Nelson Spruston

Curriculum Vitae, September 2022

Present Position

Senior Director, Scientific Programs; Laboratory Head
Janelia Research Campus, Howard Hughes Medical Institute
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Personal Data

Born: May 27, 1963; Vancouver, B.C., Canada
Citizenship: American and Canadian
Family: Married, three adult children

Education and Training

1981-1985	University of British Columbia; Vancouver, B.C. B.Sc. (Honors), Physiology, 1985
1985-1991	Baylor College of Medicine; Houston, Texas Ph.D., Division of Neuroscience; Advisor: Dr. Daniel Johnston
August 1990	Methods in Computational Neuroscience course Marine Biological Laboratory, Woods Hole, MA
June-Aug. 1991	Grass Fellowship Marine Biological Laboratory, Woods Hole, MA
1991-1995	Postdoctoral Fellow, Department of Cell Physiology Max Planck Institute for Medical Research; Advisor: Prof. Bert Sakmann

Research Interests

Synaptic integration, dendritic computation, plasticity, and cellular organization of the hippocampus. Long-term goals: contribute to an understanding of the cellular, synaptic, molecular, and circuit basis of computations underpinning memory-guided behavior.

Research Experience

1984-1985	Undergraduate research, University of British Columbia, Vancouver, Canada
1985-1991	Ph.D. thesis research, Baylor College of Medicine, Houston, Texas, USA
1992-1995	Postdoctoral research, Max Planck Institute, Heidelberg, Germany
1995-2011	Faculty, Northwestern University, Evanston, Illinois, USA
2011-present	Laboratory Head, HHMI Janelia Research Campus, Ashburn, Virginia, USA

Leadership Experience

2017-present	Senior Director, Scientific Programs; Laboratory Head; HHMI Janelia
2011-2017	Scientific Program Director; Laboratory Head; HHMI Janelia

- Scientific priority development and oversight of Group Leader and Fellow recruitment
- Oversight of reviews for group leaders and fellows (~50 labs)
- Oversight of student programs (~20 graduate and ~20 undergraduate students)

- Oversight of visiting scientist program (~100 visitors per year)
- Oversight of conference program (~20 conferences and workshops per year)
- Senior leadership on project team steering committees (esp. MouseLight and GENIE)
- Advising scientists on scientific and career-related issues (~350 scientists at all levels)
- Conflict resolution
- Institutional budgeting
- Website development
- Direct reports:
    - Erik Snapp, Director, Student and Postdoctoral Programs
    - Zarixia Zavala-Ruiz, Director, Visiting Scientist and Recruitment Programs
    - Janine Stevens, Director, Conferences and Workshop Programs
    - Caiying Guo, Director, Gene Targeting and Transgenic Resources
    - Four Fellows at Janelia (independent of my lab)
    - Six postdoctoral fellows in my lab

2009-2011 Department Chair, Neurobiology, Northwestern University

- Led a department of 15 faculty members
- Oversight of research priorities and faculty recruitment
- Oversight of faculty teaching and space assignments
- Oversight of tenure review for faculty members
- Mentoring junior faculty
- Liason to administration (e.g., dean, provost, president, other department chairs)
- Development and oversight of inter-departmental graduate and undergraduate programs

Positions

2017-present	Senior Director, Scientific Programs; Laboratory Head HHMI Janelia Research Campus
2011-2017	Scientific Program Director and Laboratory Head HHMI Janelia Research Campus
2009-2011	Dept. Chair, Martin J. and Patricia Koldyke Outstanding Teaching Professor Department of Neurobiology & Physiology Northwestern University
2006-2009	Professor, Department of Neurobiology & Physiology Northwestern University
2001-2006	Associate Professor, Department of Neurobiology & Physiology Northwestern University
1995-2001	Assistant Professor, Department of Neurobiology & Physiology Northwestern University

Fellowships, Honors, and Awards

2013-present	Fellow of the American Association for the Advancement of Science
2009-2011	Martin J. and Patricia Koldyke Outstanding Teaching Professor
2007-2009	NARSAD Distinguished Investigator Award, Brain and Behavior Res. Found.
1999-2004	NSF Career Award
1998	Klingenstein Fellowship in the Neurosciences
1998	Krieg Cortical Explorer Prize, Cajal Club
1996-1998	Alfred P. Sloan Fellow, Northwestern University
1996	Fellowship Award for the Winter Conference on Brain Research
1994-1995	Max-Planck Fellow, Heidelberg, Germany

1992-1993	Alexander von Humboldt Fellow, Heidelberg, Germany
1991	Grass Fellow in Neurophysiology, Marine Biological Lab, Woods Hole, MA
1990, 1987	Outstanding Presentation, Neuroscience Symposium, Baylor Col. Medicine
1987	Minoru Suzuki Award for Excellence in Neuroscience, Baylor Col. Medicine
1985	Graduate, First Class, Honors, Dept. Physiology, Univ. British Columbia

Additional Information

Additional professional information is listed following publications.

Publications: Theses

1. *Patch-clamp analysis of the passive membrane properties of three classes of hippocampal neurons*. Spruston N. (1992) Ph.D. dissertation, Baylor College of Medicine.
2. *Purification and characterization of new intestinal smooth muscle contractile peptides.* Spruston, N. (1985) Undergraduate honors thesis, University of British Columbia.

