

Nelson Spruston

Curriculum Vitae, February 2009

Present Position

Professor

Northwestern University

Department of Neurobiology & Physiology

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Personal Data

Born: May 27, 1963; Vancouver, B.C., Canada

Citizenship: Canadian (with U.S. residence permit)

Family: Married, three children

Research Interests

Synaptic integration and plasticity in the central nervous system.

Physiology of synaptic transmission and dendritic excitability.

Education and Research Experience

2006-present 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

1991-1995 Postdoctoral Fellow, Department of Cell Physiology

Max-Planck-Institut for Medical Research

Advisor: Prof. Bert Sakman

- August 1990 Methods in Computational Neuroscience
Marine Biological Laboratory, Woods Hole, MA
- June-Aug. 1991 Grass Fellowship
Marine Biological Laboratory, Woods Hole, MA
- 1985-1991 Baylor College of Medicine; Houston, Texas
Ph.D., Division of Neuroscience (Advisor: Dr. Daniel Johnston)
- 1981-1985 University of British Columbia; Vancouver, B.C.
B.Sc. (Honors), Physiology, 1985

Fellowships, Honors, and Awards

- 2007-2008 NARSAD Distinguished Investigator Award
- 1999-2004 NSF Career Award
- 1998 Klingenstein Fellowship in the Neurosciences
- 1998 Cajal Club Cortical Explorer Prize
- 1996 Alfred P. Sloan Fellow, Northwestern University
- 1996 Fellowship Award for the Winter Conference on Brain Research
- 1994-95 Max-Planck Fellow, Heidelberg, Germany
- 1992-93 Alexander von Humboldt Fellow, Heidelberg, Germany
- 1991 Grass Fellow in Neurophysiology, Marine Biological Lab, Woods Hole, MA
- 1990 Outstanding Presentation, Neuroscience Symposium, Baylor Col. Medicine
- 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

Teaching Activities

- 1996-04 Instructor (sole), Fundamentals of Neurobiology (undergraduate)
- 2008 Instructor, Great Experiments in Neurophysiology (graduate)
- 2001-05 Co-director, Ion Channel Physiology course, Cold Spring Harbor Lab
- 1999-04 Instructor, Fundamentals of Neuroscience (Cell & Molecular Neuro.)
- 1987-99 Several other courses (full list available on request)

Committees & Administrative Activities

- 1997-present Numerous (full list available on request)

Students and postdocs supervised

Currently advisor or co-advisor for 8 students and postdocs (full list on request)

Former students and postdoc (highlights, full list available on request)

Donald Cooper, Ph.D.	Postdoc, 1999-2004, currently Asst. Prof. at UT Southwestern
Nace Golding, Ph.D.	Postdoc, 1996-2002, currently Asst. Prof. at UT Austin
Tim Jarsky, Ph.D.	Thesis advisor, 2001-2006, currently postdoc at Northwestern
Hae-yoon Jung, Ph.D.	Thesis advisor, 1996-2001, currently postdoc at MIT
Nathan Staff, M.D., Ph.D.	Thesis advisor, 1998-2002, currently resident at Mayo Clinic
Tara Thiagarajan, Ph.D.	MBA student, 1997-1998, currently postdoc at NIH
Juan Varela, Ph.D.	Postdoc, 2002-2005, currently Res. Asst. Prof. UT Southwestern

Professional Affiliations

1987–present	Society for Neuroscience
1998–present	American Physiological Society
2004–present	American Epilepsy Society

Editorial and Referee Duties

2008-present	Associate Editor, <i>Frontiers in Neuroscience</i>
2004-present	Reviewing Editor, <i>Journal of Physiology</i>
1995-present	Reviewer for <i>Journal of Computational Neuroscience</i> , <i>Journal of Neurophysiology</i> , <i>Journal of Neuroscience</i> , <i>Journal of Neuroscience Methods</i> , <i>Journal of Physiology</i> , <i>Nature</i> , <i>Nat. Neuroscience</i> , <i>Neuron</i> , <i>PNAS</i> , <i>Science</i> , <i>TINS</i>
1998-present	Grant review for NIH, NSF, Israeli Science Foundation, Medical Research Council (UK)

