

Aryn H. Gittis, PhD
Department of Biological Sciences
and the Neuroscience Institute
Carnegie Mellon University
Pittsburgh, PA 15213
Tel: 412-268-7229
agittis@cmu.edu
ORCID ID: 0000-0002-3591-5775
Researcher ID: I-6128-2016

Appointments

2022-present: Full Professor With Tenure, Carnegie Mellon University
2019-2022: Associate Professor With Tenure, Carnegie Mellon University
2017-2018: Associate Professor, Carnegie Mellon University
2016-2018: Eberly Family Career Development Professor of Biological Sciences
2012-2017: Assistant Professor, Carnegie Mellon University

Education and degrees

2008–2012: Postdoctoral researcher in laboratory of Anatol Kreitzer at the Gladstone Institute for Neurological Disease
2002–2008: University of California, San Diego; PhD, Neurosciences
Advisor: Sascha du Lac
1997–2001: Brandeis University; B.A. Neuroscience, summa cum laude

Awards and Fellowships

2018: Janett Rosenberg Trubatch Career Development Award from the Society for Neuroscience
2018: Finalist for the Science and PINS Prize for Neuromodulation
2018: Selected for Future Leaders STS Forum, Kyoto, Japan
2017: NIH Brain Initiative R01
2016: Eberly Family Career Development Professor of Biological Sciences
2013: NARSAD Young Investigator Grant
2012: Finalist for the Eppendorf & Science Prize for Neurobiology
2012: Awarded “Outstanding Postdoctoral Fellow”, Gladstone Institute of Neurological Disease
2011: NINDS K99/R00 Pathway to Independence Award 1K99NS076524-01
2010–2011: Research grant award from the Tourette Syndrome Association
2010–2013: NINDS Ruth L. Kirschstein National Research Service Award (NRSA) F32NS065641
2007: Named ARCS Scholar (Achievement Rewards for College Scientists)
2001–2002: Fulbright Fellowship (France)
2001: Elected member of Phi Beta Kappa

Publications

1. Gopinath A, Mackie P, Hashimi B, Buchanan AM, Smith AR, Bouchard R, Shaw G, Badov M, Saadatpour L, **Gittis AH**, Ramirez-Zamora A, Okun MS, Streit WJ, Hashemi P, Khoshbouei H. (2022). DAT and TH expression marks human Parkinson's disease in peripheral immune cells. *NPJ Parkinsons Dis.* 8(1): 72.
2. Albaugh DL, **Gittis AH** (2021). Stressing the Importance of Cholinergic Interneurons in Striatal Function. *Mov. Disord*, Nov. 22.
3. Spix TS, Nanivadekar S, Toong N, Isett BR, Kaplow IM, Goksen Y, Pfenning AR, **Gittis AH** (2021). Population-Specific Neuromodulation Prolongs Therapeutic Benefits of Deep Brain Stimulation. *Science*, 374(6564): 201-206.
4. Aristieta A, **Gittis AH** (2021). Distinct Globus-Pallidus Circuits Regulate Motor and Cognitive Functions. *Trends in Neuroscience.* 44(8): 597-599.
5. Nguyen KP, Sharma A, Gil-Silva M, **Gittis AH***, Chase SM*. (2021). Distinct Kinematic Adjustments over Multiple Timescales Accompany Locomotor Skill Development in Mice. *Neuroscience*, May 4.
6. Spix TS, **Gittis AH** (2020). Parkinson's Disease: Debunking an old theory. *eLife*, 9:e62694.