Publications: Special Projects

1. *Dendrites*, 3rd edition. Stuart G, Spruston N, Häusser M, eds., Oxford University Press, 2016. (book)
2. *BigNeuron: large-scale 3D neuron reconstruction from optical microscopy images*. Peng H, Hawrylycz M, Roskams J,1 Hill S, Spruston N, Meijering E, Ascoli GA. Neuron, 87:252-256, 2015.
3. *Pyramidal neuron.* Spruston N, Scholarpedia, 4(5):6130, 2009. (online resource: www.scholarpedia.org/article/Pyramidal_neuron)
4. *Dendrites*, 2nd edition, Stuart G, Spruston N, Häusser M, eds. Oxford University Press, 2008. (book)
5. *Somato-dendritic Integration: Dendritic Integration.* Spruston N. The New Encyclopedia of Neuroscience, edited by Larry Squire et al, Elsevier, 2008. (electronic resource)
6. *Dendritic patch-clamp recording.* Davie JT, Kole MH, Letzkus JJ, Rancz EA, Spruston N, Stuart GJ, Häusser M. Nature Protocols, 1:1235-1247, 2006. (experimental protocol)
7. *Dendrites*, 1 st edition. Stuart G, Spruston N, Häusser M, eds. Oxford University Press, 1999. (book)
8. *Dendrites: bringing it all together.* Cline H, Spruston N, eds. Journal of Neurobiology, July, 2005. (special issue)

Publications: Reviews, Chapters, and Commentaries

1. *Linking axon morphology to gene expression: a strategy for neuronal cell-type classification*. Winnubst J, Spruston N, Harris JA. Current Opinion in Neurobiology, 65:70-76, 2020.
2. *Heterogeneity within classical cell types is the rule: lessons from hippocampal pyramidal neurons.* Cembrowski MS, Spruston N. Nature Reviews Neuroscience, Feb. 18, 2019.
3. *Illuminating the neuronal architecture underlying context in fear memory.* Cembrowski MS, Spruston N. Cell, 167:888-9, 2016.
4. *Dendritic integration.* Spruston N, Häusser M, Stuart G. In: Dendrites, 3rd edition, Stuart G, Spruston N, Häusser M, eds. Oxford University Press, pp. 351-398, 2016.
5. *Conclusion: the future of dendrite research.*Häusser M, Spruston N, Stuart G. In: Dendrites, 3rd edition, Stuart G, Spruston N, Häusser M, eds. Oxford University Press, pp. 703-707, 2016.

6. *Dendritic integration: 60 years of progress.* Stuart GJ, Spruston N. Nature Neuroscience, 18:1713-1721, 2016.
7. *Assembling cell ensembles.* Spruston N. Cell, 157:1502-1504, 2014.
8. *Information processing in dendrites and spines.* Spruston N, Häusser M, Stuart G. In: Fundamental Neuroscience, 231-260, Elsevier, 2013.
9. *Questions about STDP as a general model of synaptic plasticity.* Lisman J, Spruston N. Frontiers in Neuroscience, 2:140, 1-5, 2010.
10. *Timing isn't everything.* Spruston N, Cang J. Nature Neuroscience 13:277-279, 2010.
11. *Out of control in the dendrites.* Spruston N, Johnston D. Nature Neuroscience, 11:733-4, 2008.
12. *Neuroscience: strength in numbers.* Spruston N. Nature, 452:420-1, 2008.
13. *Pyramidal neurons: dendritic structure and synaptic integration.* Spruston N. Nature Reviews Neuroscience, 9:206-221, 2008.
14. *Somato-dendritic Integration: Dendritic Integration.* Spruston N. In: The New Encyclopedia of Neuroscience, edited by Larry Squire et al, Elsevier, 2008.
15. *Dendritic integration.* Spruston N, Häusser M, Stuart G. In: Dendrites, 2nd edition, Stuart G, Spruston N, Häusser M, eds. Oxford University Press, 2008.
16. *Conclusion: the future of dendrite research.* Häusser M, Spruston N, Stuart G. In: Dendrites, 2nd edition, Stuart G, Spruston N, Häusser M, eds. Oxford University Press, 2008.
17. *Chapter 5: Structural and functional properties of hippocampal neurons.* Spruston N, McBain C. In: The Hippocampus Book, Andersen P, Morris R, Amaral D, Bliss T, O'Keefe J, eds. Oxford University Press, pp. 133-201, 2007.
18. *Postsynaptic depolarization requirements for LTP and LTD: a critique of spike timing dependent plasticity.* Lisman J, Spruston N. Nature Neuroscience, 8:839-841, 2005.
19. *Introduction: Overview of dendrites.* Cline H, Spruston N. Journal of Neurobiology, 64:1-3, 2005.
20. *Peering into the dendritic machinery of striatal medium spiny neurons.* Surmeier DJ, Spruston N. Neuron. 44:401-402, 2004.
21. *Dendritic arithmetic.* Spruston N, Kath WL. Nature Neuroscience, 7:567-569, 2004.
22. *Branching out: a new idea for dendritic function.* Spruston N. Journal of Neurophysiology, 90:2887-2888, 2003
23. *Axonal gap junctions send ripples through the hippocampus.* Spruston N. Neuron 31:669-671, 2001.
24. *Diversity and dynamics of dendritic signaling.* Häusser M, Spruston N, Stuart G. Science, 290:739-744, 2000.
25. *Distant synapses raise their voices.* Spruston N. Nature Neuroscience, 3:849-851, 2000.
26. *Dendritic integration.* Spruston N, Häusser M, Stuart G. In: Dendrites, 1st edition, Stuart G, Spruston N, Häusser M, eds. Oxford University Press, pp. 231-270, 1999.
27. *Conclusion: the future of dendrite research.* Häusser M, Spruston N, Stuart G. In: Dendrites, 1st edition, Stuart G, Spruston N, Häusser M, eds. Oxford University Press, 1999.
28. *Slow sodium channel inactivation in CA1 pyramidal cells.* Mickus T, Jung H, Spruston N. In: Molecular and functional diversity of Ion Channels and Receptors. B. Rudy and P. Seeburg, eds. Annals of the New York Academy of Sciences, 868:97-101, 1999.
29. *Gamma-frequency oscillations: a neuronal population phenomenon regulated by synaptic and intrinsic cellular processes, and inducing synaptic plasticity.* Traub RD, Spruston N, Soltesz I, Konnerth A, Whittington MA, Jefferys JGR. Progress in Neurobiology, 55:563-575, 1998.

