

CURRICULUM VITAE

NAME: Stephen J Smith

BORN: March 22, 1947, Santa Monica, California

EDUCATION:

1970 B.A. in Psychology
Reed College, Portland

1977 Ph.D. in Physiology and Psychology
University of Washington, Seattle
Supervisors: Charles F. Stevens, M.D., Ph.D.; Wolfhard Almers, Ph.D.

ACADEMIC EMPLOYMENT:

1977-1980 Miller Postdoctoral Research Fellow
Department of Physiology-Anatomy
University of California, Berkeley
Supervisor: Robert S. Zucker, Ph.D.

1981-1984 Assistant Professor
Department of Physiology
Yale University School of Medicine

1984-1987 Assistant Professor
1987-1989 Associate Professor
Section of Molecular Neurobiology
Yale University School of Medicine

1984-1987 Assistant Investigator
1987-1989 Associate Investigator
Howard Hughes Medical Institute
Yale University School of Medicine

1989-1994 Associate Professor
1995- Professor
Department of Molecular and Cellular Physiology
Stanford Medical School

STANFORD TEACHING AND SERVICE:

1991-Present MCP 201, Endocrine Physiology (Lectures)
1992-Present MCP 222, Imaging: Biological Light Microscopy (Organizer)
1992-2003 MCP 215, Synaptic Transmission (Co-Organizer)
2005-Present MCP 232, Advanced Biophysical Imaging Laboratory (Co-Organizer)

1990-Present Doctoral Committee Service (12x)
1991-Present Founder and Faculty Advisor, Beckman CSIF
1998-1999 Member, Medical School Appointments and Promotions Committee
1999-2001 Chair, Medical School Appointments and Promotions Committee
2001-2002 Member, Committee on the Professoriate
2003-Present Member, Medical School Associate Dean's Review Committee
2005-Present Stanford Comprehensive Cancer Center Shared Resource Leadership

NATIONAL AND INTERNATIONAL ACADEMIC AND SCIENTIFIC SERVICE:

1994-2004 External Advisor, National Center for Microscopy & Imaging Research, La Jolla, CA
1994-1995 Course Director, *Imaging Neuronal Structure and Function*, Cold Spring Harbor, NY
1996-1999 Director, Section on Imaging, *Neurobiology* Course, Woods Hole, MA
1999-2004 Board of Scientific Counselors, NICHD, NIH
2000-2004 Scientific Advisory Board, Max Planck Institute, Heidelberg, Germany
2001-2003 Resident Faculty, Section on Imaging, *Neurobiology* Course, Woods Hole, MA

INDUSTRIAL CONSULTING AND BOARDS:

1989-1991 Consultant on Optical Imaging Technologies, BioRad, Inc.
1990-1992 Consultant on Fluorescence Detection, Affymax Research Institute, Inc.
1990-1992 Consultant on Advanced Microscopy Technologies, Newport Corp.
1991-1996 Consultant on Imaging Technologies and IP Litigation, Molecular Dynamics, Inc.
1995-2004 Consultant of Microscopy and Microarray Technologies, Axon Instruments, Inc.
2004-2005 Consultant on Microscopy Technologies, Molecular Devices, Inc.
2000-Present Board of Scientific Advisors, Cytokinetics, Inc.
2004-Present Board of Directors, Nanometrics, Inc.

PUBLICATIONS:

1. Thompson, S.H. and Smith, S.J. (1976) Depolarizing afterpotentials and burst production in molluscan pacemaker neurons. *J. Neurophysiol.* **39**: 153-161.
2. Patridge, L.D., Thompson, S.H., Smith, S.J. and Connor, J.A. (1979) Current-voltage relationships of repetitively firing neurons. *Brain Res.* **164**: 69-79.
3. Zucker, R.S. and Smith, S.J. (1979) Effect of TEA on light emission from aequorin-injected Aplysia in neurone soma. *Brain Res.* **164**: 91-102.

