

Michael Beierlein, Ph.D.

PRESENT TITLE: Associate Professor of Neurobiology and Anatomy
McGovern Medical School at UTHealth

WORK ADDRESS: Department of Neurobiology and Anatomy
6431 Fannin St., MSE R442
McGovern Medical School at UTHealth
Houston, TX 77030

CITIZENSHIP: Germany, US permanent residency

UNDERGRADUATE EDUCATION:

1994 Diploma (Biology), University of Tübingen, Germany
Advisor: Hans-Ulrich Schnitzler

GRADUATE EDUCATION:

2000 Ph.D. (Neuroscience), Brown University, Providence, RI
Advisor: Barry W Connors

POSTGRADUATE TRAINING:

2000 - 2002 Postdoctoral research, Columbia University, New York, NY
Advisor: Rafael Yuste
2002 - 2007 Postdoctoral research, Harvard Medical School, Boston, MA
Advisor: Wade Regehr

ACADEMIC APPOINTMENTS:

2007 - 2015 Assistant Professor, Department of Neurobiology and Anatomy, McGovern
Medical School at UTHealth, Houston, TX
2015 - Associate Professor (tenured), Department of Neurobiology and
Anatomy, McGovern Medical School at UTHealth, Houston, TX

EDITORIAL POSITIONS:

Ad hoc reviewer for: Cerebral Cortex, Frontiers in Cellular Neuroscience, Journal of
Neurophysiology, Journal of Neuroscience, Journal of Physiology, Nature
Communications, Neuron, PLOS Biology, Trends in Neuroscience, Learning
and Memory, Wellcome Trust

SPONSORSHIP OF GRADUATE STUDENTS:

Rajan Dasgupta 2014 – 2018
Current Position: Postdoctoral Research Fellow, Johns Hopkins University
John O'Malley 2016 – 2020
Current Position: Postdoctoral Research Fellow, NIH

SPONSORSHIP OF POSTDOCTORAL FELLOWS:

Dr. Yan-Gang Sun (2008 – 2012)

Current position: Investigator (tenure-track), ION, Shanghai, China

Dr. Vanessa Rupprecht (2012 – 2013)

Current position: Postdoctoral Research Fellow, Fraunhofer Scai, Germany

Dr. Juan Pita Almenar (2012 – 2014)

Current position: Senior Scientist, Janssen Pharmaceuticals, Beerse, Belgium

Dr. Zhiying Jiang (2014 – 2015)

Current position: Postdoctoral Research Fellow, IMM, Houston, TX

Dr. Frederik Seibt (2015 – 2017)

Current position: Scientist, Janssen Pharmaceuticals, Beerse, Belgium

CURRENT TEACHING:

Graduate School

Molecular and Cellular Neuroscience (GS141214)

Systems Neuroscience (GS140024)

Medical School

Foundations of Medical Science (MS1)

Nervous System and Behavior (MS2)

CURRENT GRANT SUPPORT:

MD Anderson Cancer Center

Title: Identification of druggable pathways contributing to thalamic reticular nucleus dysfunction, sleep deficits and AD disease progression

Period of Support: Jan 1, 2020 – December 31, 2020

Role: Co-Investigator (PI: Chin)

TDC: 72,500

National Institute of Mental Health (NIMH)

Title: Neural circuits balancing reward-approaching with threat-avoidance

Grant Number: MH120136

Period of Support: April 2020 – February 2025

Role: Co-Investigator (PI: Do Monte)

TDC: 1,972,300

National Institute of Aging (NIA)

Title: Thalamic Reticular Nucleus Dysfunction in Alzheimer's Disease

Grant Number: AG065290

Period of Support: August 2020 – April 2025

Role: PI (Contact PI: Chin)

TDC: 2,669,609

PAST GRANT SUPPORT:

Beginning Grant-in-Aid, American Heart Association

Title: Properties and Functional Consequences of Transmitter Release from Neocortical Astrocytes
Grant Number: 0865059F
Period of Support: July 2008 – June 2011
Role: PI
TDC: 140,000

Pilot Grant, UT Medical School

Title: Control of Local Circuit Dynamics by Neocortical Astrocytes
Period of Support: September 2008 - August 2009
Role: PI
TDC: 25,000

Research Grant, Whitehall Foundation

Title: Control of Local Circuit Dynamics by Neocortical Astrocytes
Grant Number: 2008-08-06
Period of Support: September 2008 - August 2012
Role: PI
TDC: 225,000

Research Grant, Epilepsy Foundation

Title: Control of Thalamic Circuit Dynamics by Endocannabinoids
Grant Number: 186610
Period of Support: July 2011 - December 2012
Role: PI
TDC: 50,000

National Institutes of Health (NINDS)

Title: Synaptic Integration in Neurons of the Thalamic Reticular Nucleus
Grant Number: NS077989
Period of Support: February 2012 - January 2019
Role: PI
TDC: 1,062,500