30. *Changes in dendritic structure and function following hippocampal lesions: correlations with developmental events?* Bulinski JC, Ohm T, Roder H, Spruston N, Turner DA, Wheal HV. Progress in Neurobiology, 55:641-650, 1998.
31. *Action potential initiation and backpropagation in neurons of the mammalian central nervous system*. Stuart G, Spruston N, Sakmann B, Häusser M. Trends in Neurosciences, 20:125-131, 1997.
32. *Cracking the neuronal code*. Ferster D, Spruston N. Science, 270:756–757, 1995.
33. *Probing dendritic function with patch pipettes*. Stuart G, Spruston N. Current Opinion in Neurobiology, 5:389–394, 1995.
34. *Dendritic attenuation of synaptic potentials and currents: the role of passive membrane properties*. Spruston N, Jaffe DB, Johnston D. Trends in Neurosciences, 17:161–166, 1994.
35. *Mechanisms shaping glutamate-mediated excitatory postsynaptic currents in the CNS*. Jonas P, Spruston N. Current Opinion in Neurobiology, 4: 366–372, 1994.
36. *Acutely exposed hippocampal neurons: A preparation for patch clamping neurons from adult hippocampal slices*. Gray R, Fisher R, Spruston N, Johnston D. In: In Vitro Preparations From Vertebrate Nervous Systems. Jahnsen, H. (ed.), John Wiley: England, 3–24, 1990.

Publications: Original Research

Preprints of unpublished work (preprints of published papers listed after publications):

1. *Organizing memories for generalization in complementary learning systems*. Sun W, Advani M, Spruston N, Saxe A, Fitzgerald J. bioRxiv, Oct. 2021. (>3000 downloads to date)

Published papers:

1. *Rapid synaptic plasticity contributes to a learned conjunctive code of position and choice-related information in the hippocampus*. Zhao X, Hsu CL, Spruston N. Neuron, 110:96-108, 2022.
2. *Hippocampal and thalamic afferents form distinct synaptic microcircuits in the mouse infralimbic frontal cortex.* Graham K, Spruston N, Bloss EB. Cell Reports, online Oct. 2021.
3. *Membrane potential dynamics underlying context-dependent sensory responses in the hippocampus*. Zhao X, Wang Y, Spruston N, Magee JC. Nature Neuroscience, 23:881-891, 2020.
4. *A Sparse, spatially biased subtype of mature granule cell dominates recruitment in hippocampal-associated behaviors*. Erwin SR, Sun W, Copeland M, Lindo S, Spruston N, Cembrowski MS. Cell Reports, 31:107551, 2020.
5. *Transcriptional corepressor SIN3A regulates hippocampal synaptic plasticity via Homer1/mGluR5 signaling*. Bridi M, Schoch H, Florian C, Poplawski SG, Banerjee A, Hawk JD, Porcari GS, Lejards C, Hahn CG, Giese KP, Havekes R, Spruston N, Abel T. JCI Insight, 5(5):e92385, 2020.
6. *Open-source software for efficient and accurate reconstruction of dendritic morphology*. Jin DZ, Zhao T, Hunt DL, Pearcy R, Hsu CL, Spruston N. ShuTu: Frontiers in Bioinformatics, 13,68:1-19, 2019.
7. *Functional clustering of dendritic activity during decision-making*. Kerlin A, Mohar B, Flickinger D, MacLennan BJ, Davis C, Spruston N, Svoboda K. eLife, 8:e46966, 2019.
8. *Reconstruction of 1,000 projection neurons reveals new cell types and organization of long-range connectivity in the mouse brain*. Winnubst J, Bas E, Ferreira TA, Wu Z, Economo MN, Edson P, Arthur BJ, Bruns C, Rokicki K, Schauder D, Olbris DJ, Murphy SD, Ackerman DG,

Arshadi C, Baldwin P, Blake R, Elsayed A, Hasan M, Ramirez D, Dos Santos B, Weldon M, Zafar A, Dudman JT, Gerfen CR, Hantman AW, Korff W, Sternson SM, Spruston N, Svoboda K, Chandrashekar J. Cell, 179:268-281, 2019.

