EN, Nehs CJ (*in press*) Neurophysiological Differences Between Dexmedetomidine Sedation and Natural Sleep Across the Rodent Lifespan: Implications for Aging and Perioperative Brain Health. *Anesthesiology and Perioperative Science*.

Melonakos ED, Siegmann MJ, *Rey C, *O'Brien C, Nikolaeva KK, Solt K, Nehs CJ (2021) Excitation of Putative Glutamatergic Neurons in the Rat Parabrachial Nucleus Region Reduces Delta Power during Dexmedetomidine but not Ketamine Anesthesia. *Anesthesiology* 135: 633–648. doi:10.1097/ALN.0000000000003883

Kato R, Zhang ER, Mallari OG, Moody OA, Vincent K, **Melonakos ED**, Siegmann MJ, Nehs CJ, Houle TT, Akeju O, Solt K (2021) D-amphetamine Rapidly Reverses Dexmedetomidine-induced Unconsciousness in Rats. *Front Pharmacol* 12: 1211. doi:10.3389/fphar.2021.668285

Moody OA, Zhang ER, Vincent KF, Kato R, **Melonakos ED**, Nehs CJ, Solt K (2021) The Neural Circuits Underlying General Anesthesia and Sleep. *Anesthesia & Analgesia* 132(5): 1254–1264. doi:10.1213/ANE.0000000000005361

Melonakos ED, Moody OA, Nikolaeva K, Kato R, Nehs CJ, Solt K (2020) Manipulating Neural Circuits in Anesthesia Research. *Anesthesiology* 133: 19–30. doi:10.1097/ALN.0000000000003279

Melonakos ED, White JA, Fernandez FR (2019) A model of cholinergic suppression of hippocampal ripples through disruption of balanced excitation/inhibition. *Hippocampus* 29: 773–786. doi:10.1002/hipo.23051

Ohtani T, Nestor PG, Bouix S, Newell D, **Melonakos ED**, McCarley RW, Shenton ME, Kubicki M (2017) Exploring the neural substrates of attentional control and human intelligence: Diffusion tensor imaging of prefrontal white matter tractography in healthy cognition. *Neuroscience* 341: 52–60. doi:10.1016/j.neuroscience.2016.11.002

Melonakos ED, White JA, Fernandez FR (2016) Gain modulation of cholinergic neurons in the medial septum-diagonal band of Broca through hyperpolarization. *Hippocampus* 26(12): 1525–1541. doi:10.1002/hipo.22653

Ohtani T, Bouix S, Lyall AE, Hosokawa T, Saito Y, **Melonakos E**, Westin CF, Seidman LJ, Goldstein J, Mesholam-Gately R, Petryshen T, Wojcik J, Kubicki M (2015) Abnormal white matter connections between medial frontal regions predict symptoms in patients with first episode schizophrenia. *Cortex* 71: 264–276. doi:10.1016/j.cortex.2015.05.028

Ohtani T, Bouix S, Hosokawa T, Saito Y, Eckbo R, Ballinger T, Rausch A, **Melonakos E**, Kubicki M (2014) Abnormalities in white matter connections between orbitofrontal cortex and anterior cingulate cortex and their associations with negative symptoms in schizophrenia: A DTI study. *Schizophr Res* 157: 190-–197. doi:10.1016/j.schres.2014.05.016

Nelson SC, Neeley SK, **Melonakos ED**, Bell JD, Busath DD (2012) Fluorescence anisotropy of diphenylhexatriene and its cationic trimethylamino derivative in liquid dipalmitoylphosphatidylcholine liposomes: Opposing responses to isoflurane. *BMC Biophys* 5: 5. doi:10.1186/2046-1682-5-5

Melonakos ED, Shenton ME, Rathi Y, Terry DP, Bouix S, Kubicki M (2011) Voxel-based morphometry (VBM) studies in schizophrenia-can white matter changes be reliably detected with VBM? *Psychiatry Res Neuroimaging* 193: 65–70. doi:10.1016/j.pscychresns.2011.01.009

Manuscripts In Preparation

⋆Graduate student. †Research assistant, undergraduate, or high school trainee.

Melonakos ED, †Philpot N, †Keldsen EW, †Richards LD, ⋆Rawson C, †Fisher RP, Tian F, Brown EN, Nehs CJ. Anesthetic-Specific Coupling Between Calcium Fluorescence and Delta Oscillations Reveals Distinct Calcium Dynamics.

†Pennock R, †Philpot N, †Keldsen EW, †Richards LD, ⋆Burdick C, ⋆Rawson C, †Fisher RP, †Whitt E, †Lambert IJ, †Haas KD, †McCormack KK, †Tsai MW, Tian F, Nehs CJ, **Melonakos ED**. Calcium Imaging Coupled to Ephys (CICE): A Python Package for Analysis of Simultaneous Calcium Imaging and Electrophysiology.