PUBLICATIONS: For links to full papers, see <https://orcid.org/0000-0003-2210-3118>

A. Refereed Original Articles in Journals (*denotes equal authorship)

1. Singer, A., Dutta, S., Lewis, E., Chen, Z., Chen, J.C., Verma, N., Avants, B., Feldman, A.K., O'Malley, J., **Beierlein, M.**, Kemere, C., Robinson, J.T. Magnetolectric materials for miniature, wireless neural stimulation at therapeutic frequencies. *Neuron* 107(40): 631-643, 2020.
2. O'Malley, J.J., Seibt, F., Chin, J. and **Beierlein, M.** TRPM4 conductances in thalamic reticular nucleus neurons generate persistent firing during slow oscillations. *J. Neurosci.* 40: 4813-482, 2020.
3. Dasgupta, R., Seibt, F., and **Beierlein, M.** Synaptic release of acetylcholine rapidly suppresses cortical activity by recruiting muscarinic receptors in layer 4. *J. Neurosci.* 38: 5338-5350, 2018.

4. Hunt, A.J., Dasgupta, R., Rajamanickam, S., Jiang, Z., **Beierlein, M.**, Chan, C.S., and Justice, N.J. Paraventricular hypothalamic and amygdalar CRF neurons synapse in the external globus pallidus. *Brain Structure and Function*: 1-14, 2018.
5. Vitale, F., Vercosa, D.G., Rodriguez, A.V., Pamulapati, S.S., Seibt, F., Lewis, E., Yan, J.S., Badhiwala, K., Adnan, M., Royer-Carfagni, G., **Beierlein, M.**, Kemere, C., Pasquali, H., and Robinson, J.T. Fluidic microactuation of flexible electrodes for neural recording. *Nano Letters* 18: 326-335, 2018.
6. Sun, Y.G., Rupprecht, V., Zhuo, L., Dasgupta, R., Seibt, M., and **Beierlein, M.** mGluR1 and mGluR5 synergistically control cholinergic synaptic transmission in the thalamic reticular nucleus. *J. Neurosci.* 36: 7886-7896, 2016.
7. Pita-Almenar, J.D., Yu, D., Lu, H.C., and **Beierlein, M.** Mechanisms underlying desynchronization of cholinergic-evoked thalamic network activity. *J. Neurosci.* 34: 14463-14474, 2014.
8. Sun, Y.G., Pita Almenar, J.D., Wu, C.S., Renger, J.J., Uebele, V.N., Lu, H.C., and **Beierlein, M.** Biphasic cholinergic synaptic transmission in the thalamic reticular nucleus. *J. Neurosci.* 33: 2248-2259, 2013.
9. Sun, Y.G., Wu, C.S., Renger, J.J., Uebele, V.N., Lu, H.C., and **Beierlein, M.** GABAergic synapses trigger action potentials in neurons of the thalamic reticular nucleus. *J. Neurosci.* 32: 7782-7790, 2012.
10. Sun, Y.G., Wu, C.S., Lu, H.C., and **Beierlein, M.**: Target-dependent control of synaptic inhibition by endocannabinoids in the thalamus. *J. Neurosci.* 31: 9222-9230, 2011.
11. Sun, Y.G. and **Beierlein, M.**: Receptor saturation controls short-term synaptic plasticity at corticothalamic synapses. *J. Neurophysiol.* 105: 2319-2329, 2011.
12. Myoga, M., **Beierlein, M.**, and Regehr, W.G.: Somatic spikes regulate dendritic signaling in small neurons in the absence of backpropagating action potentials. *J. Neuroscience* 29: 7803-7814, 2009.
13. **Beierlein, M.**, Fioravante, D., and Regehr, W.G.: Differential expression of post-tetanic potentiation and retrograde signaling mediate target-dependent short-term synaptic plasticity. *Neuron* 54(6): 949-959, 2007.
14. **Beierlein, M.** and Regehr, W.G.: Local interneurons regulate synaptic strength by retrograde release of endocannabinoids. *J. Neurosci.* 26: 9935-9943, 2006.
15. **Beierlein, M.** and Regehr, W.G.: Brief bursts of parallel fiber activity trigger calcium waves in Bergmann glia. *J. Neurosci.* 26: 6958-6967, 2006.
16. Gibson, J.R., **Beierlein, M.**, and Connors, B.W.: Functional properties of electrical synapses between inhibitory interneurons of neocortical layer 4. *J. Neurophysiol.* 93: 467-480, 2005.
17. Martin, V.V., **Beierlein, M.**, Morgan, J., Rothe, A., and Gee, K.R.: Novel Fluo-4 analogs for fluorescent calcium measurements. *Cell Calcium* 36: 509-514, 2004.
18. **Beierlein, M.**, Gee, K.R., Martin, V.V., and Regehr, W.R.: Presynaptic calcium measurements at physiological temperatures using a new class of dextran-conjugated indicators. *J. Neurophysiol.* 92: 591-599, 2004.
19. **Beierlein, M.***, Gibson, J.R.*, and Connors, B.W.: Two dynamically distinct inhibitory networks in layer 4 of the neocortex. *J. Neurophysiol.* 90: 2987-3000, 2003.
20. **Beierlein, M.**, Fall, C.P., Rinzel, J., and Yuste R.: Thalamocortical bursts trigger recurrent activity in neocortical networks: layer 4 as a frequency-dependent gate. *J. Neurosci.* 22: 9885-9894, 2002.
21. **Beierlein, M.** and Connors, B.W.: Short-term dynamics of thalamocortical and intracortical synapses onto layer 6 neurons in neocortex. *J. Neurophysiol.* 88: 1924-1932, 2002.