9. *Mapping the transcriptional diversity of genetically and anatomically defined cell populations in the mouse brain*. Sugino K, Clark E, Schulmann A, Shima Y, Wang L, Hunt DL, Hooks, BM, Tränkner D, Chandrashekar J, Picard S, Lemire A, Spruston N, Hantman A, Nelson S. eLife, 8:e38619.
10. *The subiculum is a patchwork of discrete subregions*. Cembrowski MS, Wang L, Lemire AL, Copeland M, DiLisio SF, Clements J, Spruston N. eLife, Nov. 2018.
11. *Astrocytes integrate and drive action potential firing in inhibitory subnetworks astrocytes integrate and drive neural activity*. Deemyad T, Lüthi J, Spruston N. Nature Communications, 9:4336, 2018.
12. *Voltage dependence of spatial coding in hippocampal pyramidal neurons mediated by persistent sodium current*. Hsu CL, Zhao X, Milstein A, Spruston N. Neuron, 99:1-16, 2018.
13. *A novel pyramidal cell-type triggers sharp-waves in the hippocampus*. Hunt DL, Linaro D, Si B, Romani S, Spruston N. Nature Neuroscience, 21:985-995, 2018.
14. *Dissociable structural and functional hippocampal outputs via distinct subiculum cell classes*. Cembrowski MS, Phillips MG, DiLisio SF, Shields BC, Winnubst J, Chandrashekar J, Bas E, Spruston N. Cell, 173:1-13, 2018.
15. *Single excitatory axons form clustered synapses onto CA1 pyramidal cell dendrites*. Bloss EB, Cembrowski MS, Karsh B, Colonell J, Fetter RD, Spruston N. Nature Neuroscience, 15:353-363, 2018.
16. *Integrating results across methodologies is essential for producing robust neuronal taxonomies*. Cembrowski MS, Spruston N. Neuron, 94:747-751, 2017.
17. *Brain derived neurotrophic factor differentially modulates excitability of two classes of hippocampal output neurons.* Graves AR, Moore SJ, Spruston N, Tryba AK, Kaczorowski CC. Journal of Neurophysiology, 116: 466-71, 2016.
18. *Hipposeq: a comprehensive RNA-seq database of gene expression in hippocampal principal neurons*. Cembrowski MS, Wang L, Sugino K, Shields BC, Spruston N. Elife, 5:e14997, 2016.
19. *Structured dendritic inhibition supports branch-selective integration in CA1 pyramidal cells*. Bloss EB, Cembrowski MS, Karsh B, Colonell, Fetter RD, Spruston N. Neuron, 89:1016-1030, 2016.
20. *Spatial gene expression gradients underlie prominent heterogeneity of CA1 pyramidal neurons*. Cembrowski MS, Bachman JL, Wang L, Sugino K, Shields BC, Spruston N. Neuron, 89:351-368, 2016.
21. *Dendritic sodium spikes are required for long-term potentiation at distal synapses on hippocampal pyramidal neurons*. Kim Y, Hsu CL, Cembrowski MS, Mensh BD, Spruston N. eLife, 4:e06414, 2015.
22. *Age-dependent changes in intrinsic neuronal excitability in subiculum after status epilepticus*. Chung S, Spruston N, Koh S. PLoS One, 10(3): e0119411, 2015.
23. *Balanced synaptic impact via distance-dependent synapse distribution and complementary expression of AMPARs and NMDARs in hippocampal dendrites*. Menon V, Musial TF, Liu A, Katz Y, Kath WL, Spruston N, Nicholson D. Neuron, 80:1451-63, 2013.

24. *Mechanisms of retroaxonal barrage firing in hippocampal interneurons.* Sheffield ME, Edgerton G, Heuermann RJ, Deemyad T, Mensh BD, Spruston N. J Physiology, 591: 4793-805, 2013.
25. *Hippocampal pyramidal neurons comprise two distinct cell types that are countermodulated by metabotropic receptors.* Graves AR, Moore SJ, Bloss EB, Mensh BD, Kath WL, Spruston N. Neuron, 76:776-789, 2012.
26. *Synaptic amplification by dendritic spines enhances input cooperativity.* Harnett MT, Makara JK, Spruston N, Kath WL, Magee JC. Nature, 491:599-602, 2012.
27. *Synergistic actions of metabotropic acetylcholine and glutamate receptors on the excitability of hippocampal CA1 pyramidal neurons.* Park J, Spruston N. Journal of Neuroscience, 32:6081-6091, 2012.
28. *Target-specific output patterns can be predicted by the distribution of regular-spiking and bursting pyramidal neurons in the subiculum.* Kim Y, Spruston N. Hippocampus, 22:693-706, 2012.
29. *Slow integration leads to persistent action potential firing in distal axons of coupled interneurons.* Sheffield MEJ, Best TK, Mensh BD, Kath WL, Spruston N. Nature Neuroscience, 14:200-207, 2011.
30. *A post-burst afterdepolarization is mediated by group I metabotropic glutamate receptor-dependent upregulation of $Ca_v2.3$ R-type calcium channels in CA1 pyramidal neurons.* Park J, Remy S, Varela J, Cooper DC, Chung S, Kang H, Lee J, Spruston N. PLoS Biology, 8(11): 1-17, 2010.
31. *A state-mutating genetic algorithm to design ion-channel models.* Menon V, Spruston N, Kath WL. Proc. Natl. Acad. Sci. U.S.A., 106:16829-16834, 2009.
32. *Synapse distribution suggests a two-stage model of dendritic integration in CA1 pyramidal neurons.* Katz Y, Menon V, Nicholson D, Geinisman Y, Kath WL, Spruston N. Neuron, 63:171-177, 2009.
33. *Synaptic depolarization is more effective than back-propagating action potentials during Induction of associative long-term potentiation in hippocampal pyramidal neurons.* Hardie J, Spruston N. Journal of Neuroscience, 29:3233-3241, 2009.
34. *Plasticity of burst firing induced by synergistic activation of metabotropic glutamate and acetylcholine receptors.* Moore S, Cooper DC, Spruston N. Neuron, 61:287-300, 2009.
35. *Compartmental neural simulations with spatial adaptivity.* Rempe M, Spruston N, Kath WL, Chopp D. Journal of Computational Neuroscience, 25:465-480, 2008.
36. *The distribution of bursting neurons in the CA1 region and the subiculum of the rat hippocampus.* Jarsky T, Mady R, Kennedy B, Spruston, N. Journal of Comparative Neurology, 506:535-547, 2008.
37. *Coincidence detection of place and temporal context in a network model of spiking hippocampal neurons.* Katz Y, Kath WL, Spruston N, Hasselmo ME. PLoS Computational Biology, 3:e234-248, 2007.
38. *Dendritic spikes induce single-burst long-term potentiation.* Remy S, Spruston N. Proceedings of the National Academy of Sciences USA, 104:17192-17197, 2007.
39. *Dendritic D-type potassium currents inhibit the spike afterdepolarization in rat hippocampal CA1 pyramidal neurons.* Metz AE, Spruston N, Martina M. Journal of Physiology, 581:175-187, 2007.