4. Smith, S.J. and Zucker, R.S. (1980) Aequorin response facilitation and intracellular calcium accumulation in molluscan neurones. *J. Physiol. (Lond)* **300**: 167-196.
5. Adams, D.J., Smith, S.J. and Thompson, S.H. (1980) Ionic currents in molluscan soma. *Ann. Rev. Neurosci.* **3**:141-167.
6. Smith, S.J. (1981) Excitability of gastropod neurons. *Neurosci. Res. Prog. Bull.* **119**: 286-291.
7. Smith, S.J. (1981) Calcium regulation in gastropod nerve cell bodies. In: *Molluscan Nerve Cells* (eds. J. Koester and J.H. Byrne) Cold Spring Harbor Laboratory, pp. 81-91.
8. Charlton, M.P., Smith, S.J. and Zucker, R.S. (1982) Role of presynaptic calcium ions and channels in synaptic facilitation and depression at the squid giant synapse. *J. Physiol. (Lond)* **323**: 173-193.
9. Smith, S.J., MacDermott, A.B. and Weight, F.F. (1983) Detection of intracellular calcium transients in sympathetic neurones using arsenazo III. *Nature* **304**: 350-352.
10. Hoshi, T., Rothlein, J. and Smith, S.J. (1984) Facilitation of Ca channel currents in bovine adrenal chromaffin cells. *Proc. Natl. Acad. Sci. USA* **81**: 5871-5875.
11. Boyle, M.B., Klein, M., Smith, S.J. and Kandel, E.R. (1984) Serotonin increases intracellular Ca transients in voltage-clamped sensory neurons of *Aplysia californica*. *Proc. Natl. Acad. Sci. USA* **81**: 7642-7646.
12. Smith, S.J., Augustine, G.A. and Charlton, M.P. (1985) Transmission at voltage-clamped giant synapse of the squid: evidence for cooperative calcium action in secretion of synaptic transmitter. *Proc. Natl. Acad. Sci. USA* **82**: 622-625.
13. Augustine, G.J., Charlton, M.P. and Smith, S.J. (1985) Calcium entry into voltage-clamped presynaptic terminals of squid. *J. Physiol. (Lond)* **367**: 143-162.
14. Augustine, G.J., Charlton, M.P. and Smith, S.J. (1985) Calcium entry and transmitter release at voltage-clamped nerve terminals of squid. *J. Physiol. (Lond)* **367**: 163-181.
15. Smith, S.J. (1985) Polychromator for recording optical absorbance changes from single cells. In: *Optical Methods in Cell Physiology* (eds. P. DeWeer and B. Salzberg) New York: John Wiley.
16. MacDermott, A.B., Mayer, M.L., Westbrook, G.L., Smith, S.J., and Barker, J.L. (1986) NMDA-receptor activation increases cytoplasmic calcium concentration in cultured spinal cord neurones. *Nature* **321**: 519-522.
17. Thompson, S., Smith, S.J. and Johnson, J.W. (1986) Slow outward tail currents in molluscan bursting pacemaker neurons: two components differing in temperature sensitivity. *J. Neurosci.* **6**: 3169-3176.