Invited Talks

1993-present	95 invited seminars (full list available on request)
1995-present	27 invited talks at national and international conferences (full list on request)

Theses

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

Special projects

1. Stuart G, **Spruston N**, Häusser M, eds. Dendrites, 2nd edition, Oxford University Press, 2008. (book)
2. Davie JT, Kole MH, Letzkus JJ, Rancz EA, **Spruston N**, Stuart GJ, Häusser M. Dendritic patch-clamp recording. *Nat Protoc.* 1:1235-1247, 2006. (experimental protocol)
3. Stuart G, **Spruston N**, Häusser M, eds. Dendrites, Oxford University Press, 1999. (book)
4. Cline H, **Spruston N**, eds. Dendrites: bringing it all together, *Journal of Neurobiology*, July, 2005. (special issue)

Reviews, chapters, and commentaries

1. **Spruston N**, Johnston D. Out of control in the dendrites. Nature Neuroscience, 11:733-734, 2008.
2. **Spruston N**. Neuroscience: strength in numbers. Nature, 452:420-421, 2008.
3. **Spruston N**. Pyramidal neurons: dendritic structure and synaptic integration. Nature Reviews Neuroscience, 9:206-221, 2008.
4. **Spruston N**. Somato-dendritic Integration: Dendritic Integration" (in-press), The New Encyclopedia of Neuroscience, edited by Larry Squire et al, Elsevier, 2008.
5. **Spruston N**, Häusser M, Stuart G. Dendritic integration. In: Dendrites, 2nd edition, Stuart G, **Spruston N**, Häusser M, eds. Oxford University Press, 2nd edition, pp. 351-399, 2008.

6. **Spruston N**, McBain C. Chapter 5: Structural and functional properties of hippocampal neurons. In: The Hippocampus Book, Andersen P, Morris R, Amaral D, Bliss T, O'Keefe J, eds. Oxford University Press, pp. 133-201, 2007.
7. Lisman J, **Spruston N**. Postsynaptic depolarization requirements for LTP and LTD: a critique of spike timing dependent plasticity. Nature Neuroscience, 8:839-841, 2005.
8. Cline H, **Spruston N**. Introduction: Overview of dendrites. Journal of Neurobiology, 64:1-3, 2005.
9. Surmeier DJ, **Spruston N**. Peering into the dendritic machinery of striatal medium spiny neurons. Neuron. 44:401-402, 2004.
10. **Spruston N**, Kath WL. Dendritic arithmetic. Nature Neuroscience, 7:567-569, 2004.
11. **Spruston N**. Branching out: a new idea for dendritic function. Journal of Neurophysiology, 90:2887-2888, 2003
12. **Spruston N**. Axonal gap junctions send ripples through the hippocampus. Neuron 31:669-671, 2001.
13. Häusser M, **Spruston N**, Stuart G. Diversity and dynamics of dendritic signaling. Science, 290:739-744, 2000.
14. **Spruston N**. Distant synapses raise their voices. Nature Neuroscience, 3:849-851, 2000.
15. **Spruston N**, Häusser M, Stuart G. Dendritic integration. In: Dendrites, 1st edition, Stuart G, **Spruston N**, Häusser M, eds. Oxford University Press, 1st edition, pp. 231-270, 1999.
16. Mickus T, Jung H, **Spruston N**. Slow sodium channel inactivation in CA1 pyramidal cells. 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.
17. Traub RD, **Spruston N**, Soltesz I, Konnerth A, Whittington MA, Jefferys JGR. Gamma-frequency oscillations: a neuronal population phenomenon regulated by synaptic and intrinsic cellular processes. Progress in Neurobiology, 55:563-575, 1998.
18. Bulinski JC, Ohm T, Roder H, **Spruston N**, Turner DA, Wheal HV. Changes in dendritic structure and function following hippocampal lesions: correlations with developmental events? Progress in Neurobiology, 55:641-650, 1998.
19. Stuart G, **Spruston N**, Sakmann B, Häusser M. Action potential initiation and backpropagation in neurons of the mammalian central nervous system. Trends in Neurosciences, 20:125-131, 1997.
20. Ferster D, **Spruston N**. Cracking the neuronal code. Science, 270:756-757, 1995.
21. Stuart G, **Spruston N**. Probing dendritic function with patch pipettes. Current Opinion in Neurobiology, 5:389-394, 1995.