40. *Stability and plasticity of intrinsic membrane properties in hippocampal CA1 pyramidal neurons: effects of internal anions.* Kaczorowski CC, Disterhoft JF, Spruston N. Journal of Physiology, 578:799-818, 2007.
41. *Distance-dependent differences in synapse number and AMPA receptor expression in hippocampal CA1 pyramidal neurons.* Nicholson D, Katz Y, Trana R, Kath WL, Spruston N, Geinisman Y. Neuron, 50:431-442, 2006.
42. *Conditional dendritic spike propagation following distal synaptic activation of hippocampal CA1 pyramidal neurons.* Jarsky T, Roxin A, Kath WL, Spruston N. Nature Neuroscience, 8: 1667-1676, 2005.
43. *Factors mediating powerful voltage attenuation along CA1 dendrites.* Golding N, Mickus T, Katz Y, Kath WL, Spruston N. Journal of Physiology, 568:69-82, 2005.
44. *Output-mode transitions controlled by prolonged inactivation of sodium channels in pyramidal neurons of subiculum.* Cooper DC, Chung S, Spruston N. PLoS Biology, 3:1123-1129, 2005.
45. *R-type calcium channels produce an afterdepolarization and bursting in hippocampal CA1 pyramidal neurons.* Metz A, Jarsky T, Martina M, Spruston N. Journal of Neuroscience, 25:5763-5773, 2005.
46. *Psychostimulant-induced plasticity of intrinsic neuronal excitability in ventral subiculum.* Cooper DC, Moore SJ, Staff NP, Spruston N. Journal of Neuroscience, 23:9937-9946, 2003.
47. *Intracellular correlate of EPSP-spike potentiation in CA1 pyramidal neurons is controlled by GABAergic modulation.* Staff NP, Spruston N. Hippocampus, 13:801-805, 2003.
48. *Dendritic spikes as a mechanism for cooperative long-term potentiation.*Golding N, Staff NP, Spruston N. Nature, 418:326-331, 2002.
49. *Serotonin receptor activation inhibits sodium current and dendritic excitability in prefrontal cortex via a PKC-dependent mechanism.* Carr B, Cooper DC, Ulrich SL, Tkatch T, Spruston N, Surmeier DJ. Journal of Neuroscience, 22:6846-6855, 2002.
50. *Dichotomy of action potential backpropagation in CA1 pyramidal neurons.* Golding NL, Kath WL, Spruston N. Journal of Neurophysiology, 86:2998-3010, 2001.
51. *Action potential bursting in subicular pyramidal neurons is driven by a calcium tail current.* Jung H, Staff NP, Spruston N. Journal of Neuroscience, 21:3312-3321, 2001.
52. *Resting and active membrane properties of pyramidal neurons in subiculum and CA1 of rat hippocampus.* Staff NP, Jung H, Thiagarajan T, Yao M, Spruston N. Journal of Neurophysiology, 84:2398-2408, 2000.
53. *Dendritic calcium spike initiation and repolarization are controlled by distinct potassium channel subtypes in CA1 pyramidal neurons.* Golding NL, Jung H, Mickus T, Spruston N. Journal of Neuroscience, 19:8789-8798, 1999.
54. *Properties of slow, cumulative sodium channel inactivation in rat hippocampal CA1 pyramidal cells.* Mickus T, Jung H, Spruston N. Biophysical Journal, 76:846-860, 1999.
55. *Dendritic sodium spikes are variable triggers of axonal action potentials in hippocampal CA1 pyramidal neurons.* Golding NL, Spruston N. Neuron, 21:1189-1200, 1998.
56. *Determinants of voltage attenuation in neocortical pyramidal neuron dendrites.* Stuart G, Spruston N. Journal of Neuroscience, 18:3501-3510, 1998.

57. *Specialized electrophysiological properties of anatomically identified neurons in the hilar region of the rat fascia dentata.* Lübke J, Frotscher M, Spruston N. Journal of Neurophysiology, 79:1518-1534, 1998.
58. *Prolonged sodium channel inactivation contributes to dendritic action potential attenuation in hippocampal pyramidal neurons.* Jung H, Mickus T, Spruston N. Journal of Neuroscience, 17:6639-6646, 1997.
59. *Interneurons in the stratum lucidum of the hippocampus: an anatomical and electrophysiological characterization.* Spruston N, Lübke J, Frotscher M. Journal of Comparative Neurology, 385:427-440, 1997.
60. *Activity-dependent action potential invasion and calcium influx into hippocampal CA1 dendrites.* Spruston N, Schiller Y, Stuart G, Sakmann B. Science, 268:297–300, 1995.
61. *Dendritic glutamate receptor channels in rat hippocampal CA3 and CA1 pyramidal neurons.* Spruston N, Jonas P, Sakmann, B. Journal of Physiology (Lond.), 482:325-352, 1995.
62. *Voltage- and space-clamp errors associated with measurement of electrotonically remote synaptic events.* Spruston N, Jaffe DB, Williams SW, Johnston D. Journal of Neurophysiology, 70: 781–802, 1993.
63. *Perforated patch-clamp analysis of the passive membrane properties of three classes of hippocampal neurons.* Spruston N, Johnston D. Journal of Neurophysiology, 67: 508-529, 1992.
64. *Cyclic nucleotide-mediated modulation of the pyloric motor pattern in the stomatogastric ganglion of the crab.* Spruston N, Nusbaum M. Cancer borealis. Biological Bulletin, 181: 329-330, 1991.
65. *Isolation from porcine intestinal extracts of a cholecystokinin-like peptide and a peptide with homology to cytochrome oxidase polypeptide VII and chymodenin.* McIntosh CH, Dahl MA, Kwok YN, Mutt V, Spruston N, Brown JC. Canadian Journal of Physiology and Pharmacology, 66:1407-1414, 1988.