†Keldsen EW, †Downs I, †Franco J, †Pennock R, †Philpot N, †Richards LD, ⋆Burdick C, ⋆Rawson C, †Fisher R, †Whitt E, †Lambert IJ, †Haas KD, †McCormack KK, †Tsai MW, Tian F, Vincent KF, Siegmann MJ, Solt K, Brown EN, Nehs CJ, **Melonakos ED**. The relationship between calcium events and the electroencephalogram in the rat cortex during sleep and general anesthesia induced by diverse agents.

Conference Publications

** Graduate student. † Research assistant, undergraduate, or high school trainee.*

†Church D, **Melonakos ED** (2025) Using 3D Printed Rat Skull Models to Improve Stereotactic Training. *Poster presented by D. Church at the 2025 Life Sciences Research Conference.*

Melonakos ED, †Philpot N, †Keldsen EW, †Richards LD, *Rawson C, †Fisher RP, Tian F, Brown EN, Nehs CJ (2025) Anesthetic-Specific Coupling Between Calcium Fluorescence and Delta Oscillations Reveals Distinct Calcium Dynamics. *Poster presented by E. W. Keldsen at the 2025 meeting of the Society for Neuroscience.*

Melonakos ED, †Rawson CD, †Richards LD, †Fisher RP, †Whitt ED, †Lambert IJ, †Haas KD, †McCormack KK, †Tsai MW, Tian F, Vincent KF, Siegmann MJ, Solt K, Brown EN, Nehs CJ (2025) Correlations of calcium fluorescence recorded by miniature, head-mounted microscopes and delta waves during general anesthesia and sleep. *Poster presented by C. D. Rawson at the 2025 Consciousness, Anesthesia and Evolutionary Biology Gordon Research Conference.*

†Nelson A, †Haas K, †Fisher R, †Whitt E, Tian F, Brown E, Nehs C, **Melonakos ED** (2024) Simultaneous Calcium Imaging and Electrophysiology to Investigate Synchronous Activity in the Rat Cortex. *Poster presented by A. Nelson at the 2024 Annual Neuroscience Snowbird Symposium of the Intermountain Chapter of the Society for Neuroscience.*

Melonakos ED, †Fisher RP, †Whitt ED, †Lambert IJ, †Haas KD, †McCormack KK, †Tsai MW, Tian F, Vincent KF, Siegmann MJ, Solt K, Brown EN, Nehs CJ (2023) Simultaneous calcium imaging and electrophysiology in the rat cortex during sleep and general anesthesia induced by diverse agents. *Poster presented at the 2023 meeting of the Society for Neuroscience.*

Melonakos ED, †Lambert IJ, †Haas KD, †McCormack KK, †Whitt E, †Fisher R, †Tsai MW, Vincent KF, Siegmann MJ, Solt K, Brown EN, Nehs CJ (2023) Simultaneous calcium imaging and electrophysiology in the rat cortex during sleep and general anesthesia induced by diverse agents. *Poster presented at the 2023 Consciousness, Anesthesia and Evolutionary Biology Gordon Research Conference.*

Melonakos ED, Nikolaeva KK, Siegmann MJ, Brown EN, Solt K, Nehs CJ (2019) Aging increases time to recovery and prolongs cortical EEG rhythms in anesthetized rats *Poster presented at the Society for Neuroscience's 2019 Annual Meeting.*

Kato R, Mallari OG, Zhang ER, **Melonakos ED**, Siegmann MJ, Van Dort CJ, Johnson-Akeju O, Solt K (2019) Differential effects of D-amphetamine on behavior and neurophysiology during dexmedetomidine vs. ketamine anesthesia in rats. *Poster presented by R. Kato at the Society for Neuroscience's 2019 Annual Meeting.*

Melonakos ED, White JA, Fernandez FR (2014) History-Dependent Changes in Gain of Medial Septal Cholinergic Neurons. *Poster presented at the Society for Neuroscience's 2014 Annual Meeting.*

Melonakos ED, White JA, Fernandez FR (2014) History-Dependent Changes in Spiking Patterns of Medial Septal Cholinergic Neurons. *Poster presented at the 2014 Research Trainee Symposium: Molecular Medicine and Medical School Research Programs.*

Fowler M, Cardon B, **Melonakos ED**, Brasfield N, Bell JD, Busath DD (2012) Simulation of Isoflurane and Fluorescent Probes in a DPPC Bilayer. *Poster presented by M. Fowler at the 2012 Annual Neuroscience Snowbird Symposium of the Intermountain Chapter of the Society for Neuroscience.*