7. Lawler AJ, Brown AR, Bouchard RS, Toong N, Kim Y, Velraj N, Fox G, Kleyman M, Kang B, **Gittis AH**, Pfenning AR. (2020) Cell type-specific oxidative stress genomic signatures in the globus pallidus of dopamine depleted mice. *J. Neurosci.* 09 Nov.
8. Phillips RS, Rosner I, **Gittis AH**, Rubin JE. The effects of chloride dynamics on substantia nigra pars reticulata responses to pallidal and striatal inputs. (2020) *eLife*, Sep 7;9:e55592.
9. Whalen TC, Willard AM, Rubin JE, **Gittis AH**. (2020) Delta oscillations are a robust biomarker of dopamine depletion severity and motor dysfunction in awake mice. *J Neurophysiol.* Aug 1;124(2):312-329.
10. Kodama T, **Gittis AH**, Shin M, Kelleher K, Kolkman KE, McElvain L, Lam M, du Lac S. (2020) Graded Coexpression of Ion Channel, Neurofilament, and Synaptic Genes in Fast-Spiking Vestibular Nucleus Neurons. *J Neurosci.* 40(3):496-508.
11. Corbit VL, **Gittis AH**, Ahmari SE. (2019) A Model of Restraint: Nucleus Accumbens Fast-Spiking Interneurons Inhibit Unwanted Actions. *Biol Psychiatry*, 86(11):804-806.
12. Ramirez-Zamora et al. (2019) Proceedings of the Sixth Deep Brain Stimulation Think Tank Modulation of Brain Networks and Application of Advanced Neuroimaging, Neurophysiology, and Optogenetics. *Front Neurosci.* 13:936.
13. Willard AM*, Isett BR*, Whalen TC, Mastro KJ, Ki C, Mao X., **Gittis AH**. (2019) State Transitions in the SNr Predict the Onset of Motor Deficits in Models of Progressive Dopamine Depletion in Mice. *eLife*. 8e42746
14. Corbit VL, Manning L, **Gittis AH***, Ahmari SE*. (2019) Strengthened inputs from secondary motor cortex to striatum in a mouse model of compulsive behavior. *J. Neurosci.* Feb. 8: 1728-18.
15. Eisinger, RS, Cernera S, Gittis AH, Gunduz A, Okun MS. (2019) A review of basal ganglia circuits and physiology: Application to deep brain stimulation. *Parkinsonism and Related Disorders.* 59: 9-20.
16. Yttri E, **Gittis AH**. (2018) Translating insights from optogenetics to therapies for Parkinson's disease. *Curr. Opin. Biomed Engineering* 8:14-19.
17. Whalen TC, **Gittis AH** (2018) Histamine and deep brain stimulation: the pharmacology of regularizing a brain. *J. Clinical Inv.* 128(12): 5201-5202.
18. **Gittis AH**. (2018) Genetic Road Maps Pave The Way To Repair Basal Ganglia Function in Parkinson's Disease. *Science*, 361(6401): 462.
19. Corbit VL, Ahmari SE, **Gittis AH**. (2017) A Corticostriatal Balancing Act Supports Skill Learning. *Neuron* 96(2): 253-255.
20. Mastro KM, Zitelli KZ, Willard AM, LeBlanc KH, Kravitz AV, **Gittis AH**. (2017) Cell-Specific Pallidal Intervention Induces Long-Lasting Motor Recovery in Dopamine Depleted Mice. *Nature Neuroscience* 20, 815-823.
21. Corbit VL, Whalen TC, Zitelli KT, Crilly SY, Rubin JE, **Gittis AH** (2016) Pallidostriatal Projections Promote β Oscillations in a Dopamine-Depleted Biophysical Network Model. *J. Neurosci* 36(20): 5556-71.
22. Willard AM, **Gittis AH** (2015) Mapping Neural Circuits with CLARITY. *eLife* 4: e10032
23. **Gittis AH**, Brasier DJ (2015) Astrocytes Tell Neurons When to Listen Up. *Science*. 349(6249): 690-1.
24. Willard AM, Bouchard RS, **Gittis AH**. (2015) Differential Degradation of Motor Deficits During Gradual Depletion with 6-Hydroxydopamine In Mice. *Neuroscience* 301: 254-267.