Preprints: Subsequently published as original research articles listed above

1. *Rapid synaptic plasticity contributes to a learned conjunctive code of position and choice-related information in the hippocampus.* Zhao X, Hsu CL, Spruston N. bioRxiv, July 2021.
2. *Hippocampal and thalamic afferents form distinct synaptic microcircuits in the mouse frontal cortex.* Graham K, Spruston N, Bloss E. bioRxiv, March 2021.
3. *A sparse, spatially biased subtype of mature granule cell is preferentially recruited in hippocampal-associated behaviors.*Erwin SR, Sun W, Copeland M, Lindo S, Spruston N, Cembrowski MS. bioRxiv, Oct. 2019.
4. *Synaptic mechanisms of context-dependent sensory responses in the hippocampus.* Zhao X, Wang Y, Spruston N, Magee J. bioRxiv, May 2019.
5. *Functional clustering of dendritic activity during decision-making.* Kerlin A, Mohar B, Flickinger D, MacLennan BJ, Davis C, Spruston N, Svoboda K. bioRxiv, Oct. 2018, https://www.biorxiv.org/content/early/2018/10/10/440396.
6. *ShuTu: Open-source software for efficient and accurate reconstruction of dendritic morphology.* Jin DZ, Zhao T, Hunt DL, Pearcy R, Hsu CL, Spruston N. bioRxiv, Nov. 2017, https://doi.org/10.1101/226548.

7. *The Transcriptional Logic of Mammalian Neuronal Diversity.* Sugino K, Clark E, Schulmann A, Shima Y, Wang L, Hunt DL, Hooks BM, Trankner D, Chandrashekar J, Picard S, Lemire A, Spruston N, Hantman A, Nelson S. bioRxiv, Nov. 2017, https://doi.org/10.1101/208355.
8. *Astrocytes integrate and drive neural activity.* Deemyad T, Lüthi J, Spruston N. bioRxiv, Mar. 2018, https://doi.org/10.1101/282764.
9. *Reconstruction of 1,000 projection neurons reveals new cell types and organization of long-range connectivity in the mouse brain.*Winnubst J, Bas E, et al., Spruston N, Svoboda K, Chandrashekar J. bioRxiv, Feb. 2019, https://doi.org/10.1101/537233.

Research Funding

2011-present	The Spruston lab is exclusively funded by HHMI (~$1.2M per year; Janelia does not allow any funding from outside sources).
2011	"CRCNS: Collaboration on high-resolution maps of synapses on hippocampal neurons", National Institutes of Health (NINDS R01, PIs: Spruston, Kath, Smith, Remy; grant continued to 2014 without Spruston as a collaborator instead of a PI because of Janelia rules).
2002-2011	"Modeling realistic microcircuits of hippocampal neurons" National Institutes of Health (NINDS R01, PI: Spruston)
1996-2011	"Synaptic integration and propagation in CA1 dendrites" National Institutes of Health (NINDS R01, PI: Spruston)
2006-2011	Two-Photon Imaging Center (NIH/NINDS Institutional P30, PI: Surmeier, Co-I: Spruston)
2003-2011	"Neurobiology of Information Storage" (NIH/NIMH training grant, PI: Routtenberg, Co-Director: Spruston)
2010-2013	NIH National Research Service award to Austin Graves
2007-2009	NARSAD Distinguished Investigator Award
2006-2009	NIH National Research Service award to Jason Hardie
2002-2005	NIH National Research Service award to Alexia Metz
2002-2005	NIH National Research Service award to Tim Jarsky
2000-2003	NIH National Research Service award to Don Cooper
2000-2004	NIH National Research Service award to Nathan Staff
1999-2009	"Slow outward currents and learning in aging hippocampus" National Institutes of Health (NIA R01, PI: John Disterhoft, Co-I: Spruston)
1998-2001	NIH National Research Service award to Nace Golding
1996-1999	Human Frontiers in Science Program

Teaching Activities

2018-present	Founder and Director, ChIRP training program, Janelia
1996-2009	Instructor (sole), Fundamentals of Neurobiology (undergraduate)
2008	Instructor, Great Experiments in Neurophysiology (graduate)
2001-2005	Co-director, Ion Channel Physiology course, Cold Spring Harbor Lab
1999-2004	Instructor, Fundamentals of Neuroscience (Cell & Molecular Neuro.)
1987-1999	Several other courses (full list available on request)

Committees & Administrative Activities

Janelia Research Campus, Howard Hughes Medical Institute

2017-present	Senior Scientific Director, Scientific Programs

2011-2017 Scientific Program Director
2017-2019 Diversity, Equity, and Inclusion working group, HHMI
2019-2020 Co-chair and founder, Diversity, Equity, and Inclusion committee, Janelia
2014-present GENIE Steering Committee
2014-present MouseLight Steering Committee
2013-2016 Neuroseq Steering Committee

Department of Neurobiology & Physiology, Northwestern University

2009-2011 Department Chair
2006-2007 Faculty Search Committee
2005-2006 Faculty Search Committee
2004-2005 Faculty Search Committee
2003-2004 Faculty Search Committee
2001-2006 Seminar Committee (Chair)
1996-2009 Appointment Review Committee
1995-1996 Faculty Search Committee
1997-1999 Seminar Committee (Chair)
1997-1999 Department Future Committee

Institute for Neuroscience, Northwestern University

2006-2009 Member, NUIN Advisory Board
1999-2004 Chair, Curriculum Committee
1998-2003 Student Advisory Committee, NUIN
1997-2004 Graduate Admissions Committee

Weinberg College of Arts & Sciences, Northwestern University

2005-2007 Tenure Committee
2003-2004 Chemistry of Life Processes Planning Committee
2001-2005 Committee on Superior Students and Honors
1999 Life Science Vision Committee
1997 Life Science Core Facilities Committee

Office of Research, Northwestern University

2003-2009 Instrument Shop Committee
2003-2004 Research Effort Reporting Committee
2002-2003 Research Roles and Responsibilities Committee

Other Departments and Programs, Northwestern University

2007-present Presidential Fellowship Committee
1998-present Review Committee, Undergraduate Program in Biological Science
1999-2000 Faculty Search Committee, Dept. Biochemistry, Mol. Biol., and Cell Biology
1997-2004 Admissions Committee, Medical Scientist Training Program
1997-1998 Graduate Admissions Committee, Interdepartmental Program in Biol. Sci.