18. Smith, S.J., Charlton, M.P., and Augustine, G.J. (1986) The voltage-dependence of transmitter release. *J. Physiol. (Paris)* **81**(4): 332-339.
19. Smith, S.J. and Thompson, S.H. (1987) Slow membrane currents in bursting pace-maker neurones of *Tritonia*. *J. Physiol. (Lond)* **382**: 425-448.
20. Hoshi, T. and Smith, S.J. (1987) Large depolarization induces long openings of voltage-dependent calcium channels in adrenal chromaffin cells. *J. Neurosci.* **7**: 571-580.
21. Mayer, M.L., MacDermott, A.B., Westbrook, G.L., Smith, S.J. and Barker, J.L. (1987) Agonist- and voltage-gated calcium entry in mouse spinal cord neurons under voltage clamp measured using arsenazo III. *J. Neurosci.* **7**: 3230-3244.
22. Forscher, P., Kaczmarek, L.K., Buchanan, J. and Smith, S.J. (1987) Cyclic AMP induces changes in distribution and transport of organelles within growth cones of *Aplysia* bag cell neurons. *J. Neurosci.* **7**: 3600-3611.
23. Augustine, G.J., Charlton, M.P. and Smith, S.J. (1987) Ca action in synaptic transmitter release. *Ann. Rev. Neurosci.* **10**: 633-693.
24. Smith, S.J. (1987) Progress on LTP at hippocampal synapses: A post-synaptic Ca trigger for memory storage? *Trends Neurosci.* **10**: 142-44.
25. Smith, S.J., Osses, L.R. and Augustine, G.J. (1988) Fura-2 imaging of localized calcium accumulation within squid 'giant' presynaptic terminal. In: *Ion Channel Modulation* (Grinell, A.D., Armstrong, D.L. and Jackson, M.B., eds.), Plenum: New York. pp. 147-155.
26. Augustine, G.J., Charlton, M.P. and Smith, S.J. (1988) Toward a molecular understanding of synaptic transmitter release: Physiological clues from the squid giant synapse. In: *Ion Channel Modulation* (Grinell, A.D., Armstrong, D.L. and Jackson, M.B., eds.), Plenum: New York. pp. 157-168.
27. Forscher, P. and Smith, S.J. (1988) Actions of cytochalasins on the organization of actin filaments and microtubules in a neuronal growth cone. *J. Cell Biol.* **107**: 1505-1516.
28. Smith, S.J. and Augustine, G.J. (1988) Calcium ions, active zones and neurotransmitter release. *Trends Neurosci.* **11**:458-464.
29. Smith, S.J. (1988) Neuronal Cytomechanics: The actin-based motility of growth cones. *Science* **242**: 708-715.
30. Augustine, G.J., Buchanan, J., Charlton, M.P., Osses, L.R. and Smith, S.J. (1989). Fingering the trigger for neurotransmitter secretion: Studies on the calcium channels of squid giant presynaptic terminals. In: *Secretion and Its Control* (Oxford, G. and Armstrong, C., Eds.), New York: The Rockefeller University Press, pp. 204-223.