22. **Spruston N**, Jaffe DB, Johnston D. Dendritic attenuation of synaptic potentials and currents: the role of passive membrane properties. Trends in Neurosciences, 17:161–166, 1994.
23. Jonas P, **Spruston N**. Mechanisms shaping glutamate-mediated excitatory postsynaptic currents in the CNS. Current Opinion in Neurobiology, 4: 366–372, 1994.
24. Gray R, Fisher R, **Spruston N**, Johnston D. Acutely exposed hippocampal neurons: A preparation for patch clamping neurons from adult hippocampal slices. In: In Vitro Preparations From Vertebrate Nervous Systems. Jahnsen, H. (ed.), John Wiley: England, 3–24, 1990.

Research publications

1. Moore S, Cooper DC, **Spruston N**. Plasticity of burst firing induced by synergistic activation of metabotropic glutamate and acetylcholine receptors. Neuron, 61:287-300, 2009.
2. Rempe M, **Spruston N**, Kath WL, Chopp D. Compartmental neural simulations with spatial adaptivity. Journal of Computational Neuroscience, 25:465-480, 2008.
3. Jarsky T, Mady R, Kennedy B, **Spruston N**. The distribution of bursting neurons in the CA1 region and the subiculum of the rat hippocampus. Journal of Comparative Neurology, 506:535-547, 2008.
4. Katz Y, Kath WL, **Spruston N**, Hasselmo ME. Coincidence Detection of Place and Temporal Context in a Network Model of Spiking Hippocampal Neurons. PLoS Computational Biology, 3:e234-248, 2007.
5. Remy S, **Spruston N**. Dendritic spikes induce single-burst long-term potentiation. Proceedings of the National Academy of Sciences USA, 104:17192-17197, 2007.
6. Metz AE, **Spruston N**, Martina M. Dendritic D-type potassium currents inhibit the spike afterdepolarization in rat hippocampal CA1 pyramidal neurons. Journal of Physiology, 581:175-187, 2007.
7. Kaczorowski CC, Disterhoft JF, **Spruston N**. Stability and plasticity of intrinsic membrane properties in hippocampal CA1 pyramidal neurons: effects of internal anions. Journal of Physiology, 578:799-818, 2007.
8. Nicholson D, Katz Y, Trana R, Kath WL, **Spruston N**, Geinisman Y. Distance-dependent differences in synapse number and AMPA receptor expression in hippocampal CA1 pyramidal neurons. Neuron, 50:431-442, 2006.
9. Jarsky T, Roxin A, Kath WL, **Spruston N**. Conditional dendritic spike propagation following distal synaptic activation of hippocampal CA1 pyramidal neurons. Nature Neuroscience, 8: 1667-1676, 2005.