Melonakos ED, White JA (2012) History-Dependent Accommodation and Neuronal Phase-Locking to Theta Inputs in the Medial Septum. *Poster presented at the 2012 Research Trainee Symposium: Molecular Medicine and Medical School Research Programs.*

Cardon B, **Melonakos E**, Brasfield N, Ha I, Bell JD, Busath DD (2011) Self-Distribution of Dye and Isoflurane in the DPPC Bilayer. *Biophysical Journal* 100(3): 632a–632a. *Poster presented by N. Brasfield at the 2011 Biophysical Society meeting in Baltimore, MD.* doi:10.1016/j.bpj.2010.12.3632

Melonakos ED, White JA (2011) Anesthetics Affect the Frequency-Current Curves of Individual Neurons. *Poster presented at the 2011 Utah Biomedical Engineering Conference and at the 2011 Annual Neuroscience Snowbird Symposium of the Intermountain Chapter of the Society for Neuroscience.*

Ohtani T, Kubicki M, Bouix S, Terry D, Rausch A, **Melonakos E**, Pelavin P, Alvarado J, LaVenture A, De Siebenthal J, McCarley RW, Shenton ME (2010) Abnormalities in White Matter Connectivity between Orbitofrontal Cortex and Anterior Cingulate Cortex in Schizophrenia. *Biological Psychiatry* 67(9): 875. *Poster presented by T. Ohtani at the 2010 Society of Biological Psychiatry Convention, New Orleans, LA.*

Melonakos E, Shenton M, Rathi Y, Bouix S, Kubicki M (2009) Can Whole Brain Voxel-Based Morphometry Studies Applied to DTI Data Localize White Matter Changes in Schizophrenia? *Schizophrenia Bulletin* 35(Supplement 1): 202–203. *Poster presentation at the 2009 International Congress on Schizophrenia Research, San Diego, CA.*

Terry D, Rausch A, Alvarado J, **Melonakos E**, Markant D, Westin CF, Kikinis R, Siebenthal J, Shenton M, Kubicki M (2009) White matter properties of emotion related connections in schizophrenia. *Poster presented by D. Terry at Mysell Harvard Research Day, Psychiatry Annual Meeting, 2009.*

Melonakos E, Terry D, Markant D, Rausch A, Alvarado J, Kikinis R, Westin CF, Shenton M, Kubicki M (2009) White Matter Properties of Orbitofrontal Connections in Schizophrenia. *Biological Psychiatry* 65(8)(Supplement S): 204S. *Poster presentation at the 2009 Society of Biological Psychiatry Convention, Vancouver, BC.*

Melonakos E, Shenton M, Rathi Y, Bouix S, Kubicki M (2009) Can Whole Brain Voxel-Based Morphometry Studies Applied to DTI Data Localize White Matter Changes in Schizophrenia? *Biological Psychiatry* 65(8)(Supplement S): 204S–205S. *Poster presentation at the 2009 Society of Biological Psychiatry Convention, Vancouver, BC.*

Other Publications

Melonakos ED, White JA, Fernandez FR (2016) Cover Image, Volume 26, Issue 12. *Hippocampus* 26(12): C1. doi:10.1002/hipo.22677

Shenton ME, Turetsky BI (2011) Understanding Neuropsychiatric Disorders: Insights from Neuroimaging. Cambridge: Cambridge University Press. *I created Figure 1.4 on page 19.*

Seminars

Neuroscience Seminars, Neuroscience Center, Brigham Young University. November 20, 2024. “Delta Waves in the Rat Cortex During Sleep and General Anesthesia Induced by Diverse Agents”.

Research Conference, Department of Anesthesiology, University of Utah. March 19, 2024. "Slow Waves in the Rat Cortex During Sleep and General Anesthesia Induced by Diverse Agents".

Duke Perioperative Research Seminar, Department of Anesthesiology, Duke University School of Medicine. March 7, 2024. "Slow Waves in the Rat Cortex During Sleep and General Anesthesia Induced by Diverse Agents".

Weekly CELL Seminars, Department of Cell Biology and Physiology, Brigham Young University. January 31, 2024. "Neural activity in the rat cortex during sleep and general anesthesia induced by diverse agents".

Research Seminar, Department of Anesthesiology, University of Colorado School of Medicine. January 23, 2024. "Neural activity in the rat cortex during general anesthesia induced by diverse agents".

Weekly CELL Seminars, Department of Cell Biology and Physiology, Brigham Young University. February 8, 2023. "Neural activity in the rat cortex during general anesthesia induced by diverse agents".

Neural Engineering Research Group, Department of Biomedical Engineering, University of Utah. April 18, 2015. "History-Dependent Changes in Gain of Medial Septal Cholinergic Neurons".

Neural Engineering Research Group, Department of Biomedical Engineering, University of Utah. November 5, 2013. "History-Dependent Changes in Spiking Patterns of Cholinergic Neurons in the Medial Septum".