25. Mastro KJ, **Gittis AH**. (2015) Striking the Right Balance: Cortical Modulation of the Subthalamic Nucleus-Globus Pallidus Circuit. *Neuron* 85(2): 233-235.
26. **Gittis AH**, Berke JD, Bevan MD, Chan CS, Mallet N, Morrow MM, Schmidt R. (2014) New Roles for the external globus pallidus in basal ganglia circuits and behavior. *J. Neurosci* 34(46): 15178-83.
27. Mastro KJ, Bouchard RS, Holt HAK, **Gittis AH**. (2014) Transgenic Mouse Lines Subdivide External Segment of the Globus Pallidus Neurons and Reveal Distinct GPe Output Pathways. *J. Neurosci* 34(6): 2087-2099.
28. Fan YJ, **Gittis AH**, Juge F, Qui C, Xu YZ, Rabinow L. Multifunctional RNA processing protein SRm160 induces apoptosis and regulates eye and genital development in Drosophila. (2014) *Genetics* 197(4): 1251-65.
29. **Gittis AH** (2012) Striatal Interneurons: causes of or cures for movement disorders? *Science* 338(6103): 59.
30. **Gittis AH**, Kreitzer, AK. (2012) Striatal Microcircuits and Disease. *Trends in Neuroscience* 35(9): 557-564.
31. **Gittis AH**, Leventhal, DK, Fensterheim BA, Pettibone JR, Berke JD, Kreitzer AC. (2011) Selective inhibition of striatal fast-spiking interneurons causes dyskinesias. *J Neurosci* 31 (44): 15727-31.
32. **Gittis AH**, Hang GB, Shoenfeld LM, Atallah B, Kreitzer A. (2011) Rapid reorganization of striatal microcircuits in a mouse model of Parkinson's disease. *Neuron* 71(5): 858-868.
33. Higley MJ, **Gittis AH**, Oldenburg IA, Balthasar N, Seal RP, Edwards RH, Lowell BB, Kreitzer AC, Sabatini BL. (2011) Cholinergic interneurons mediate fast VGluT3-dependent glutamatergic transmission in the striatum. *PLoS One* 6(4):e19155.
34. **Gittis AH**, Moghadam SH, du Lac S. (2010) Mechanisms of sustained high firing rates in two classes of vestibular nucleus neurons: Differential contributions of resurgent Na, Kv3, and BK currents. *J Neurophys* 104(3):1625-1624.
35. **Gittis AH**, Nelson AB, Kreitzer AC (2010) Distinct roles of GABAergic interneurons in the regulation of striatal output pathways. *J Neurosci* 30 (6): 2223-2234
36. **Gittis AH**, du Lac S (2008) Similar properties of transient, persistent, and resurgent Na currents in GABAergic and non-GABAergic vestibular nucleus neurons. *J Neurophys* 99(5): 2060-5.
37. **Gittis AH**, du Lac S (2007) Firing properties of GABAergic versus non-GABAergic vestibular nucleus neurons conferred by a differential balance of potassium currents. *J Neurophys* 97(6): 3986-96
38. **Gittis AH**, du Lac S (2006) Intrinsic and synaptic plasticity in the vestibular system. *Curr Opin Neurobiol* 16(4): 1-6.
39. Nelson AB, **Gittis AH**, du Lac S. (2005) Decreases in CaMKII activity trigger persistent potentiation of intrinsic excitability in spontaneously firing vestibular nucleus neurons. *Neuron* 46(4): 623-631.
40. Strachan GD, Morgan KL, Otis LL, Caltagarone J, **Gittis A**, Bowser R, Jordan-Sciutto KL. (2004) Fetal Alz-50 clone 1 interacts with the human orthologue of the Kelch-like Echinoid-associated protein. *Biochemistry* 43(38):12113-22.

Book Chapters

Gittis AH, Hooks BM, Gerfen CR (2019) "The Basal Ganglia" in Circuit Development (Section Editor Hongkui Zeng), Comprehensive Developmental Neuroscience Series, 2nd Edition (Series Editors John Rubenstein, Pasko Rakic, Bin Chen and Kenneth Kwan).

Patents

1. Sharma A, Chase SM, **Gittis AH** (2016) A split-wheel treadmill system for rodents. Provisional U.S. Patent Application No. 62/496,572
2. Mastro KJ, **Gittis AH** (2017) Cell-specific intervention strategies to prolong the prokinetic effects of deep brain stimulation. Provisional U.S. Patent Application No. US 62/600,722

3. Spix TS, **Gittis AH** (2020) US Patent Application: PCT/US21/13635. "Neuromodulation Using Electrical Stimulation." Submitted 1/15/21.