10. Golding N, Mickus T, Katz Y, Kath WL, **Spruston N**. Factors mediating powerful voltage attenuation along CA1 dendrites, Journal of Physiology, 568:69-82, 2005.
11. Cooper DC, Chung S, **Spruston N**. Output-mode transitions controlled by prolonged inactivation of sodium channels in pyramidal neurons of subiculum. PLoS Biology, 3:1123-1129, 2005.
12. Metz A, Jarsky T, Martina M, Spruston N. R-type calcium channels produce an afterdepolarization and bursting in hippocampal CA1 pyramidal neurons. Journal of Neuroscience, 25:5763-5773, 2005.
13. Cooper DC, Moore SJ, Staff NP, **Spruston N**. Psychostimulant-induced plasticity of intrinsic neuronal excitability in ventral subiculum. Journal of Neuroscience, 23:9937-9946, 2003.
14. Staff NP, **Spruston N**. Intracellular correlate of EPSP-spike potentiation in CA1 pyramidal neurons is controlled by GABAergic modulation, Hippocampus, 13:801-805, 2003.
15. Golding N, Staff NP, **Spruston N**. Dendritic spikes as a mechanism for cooperative long-term potentiation. Nature, 418:326-331, 2002.
16. Carr B, Cooper DC, Ulrich SL, Tkatch T, **Spruston N**, Surmeier DJ. Serotonin receptor activation inhibits sodium current and dendritic excitability in prefrontal cortex via a PKC-dependent mechanism. Journal of Neuroscience, 22:6846-6855, 2002.
17. Golding NL, Kath WL, **Spruston N**. Dichotomy of action potential backpropagation in CA1 pyramidal neurons, Journal of Neurophysiology 86:2998-3010, 2001.
18. Jung H, Staff NP, **Spruston N**. Action potential bursting in subicular pyramidal neurons is driven by a calcium tail current. Journal of Neuroscience 21:3312-3321, 2001.
19. Staff NP, Jung H, Thiagarajan T, Yao M, **Spruston N**. Resting and active membrane properties of pyramidal neurons in subiculum and CA1 of rat hippocampus, Journal of Neurophysiology, 84:2398-2408, 2000.
20. Golding NL, Jung H, Mickus T, **Spruston N**. Dendritic calcium spike initiation and repolarization are controlled by distinct potassium channel subtypes in CA1 pyramidal neurons. Journal of Neuroscience, 19:8789-8798, 1999.
21. Mickus T, Jung H, **Spruston N**. Properties of slow, cumulative sodium channel inactivation in rat hippocampal CA1 pyramidal cells. Biophysical Journal, 76:846-860, 1999.
22. Golding NL, **Spruston N**. Dendritic spikes are variable triggers of axonal action potentials in hippocampal CA1 pyramidal neurons. Neuron, 21:1189-1200, 1998.
23. Stuart G, **Spruston N**. Determinants of voltage attenuation in neocortical pyramidal neuron dendrites. Journal of Neuroscience, 18:3501-3510, 1998.
24. Lübke J, Frotscher M, **Spruston N**. Specialized electrophysiological properties of anatomically identified neurons in the hilar region of the rat fascia dentata. Journal of Neurophysiology, 79:1518-1534, 1998.

25. Jung H, Mickus T, **Spruston N**. Prolonged sodium channel inactivation contributes to dendritic action potential attenuation in hippocampal pyramidal neurons. Journal of Neuroscience, 17:6639-6646, 1997.
26. **Spruston N**, Lübke J, Frotscher M. Interneurons in the stratum lucidum of the hippocampus: electrophysiological and morphological characterization. Journal of Comparative Neurology, 385:427–440, 1997.
27. **Spruston N**, Schiller Y, Stuart G, Sakmann B. Activity-dependent action potential invasion into CA1 pyramidal neuron dendrites. Science, 268:297–300, 1995 (see accompanying “Research News” article pp. 200–201, by M. Barinaga).
28. **Spruston N**, Jonas P, Sakmann, B. Dendritic glutamate receptor channels in rat hippocampal CA3 and CA1 pyramidal neurons. Journal of Physiology (Lond.), 482:325–352, 1995.
29. **Spruston N**, Jaffe DB, Williams SW, Johnston D. Voltage- and space-clamp errors associated with measurement of electrotonically remote synaptic events. Journal of Neurophysiology, 70: 781–802, 1993.
30. **Spruston N**, Johnston D. Perforated patch-clamp analysis of the passive membrane properties of three classes of hippocampal neurons. Journal of Neurophysiology, 67: 508–529, 1992.
31. **Spruston N**, Nusbaum M. Cyclic nucleotide-mediated modulation of the pyloric motor pattern in the stomatogastric ganglion of the crab, *Cancer borealis*. Biological Bulletin, 181: 329–330, 1991.
32. McIntosh CH, Dahl MA, Kwok YN, Mutt V, **Spruston N**, Brown JC. Isolation from porcine intestinal extracts of a cholecystokinin-like peptide and a peptide with homology to cytochrome oxidase polypeptide VII and chymodenin. Canadian Journal of Physiology and Pharmacology, 66:1407-1414, 1988.