Teaching Experience

Brigham Young University, Provo, Utah
Department of Cell Biology and Physiology

2025	CELL 568 (Guest Lecturer for 2 hours), Cellular Electrophysiology and Biophysics, 3 credit hours
2024-Present	CELL 362, Advanced Physiology, 3 credit hours
2024-Present	CELL 295R, Introductory Undergraduate Research in Cell Biology and Physiology, variable credit hours
2025-Present	CELL 495R, Advanced Undergraduate Research in Cell Biology and Physiology, variable credit hours
2024-Present	CELL 349R,Cell Biology and Physiology Teaching Experience, variable credit hours
2010	PDBIO 550R (Volunteer Teaching Assistant), Molecular Dynamics

Neuroscience Center

2025-Present	NEURO 449R, Undergraduate Research Experience, variable credit hours

Department of Chemistry and Biochemistry

2008	CHEM 351 (Teaching Assistant), Organic Chemistry I (recitation leader for 2 sections)

University of Utah, Salt Lake City, Utah
Department of Bioengineering

2012	BIOEN 3301 (Graduate Teaching Assistant), Computation Methods for Bioengineers

Research Mentoring

**Author on journal article. †Author on conference poster.*

Ph.D. Students

Cassandra Burdick, 2025-Present, Cell Biology and Physiology.

M.S. Students

Clayton Rawson, 2025-Present, Cell Biology and Physiology.

Undergraduate Students

Lily Cardall, 2026-Present.
Reed Pennock, 2025-Present.
Luke Martinez, 2025-Present.
Josie Allred, 2025-Present.
Jace Franco, 2025-Present.
†Elijah Keldsen, 2025-Present.
Jacob Adair, 2025-Present.
Joy Kramer, 2025-Present.
Kyler Roper, 2025-Present.
Isaac Downs, 2025-Present.
Caleb Ford, 2025-Present.
Ryan Lindsey, 2025-Present.
Blake Shepherd, 2025-Present.
Hayden Grossarth, 2025-Present.
Samuel Scheffner, 2025-Present.
Ian Jackson, 2024-Present.
Mia Mendoza, 2024-Present.
Neil Loosli, 2024-Present.
†Davis J. Church, 2024-Present.
James Ashton, 2024-Present.
Thomas Worley, 2024-2025.
†Alexia Nelson, 2024-2025.
Zachary Emerson, 2025.
†Nathan Philpot, 2025.
Nicholas York, 2025.
†Luke Richards, 2024-2025.
†Kase Haas, 2022, 2024-2025.
†Ethan Whitt, 2023.
†Isaac Lambert, 2022.
†Katherine McCormack, 2021.
*Christopher O'Brien (from the University of Tennessee, Knoxville), 2019.
*Charles Rey (from Westminster College), 2019.

Other

Clayton Rawson (volunteer research assistant while at Noorda College of Medicine), 2024-2025.
†Fangyun Tian (Instructor, MGH), 2023-2024.
†Rachael Fisher (Research Assistant, MGH), 2023.
†Max Tsai (from Winchester High School), 2022.

Professional Memberships

2013 - 2016, 2019-Present — Member, Society for Neuroscience

Academic Citizenship

Brigham Young University Committees

2026-Present Physiology and Exercise Sciences Curriculum Working Group, College of Life Sciences
2024-Present Graduate Committee (member), Department of Cell Biology and Physiology
2024-Present CURA Committee (member), Neuroscience Center

Scientific Peer Review:

Neurochemical Research (*ad hoc*)

Awards and Achievements

- Spiritually Strengthening Faculty Award Nominee, College of Life Sciences (Fall 2025)
- Andrew Ng's Machine Learning course, Coursera (2017)
- Developed a Nernst Potential Android app (2016)
- Society for Neuroscience Annual Meeting Blogger (2013)
- Dean's List, BYU (Spring 2009)
- 800 GRE Quantitative Score (2009)
- 1st Place Prosthetic Leg Design, BYU Biomedical Engineering Club (2009)
- Half-tuition Scholarship, BYU (Summer 2008 - Fall 2008; Summer 2009 - Winter 2010)
- Mary Lou Fulton Chair Internship Grant, BYU (2008)
- Full-tuition Scholarship, BYU (Fall 2004 - Winter 2005)
- Eagle Scout, Boy Scouts of America (2000)
- Moderate Proficiency in Mandarin Chinese

Other Service

The Church of Jesus Christ of Latter-day Saints
Taiwan Taichung Mission, Taichung, Taiwan
2005 - 2007 *Volunteer Church Missionary*
Led proselytizing efforts of missionaries in several cities in Taiwan
Administered and taught weekly English classes