Invited Talks

2022: Opto-DBS, Geneva, Switzerland
2022: Neuromodulation Symposium, Minneapolis, MN
2022: UT San Antonio, San Antonio, TX
2022: Van Andel Institute, Grand Rapids, MI
2021: Tyler's Hope Think Tank
2021: Georgetown, Washington D.C.
2021: Panelist, Cure Parkinson's Webinar
2021: Oxford University, UK
2021: UT Southwestern, Houston TX
2021: Keynote speaker, Swedish Basal Ganglia Society Meeting
2021: European Brain and Behavior Society (EBBS) meeting (Zoom)
2021: Nature Conference: Technologies for Neuroengineering
2021: Virtual Dopamine Conference (ViDA)
2021: American College of Neuropsychopharmacology (ACNP) meeting
2021: SUNY Stony Brook, NY
2021: Parkinsonian National Day, Brazil
2021: Yale University, New Haven, CT
2020: University of Texas, El Paso
2020: Emory University, GA
2019: U. Minnesota, MN
2019: Washington University, St. Lois, MO
2019: Johns Hopkins University, Baltimore, MD
2019: UCSF, San Francisco, CA
2019: Harvard Udall Center, Harvard, MA
2019: Brandeis University, Boston, MA
2019: Catecholamines GRC, Newry, ME
2019: Parkinson's Disease GRC, Newry, ME
2019: University of Southern California, Los Angeles, CA
2019: Vollum Institute, Portland, OR
2019: North American Neuromodulation Society, Las Vegas, NV
2018: Neuromodulation: The Science, Cleveland, OH
2018: Society for Neuroscience, San Diego, CA
2018: 6th Annual DBS Think Tank, Atlanta, GA
2018: Harvard/Mass General Hospital, Boston, MA
2018: CMU alumni even, Boston, MA
2018: Chair "Basal Ganglia Development and the STN-GPe Network", Basal Ganglia GRC, Ventura, CA
2017: Neurosurgical Grand Rounds, Allegheny General Hospital, Pittsburgh, PA
2017: Molecular and Cellular Cognitive Society meeting, Washington D.C.
2017: Parkinson Foundation of Western PA, Pittsburgh, PA
2017: UCLA, Los Angeles, CA
2017: Duke University, Durham, NC
2017: Opto-DBS, Geneva, Switzerland
2017: International Basal Ganglia Society Meeting XII, Merida, Yucatan, Mexico
2017: Case Western Reserve, Cleveland, OH
2017: University of Minnesota, MN
2016: Action selection across the animal kingdom, Janelia, Ashburn, VA
2016: Dopamine 2016, Vienna, Austria
2016: Basal Ganglia Gordon Conference, Ventura, CA
2016: Department of Biological Sciences Retreat, Hidden Valley Resort, PA
2015: UCSD, San Diego, CA
2015: NIH, Bethesda, MD
2015: Brandeis University, Waltham, MA
2014: CNS workshop on Basal ganglia: Dynamics, function and learning, Quebec City, Canada
2014: SFN mini-symposium (chair), Washington D.C.
2014: FENS meeting, Milan, Italy
2013: Department of Biological Sciences Retreat, Hidden Valley Resort, PA
2013: Penn State, State College, PA
2012: Albert Einstein College of Medicine seminar, New York, NY

2012: University of Pittsburgh Neuroscience seminar, Pittsburgh, PA
2012: Department of Biological Sciences Retreat, Hidden Valley Resort, PA
2012: Synaptic Transmission Gordon Conference, Waterville Valley, NH
2012: Gladstone Retreat, San Francisco, CA
2012: Tyler's Hope Dystonia Think Tank, Gainesville, FL
2011: The Bachmann-Strauss Dystonia & Parkinson Foundation, New York, NY
2010: Youngstown State University, Youngstown, OH
2010: Westminster College, New Wilmington, PA

On-line presentations

2021: Faculty Dialogues: The Neuroscience of the Aging Brain
2018: SFN Optogenetic Program
2017: CMUThink Webinar "New Frontiers In Parkinson's Treatment"