Advisory Panels and Program Review

2018-present Scientific Advisory Board, Chan Zuckerberg Initiative, Human Cell Atlas
2016-2017 Scientific Advisory Board, Max Planck Florida Institute, Jupiter, Florida, USA
April 2014 University of Toronto, Faculty of Medicine, Canada
2014-present Rheinische Friedrich-Wilhelms-Universität Bonn, Germany
2011 Univ. Texas Southwestern, Neuroscience Program, Dallas, Texas, USA

Professional Development Workshops

April 2014	Leading Through Communication, Linkage, Inc.
April 2014	Collaborative Leadership, Glaser & Associates, Inc.
January 2014	Improvisation for Scientists, Alan Alda Center for Communicating Science

Students and Postdocs Supervised

*Former students and postdocs (highlights only)**

Xinyu Zhao, Ph.D.	Postdoctoral fellow, 2011-2021; currently Asst. Prof. at Tsinghua University
Ching-Lung Hsu, Ph.D.	Postdoctoral fellow, 2011-2020; currently Asst. Research Fellow at Academia Sinica, Taiwan, link
David Hunt, Ph.D.	Postdoctoral fellow, 2012-2020; currently Asst. Prof. at Cedars Sinai, Los Angeles, CA, USA, link
Erik Bloss, Ph.D.	Postdoctoral fellow, 2012-2020; currently Asst. Prof. at Jackson Laboratory, Bar Harbor, ME, USA, link
Mark Cembrowski, Ph.D.	Postdoc, 2012-2018; currently Assistant Prof. at Univ. British Columbia, Vancouver, BC, Canada, link
Stefan Remy, M.D.	Postdoc, 2005-07; currently Director, Leibniz-Institut für Neurobiologie, Magedburg, Germany, link
Yael Katz, Ph.D.	Graduate student, 2004-2008; currently CEO and Co-Founder of BrainCheck, Houston, TX and Austin, TX, link, link
Mark Sheffield, Ph.D.	Graduate student, 2006-2011; currently Assistant Professor at the University of Chicago, link
Tim Jarsky, Ph.D.	Graduate student, 2001-2006; currently Associate Director of Electrophysiology at Allen Institute for Brain Science, link
Catherine Kaczorowski, Ph.D.	Graduate student, 2001-06; currently Professor and Endowed Chair at Jackson Laboratory, Bar Harbor, ME, USA, link
Tara Deemyad, Ph.D.	Postdoc, 2012-16; currently Research Associate Professor at Johns Hopkins University.
Alexia Metz, Ph.D.	Graduate student, 2001-06; currently Associate Professor at the University of Toledo, link
Nace Golding, Ph.D.	Postdoc, 1996-2002; currently Professor and Director at Univ. Texas, Austin, TX, USA, link
Nathan Staff, M.D., Ph.D.	Graduate student, 1998-2002; currently Neurologist at Mayo Clinic, Rochester, MN, USA, link
Tara Thiagarajan, Ph.D.	Undergraduate researcher, 1997-1998; currently Founder and Chief Scientist of Sapien labs, link

Current postdocs at Janelia (2011-present)

Yuhan Wang	Postdoctoral fellow, 2022-present
Gabriela Michel	Postdoctoral fellow, 2019-present
Boaz Mohar	Postdoctoral fellow, 2016-present (joint with Karel Svoboda)
Weinan Sun	Postdoctoral fellow, 2017-present
Johan Winnubst	Postdoctoral fellow, 2019-present

Summer undergraduates at Janelia (2011-2019)

Jessica Passlack	Summer undergrad, 2018, 2019
Reem Azar	Summer undergrad, 2017
Karla Montejo	Summer undergrad, 2017

Matthew Phillips	Summer undergrad, 2015, 2016
Lara Reid	Summer undergrad, 2015
Joel Lüethi	Summer undergrad, 2014, 2015
Rachel Tillage (nee, Pearcy)	Summer undergrad, 2014
Josh Fass	Summer undergrad, 2013

Former postdocs at Janelia (2011-2021)

Xinyu Zhao	Postdoctoral fellow, 2011-2021
Ching-Lung Hsu	Postdoctoral fellow, 2011-2020
David Hunt	Postdoctoral fellow, 2012-2020
Erik Bloss	Postdoctoral fellow, 2012-2020
Mark Cembrowski, Ph.D.	Postdoctoral fellow, 2012-2018
Tara Deemyad, Ph.D.	Postdoctoral fellow, 2012-2016
Julia Bachman	Postdoctoral fellow, 2013-2016
Austin Graves, Ph.D.	Postdoctoral fellow, 2012
Yujin Kim, Ph.D.	Postdoctoral fellow, 2012

**While at Northwestern University (1995-2011) I mentored 17 Postdocs, 15 Graduate Students, and 18 Undergraduates. I actively participated on 22 Thesis Committees at Northwestern, excluding my own students; and was an external member of 4 Thesis Committees at other institutions. A complete list is available upon request.*

Collaborators (Past and Present)

2019-present	Andrew Saxe, PhD, University College London
2018-present	James Fitzgerald, PhD, HHMI Janelia Research Campus
2017-2019	Sandro Romani, PhD, HHMI Janelia Research Campus
2015-present	Karel Svoboda, PhD, HHMI Janelia Research Campus
2015-2018	Jeff Magee, PhD, HHMI Janelia Research Campus
1997-2013	William L. Kath, PhD, Northwestern University
2010-present	Brett D. Mensh, MD, PhD
2013-2017	Dezhe Z. Jin, PhD, Penn State University
2011-2014	Stephen Smith, PhD, Stanford University
2005-2013	Daniel A. Nicholson, PhD, Rush University Medical Center
2013-2014	Ted Abel, PhD, University of Pennsylvania
2014-2016	Haining Zhong, PhD, Vollum Institute