31. Brehm, P., Lechleiter, J., Smith, S.J and Dunlap, K. (1989) Intercellular signalling as visualized by endogenous calcium-dependent bioluminescence. *Neuron* **3**: 191-198.
32. Forscher, P. and Smith, S.J (1989) Cytoplasmic actin filaments move particles on the surface of a neuronal growth cone. In: *Optical Microscopy for Biology* (K. Jacobson and Brian Hermann, Eds.), Wiley-Liss, N.Y. pp. 459-471.
33. Cornell-Bell, A.H., Finkbeiner, S.M., Cooper, M.S. and Smith, S.J (1990) Glutamate induces calcium waves in cultured astrocytes: Long-range glial signalling. *Science* **247**: 470-473.
34. Cooper, M.S., Cornell-Bell, A.H., Chernjavsky, A., J.W. Dani and Smith, S.J (1990). Tubulovesicular processes emerge from trans-Golgi cisternae, extend along microtubules, and interlink adjacent trans-Golgi elements into a reticulum. *Cell*, **61**: 135-145.
35. Cornell-Bell, A.H., Thomas, P.G. and Smith, S.J. (1990). The excitatory neurotransmitter glutamate causes filopodia formation in cultured hippocampal astrocytes. *Glia*, **3**:322-334.
36. Smith, S.J, Cooper, M.W. and Waxman, A. (1990). Laser microscopy of subcellular structure in living Neocortex: can one see dendritic spines twitch? In: *The Biology of Memory, XXIII Symposium Medicum Hoechst*, (L.R.Squire and E. Lindenlaub, Eds), F.K. Schattauer Verlag, Stuttgart. pp. 49-71.
37. Goldman, R.S., Finkbeiner, S.M. and Smith, S.J (1991) Endothelin induces a sustained rise in intracellular calcium in hippocampal astrocytes. *Neurosci. Lett.*, **123**: 4-8.
38. Cornell-Bell, A.H., Finkbeiner, S.M., Cooper, M.S. and Smith, S.J (1991) Extraneuronal communication, in *Neurosciences Year*, Suppl. 2 to *Encyclopedia of Neuroscience*, G. Adelman and B. Smith, eds., Birkhauser, Boston. pp. 65-68.
39. Smith, S.J and Jahr, C.E. (1992) Rapid induction of filopodial sprouting by applications of glutamate to hippocampal neurons. In: *The Nerve Growth Cone*, (P.C. Letourneau, S.B. Kater and E.R. Macagno, Eds.), Raven Press, New York. pp. 19-26.
40. Dani, J.W., Chernjavsky, A, and Smith, S.J. (1992) Neuronal activity triggers Ca waves in hippocampal astrocyte networks. *Neuron*, **8**: 429-440.
41. Cooper, M.W. and Smith, S.J. (1992) A real-time analysis of growth cone - target cell interactions during the formation of stable contacts between hippocampal neurons in culture. *J. Neurobiology*, **23**, 814-828.
42. Smith, S.J., Do astrocytes process neural information? (1992) *Prog. in Brain Res.*, **94**, 119-136.
43. Reist, N.E. and Smith, S.J. (1992) Neurally-evoked calcium transients in terminal Schwann cells at the neuromuscular junction. *Proc. Natl. Acad. Sci., U.S.A.* **89**, 7625-7629.

44. O'Rourke, N.A., Dailey, M.E., Smith, S.J. and McConnell, S.K. (1992) Diverse migratory pathways in the developing cerebral cortex. *Science*, **258**, 299-302.
45. McNeill, H., Ryan, T.A., Smith, S.J. and Nelson, W.J. (1993) Spatial and temporal dissection of immediate and early events following cadherin-mediated epithelial cell adhesion. *J. Cell Biol.*, **120**, 1217-1226.
46. Frances, C.L., Ryan, T.A., B.D. Jones, Smith, S.J and Falkow, S. (1993) Ruffles induced by *Salmonella* and other stimuli direct macropinocytosis of bacteria. *Nature*, **364**, 639-642.
47. Dailey, M. E. and Smith, S.J. (1993) Confocal imaging of mossy fiber growth in live hippocampal slices. *Jap. J. Physiol.* **43** (Suppl. 1), 183-192.
48. Ryan, T.A., Reuter, H., Wendland, B., Schweizer, F.E., Tsien, R.W. and Smith, S.J. (1993) The kinetics of synaptic vesicle recycling measured at single presynaptic boutons. *Neuron*, **11**, 713-724.
49. Smith, S.J, Buchanan, J., Osses, L.R., Charlton, M.P. and Augustine, G.J. (1993) The spatial distribution of calcium signals in squid presynaptic terminals. *J. Physiol. (Cambridge)*, **472**, 573-593.
50. Dailey, M.E., Buchanan, J., Bergles, D.E. and Smith, S.J (1994) Mossy fiber growth and synaptogenesis in rat hippocampal slices *in vitro*. *J.Neurosci.*, **14**: 1060-1078.
51. Dailey, M.E. and Smith, S.J (1994) Spontaneous Ca²⁺ transients in developing hippocampal pyramidal cells. *J.Neurobiol.*, **25**: 243-251.
52. Smith, S.J (1994) Neuromodulatory Astrocytes. *Current Biology*, **4**: 807-810.
53. Smith, S.J (1994) Just a Chemical Attraction (News and Views). *Nature*, **368**: 101-102.
54. Dani, J.W. and Smith, S.J (1995) The triggering of astrocytic calcium waves by NMDA-induced neuronal activation. *Ciba Foundation Symposium*, **188**: 195-209.
55. Ryan, T.A., and Smith, S.J. (1995) Vesicle pool mobilization during action potential firing at hippocampal synapses. *Neuron*, **14**: 983-989.
56. Wong, R. O. L., Chernjavsky, A., Smith, S.J and Shatz, C.J. (1995) Early functional neural networks in the developing retina. *Nature*, **374**: 716-718.
57. Bergles, D.E., Doze, V.A., Madison, D.V. and Smith, S.J. (1996) Excitatory actions of norepinephrine on multiple classes of hippocampal CA1 interneurons. *J. Neurosci.*, **16**: 572-585.
58. Dailey, M.E. and Smith, S.J (1996) The dynamics of dendritic structure in developing hippocampal slices. *J. Neurosci.*, **16**: 2983-2994.