22. Amitai, Y., Gibson, J.R., **Beierlein, M.**, Patrick, S.L., Ho, A.M., Connors, B.W., and Golomb, D.: The spatial dimensions of electrically coupled networks of interneurons in the neocortex. *J. Neurosci.* 22: 4142-4152, 2002.
23. Landisman, C.E., Long, M.A., **Beierlein, M.**, Deans, M.R., Paul, D.L., and Connors, B.W.: Electrical synapses in the thalamic reticular nucleus. *J. Neurosci.* 22: 1002-1009, 2002.
24. **Beierlein, M.***, Gibson, J.R.* and Connors, B.W.: A network of electrically coupled interneurons drives synchronized inhibition in neocortex. *Nat. Neurosci.* 3: 904-910, 2000.
25. Gibson, J.R.* , **Beierlein, M.***, and Connors, B.W.: Two networks of electrically coupled inhibitory neurons in neocortex. *Nature* 402: 75-79, 1999.
26. Lin, Z., Lin, Y., Schorge, S., Pan, J., **Beierlein, M.**, and Lipscombe, D.: Alternative splicing of a short cassette exon in α_{1B} generates functionally distinct N-type calcium channels in central and peripheral neurons. *J. Neurosci.* 19: 5322-5331, 1999.
27. Kim, H.G., **Beierlein, M.**, and Connors, B.W.: Inhibitory control of excitable dendrites in neocortex. *J. Neurophysiol.* 74: 1810-1814, 1995.

Invited Articles

1. **Beierlein, M.** Synaptic properties and functional consequences of cholinergic signaling in the mammalian CNS. *J. Physiol.* (Editorial) 592: 4129-4130, 2014.
2. **Beierlein, M.** Synaptic mechanisms underlying cholinergic control of thalamic reticular nucleus neurons. *J. Physiol.* (Review) 592: 4137-4145, 2014.
3. **Beierlein, M.** and Regehr, W.G.: Conventional synapses for unconventional cells. *Neuron* (Preview) 46(5), 694-696, 2005.

Chapters

1. Dasgupta, R, Seibt, F, Sun, Y-G, **Beierlein, M.**: Examining Cholinergic Synaptic Signaling in the Thalamic Reticular Nucleus (TRN)” In: *Ion Channels: A Laboratory Manual* (J. Kammermeier, I. Digid, S. Brenowitz eds.), pp 111-116, Cold Spring Harbor Laboratory Press, Woodbury, NY, 2017.
2. **Beierlein, M.**: Cable properties and information processing in dendrites. In: *From Molecules to Networks: An Introduction to Cellular and Molecular Neuroscience*, Third edition (Byrne, J.H., Heidelberger, R., Waxham, M.N., eds.), pp 509-529, Elsevier, San Diego, 2014.
3. **Beierlein, M.**: Imaging calcium waves in cerebellar Bergmann glia. In: *Optical Imaging in Neuroscience* (Yuste, R., Lanni, F., Konnerth, A., eds.), pp 699-706, Cold Spring Harbor Laboratory Press, Woodbury, NY, 2011.
4. Connors, B.W., Castro-Alamancos, M.A., and **Beierlein, M.**: Diverse neuronal functions of the cerebral cortex. In: *Excitatory amino acids and the cerebral cortex* (Conti, F., Hicks, P., eds.), pp 21–32, MIT, Cambridge, MA, 1996.
5. Walker, J.M., Hohmann, A.G., Hemstreet, M.K., Martin, W.J., **Beierlein, M.**, Roth, J.S., Patrick, S.L., Carroll, F.I., and Patrick, R.L.: Functional role of sigma receptors in the nervous system. In: *Aspects of Synaptic Transmission, Volume II: Acetylcholine, Sigma Receptors, CCK and Eicosanoids, Neurotoxins.* (Stone, T.W., ed.), pp 91-112, Taylor and Francis, London, 1993.