Editorial Boards

2019 – present: eLife
2022 – present: Science Advances

Professional Committees

2022 – present: Board of Scientific Counselors (NINDS)
2020-present: Director, Program in Systems Neuroscience PhD program at CMU
2018-2022: Program Committee, Society for Neuroscience
2018-2023: Standing member, SMI Study Section
2018-present: Co-Chair, Scientific Advisory Board of Tourette Syndrome Association

Professional Memberships

2015- present: Tourette Syndrome Association Scientific Advisory Board
2011- present: Member, International Basal Ganglia Society
1997- present: Member, Society for Neuroscience

Reviewing

grants

2020: NINDS R35
2018-2023: Standing member SMI Study Section
2017-2018: Co-Chair, Scientific Advisory Board of Tourette Syndrome Association
2017: Ad Hoc Reviewer for SMI Study Section
2016: VA Merit Review Panel, Neurobiology E
2015: Early Career Reviewer for CNNT study section
2015: NSF Neuromodulation study section
2015-2017: NIH Udall Centers of Excellence for Parkinson's Disease Research
2015-present: Research grants, Tourette Syndrome Association
2014: Congressionally Directed Medical Research Programs (CDMRP)

Journals

Cell, Science, Nature, Neuron, Nature Neuroscience, Nature Medicine, Nature Communications, eLife, Current Biology, Journal of Neuroscience, Journal of Neurophysiology, Journal of Physiology, Cerebral Cortex, PLoS ONE, Journal of Clinical Investigation, European Journal of Neuroscience, Neurobiology of Disease

Grant Support

Current

CRCNS R01NS125814 (Rubin, PI & Gittis, MPI) 08/2021 - 07/2024 2.0 Calendar
NSF/NIH \$305,496
Diverse effects of GABAergic inputs on a basal ganglia output center
This is a collaborative experimental/modeling project which investigates how CI dynamics impact the physiological responses of SNr neurons to converging inputs from the GPe and striatum.

R01 NS117058 (Gittis, PI & Turner, MPI) 4/2020-02/2025 2.0 Calendar
NIH \$201,571

DBS Protocols for Long-Lasting Therapeutic Benefit in Mouse and Primate Models of Parkinson's Disease
This project seeks to develop an electrical stimulation protocol in mice and primates that can drive population-specific neuromodulation that recapitulates the circuit and behavioral features seen following selective optogenetic stimulation of the GPe in Parkinsonian mice.

R01 NS104835 (Gittis) 9/1/2017-8/31/2022 2.0 Calendar
NIH \$250,000
Delineating Cell-Specific Output Pathways of the GPe That Support Long-Lasting Behavioral Recovery In Dopamine Depleted mice
This project will investigate the anatomical and functional output pathways of the GPe and their role in supporting long-lasting behavioral rescue in an acute model of dopamine depletion.

R01 NS101016 (Gittis) 4/1/2018-3/31/2023 2.0 Calendar
NIH \$218,750
Circuit Mechanisms Underlying Long-lasting Recovery of Movement in Dopamine Depleted Mice Induced by Optogenetic Intervention in the GPe
This project examines whether circuit dysfunction and behavioral rescue observed in acutely depleted mice translate to chronic models of dopamine depletion.

(Gittis, PI & Wang, Co-PI) 10/2019-7/2022 0.5 Calendar
Michael J. Fox Foundation 17586 \$73,734
Preclinical Testing of Novel DBS Protocol for Long-Lasting Therapeutic Effects
This project will pilot the in vivo efficacy of DBS protocols designed to drive population-specific neuromodulation.

(Gittis) N/A 0.5 Calendar
Highmark \$19,830
DHTI: Gradual depletion model to explore time points for intervention
This proposal is to develop a gradual depletion Parkinson's mouse model to identify critical time points for therapeutic intervention.

Training Grants

T32NS126122 (Gittis)
Training Program in Big Data Systems Neuroscience
This training grant will hold 4 slots for PhD students that want to receive training in combined experimental and computational techniques in systems neuroscience.