Professional Affiliations

1987–present	Society for Neuroscience
1998–present	American Association for the Advancement of Science
1998–present	American Physiological Society

Editorial and Referee Duties

2017-present	Editorial Board, Current Opinion in Neurobiology
2008-2012	Associate Editor, Frontiers in Neuroscience
2004-2011	Reviewing Editor, Journal of Physiology
1998-present	Grant review for NIH, NSF, Israeli Science Foundation, Medical Research Council (UK), Swiss National Science Foundation
1995-present	Reviewer for numerous journals, including Cell, Nature, Nature Neuroscience, Neuron, Science, eLife

Invited Talks

Invited Seminars and Conferences (future)

MIT, Boston, Massachusetts, October 2022

*Invited Seminars at Universities and Research Institutes (past nine years)**

INMED-UNIS, Marseilles, France, April 2022
University of British Columbia, May 2022
University of Montreal, Montreal, Canada, March 2022
Duke University, Chapel Hill, North Carolina, February 2022
Yale University (remote), November 2021
University of Hamburg, Germany (remote), June 2021
Australian National University, Canberra, Australia (remote), Dec. 2020
National Institutes of Health, Bethesda, Maryland, January 2020
Scripps Institute, La Jolla, California, December 2019
Allen Institute for Brain Science, September 2019
Case Western Reserve University, September 2019
Stanford University, May 2019
Vanderbilt University, Nashville, Tennessee, May 2019
Univ. Colorado Health Science Center, Denver, March 2019
EMBO Neuroscience meeting (keynote), NCBS, Bangalore, India, February 2019
Georgia Tech & Emory Neuroscience, Atlanta, Georgia, January 2019
Johns Hopkins Neuroscience Retreat (keynote), September 2018
Cold Spring Harbor Laboratory (course), June 2018
University of Chicago, May 2018
University of Texas Southwestern Neuroscience retreat (keynote), April 2018
Bonn Brain Symposium (keynote), March 2018
Yale University, April 2017
Institute of Science and Technology, Vienna, March 2016
Columbia University, New York, February 2016
University of Minnesota, Minneapolis, January 2016
Pennsylvania State University Neuroscience Seminar, College State, September 2015
Université de Montréal, Neuroscience Seminar, September 2015
Int'l Conference on Brain Informatics & Health, Imperial College London, September 2015
Spring Hippocampal Research Conference, Taormina, Sicily, June 2015
Open Source Brain 2015, Sardinia, Italy, May 2015
SFB 1089, Bonn Brain 3, Bonn, Germany, April 2015
McGill University, Centre for Research in Neuroscience, Montreal, Dec 2014
Laval University, Quebec Mental Health Institute Research Centre, Quebec, Dec 2014
Medical University of South Carolina, Charleston, South Carolina, April 2014
Baylor College of Medicine, Houston, Texas, April 2014
Rheinische Friedrich-Wilhelms-Universität Bonn, Germany, March 2014
Stanford University, Stanford, California, March 2014
Stowers Institute for Medical Research, Kansas City, Missouri, Dec. 2013
Sanford-Burnham Medical Research Institute, La Jolla, California, Dec. 2013
New York University, New York, Oct. 2013
National Institute of Biological Sciences (NIBS), Beijing, China, May 2013
Institute of Neuroscience (ION), Shanghai, China, May 2013
The Hebrew University of Jerusalem, Jerusalem, April 2013
Technion - Israel Institute of Technology, Haifa, Israel, April 2013

Weizmann Institute of Science, Rehovot, Israel, April 2013
University of North Carolina, Durham, Oct. 2012
Korea Institute of Science and Technology, Seoul, May 2012
Korea Brain Research Institute, Daegu, May 2012
Daegu Gyeongbuk Institute of Science and Technology, Daegu, May 2012
Tufts University, Boston, Apr. 2012
University of Utah, Salt Lake City, Apr. 2012
Champalimaud, Lisbon, Portugal, Jan. 2012
Univ. California San Diego, Nov. 2011
Vollum Institute, Portland, Oregon, Oct. 2011

**While at Northwestern University (1995-2011) I gave 94 talks at universities and research institutes and as a postdoc I gave 7 talks. A complete list is available upon request.*

Invited Presentations at National and International conferences (past five years)*

BICCN meeting, San Diego, California, November 2018
National Institutes of Health (Memorial for Wil Rall), November 2018
Synaptic Inhibition Gordon Conference, Les Diablerets, Switzerland, June 2017
Mathmem Workshop, Barcelona, Spain, March 2017
Dendrites Gordon Conference, Tuscany, Italy, March 2017
Electrical Synapses Conference, Janelia, April 2017
AREADNE Conference, Santorini, Greece, June 2016
Dendrites Conference, Crete, Greece, June 2016
Dendrites Conference, Paris, France, March 2016
Frontiers in Neurophotonics Symposium, Quebec, October 2015
AAALAC 50th Anniversary Symposium, Washington DC, September 2015
Scottish Neuroscience Group Meeting, University of St. Andrews, Scotland, August 2015
IFM Colloquim on Neuronal signal integration, computation and transduction, Paris, Oct. 2014
Francis Crick Symposium on Neuroscience, Suzhou, China, May 2013
Winter Conference on Neural Plasticity, Curacao, Feb. 2013
Dendrites Conference, Janelia Farm Research Campus, March 2012

**While at Northwestern University (1995-2011) I gave 44 invited talks at national and international conferences. A complete list is available upon request.*