59. Ryan, T.A., Smith, S.J and Reuter, H. (1996) The timing of synaptic vesicle endocytosis. *Proc. Natl. Acad. Sci., USA*, **93**: 5567-5571.
60. Shalon, D., Smith, S. J and Brown, P.O. (1996) A DNA micro-array system for analyzing complex DNA samples using two-color fluorescent probe hybridization. *Genome Research* **6**:639-645.
61. Ryan, T.A., Ziv, N.E. and Smith, S.J (1996) Potentiation of evoked vesicle turnover at individually resolved synaptic boutons. *Neuron* **17**: 125-134.
62. Ziv. N.E. and Smith, S.J (1996) Evidence for a role of dendritic filopodia in synaptogenesis and spine formation. *Neuron* **17**: 91-102.
63. Ryan, T.A., Li, L., Chin, L.-S., Greengard, P. and Smith, S.J (1996) Synaptic vesicle recycling in synapsin I knock-out mice. *J. Cell Biol.* **134**: 1219-1227.
64. Adams, C.L., Nelson, W.J. and Smith, S.J (1996) Quantitative analysis of cadherin-catenin-actin reorganization during development of cell-cell adhesion. *J Cell Biol.* **135**: 1899-1911.
65. Ryan, T.A., Reuter, H. and Smith, S. J (1997) Optical detection of quantal presynaptic membrane turnover. *Nature* **388**: 478-482.
66. Smith, S.J (1998) Glia help synapses form and function. *Current Biology* **8**: R158-160.
67. Adams, C.L., Chen, Y.T., Smith, S.J and Nelson, W.J. (1998) Mechanisms of epithelial cell-cell adhesion and cell compaction revealed by high-resolution tracking of E-Cadherin-green fluorescent protein. *J. Cell Biol.* **142**: 1105-1119.
68. Smith, S.J (1999) Dissecting dendrite dynamics. *Science* **19**: 1860-1861.
69. Jontes, J.D., Buchanan, J. and Smith, S.J (2000) Growth cone and dendrite dynamics in zebrafish embryos: in vivo imaging of early events in synaptogenesis. *Nature Neuroscience* **3**: 231-237.
70. Ahmari, S.E., Buchanan, J. and Smith, S.J (2000) Assembly of presynaptic active zones from cytoplasmic transport packets. *Nature Neuroscience* **3**: 445-451.
71. Jontes, J.D. and Smith, S.J (2000) Filopodia, spines and the generation of synaptic diversity. *Neuron* **27**, 11-14.
72. Waters, J.D. and Smith, S.J (2000) Phorbol esters potentiate evoked and spontaneous release by different presynaptic mechanisms. *J. Neurosci.* **20**, 7863-7870.
73. Micheva, K.D., Holz, R.W. and Smith, S.J (2001) Regulation of presynaptic phosphatidylinositol 4,5-biphosphate by neuronal activity. *J. Cell Biol.* **154**, 355-68.

74. Harata, N., Ryan, T.A., Smith, S.J., Buchanan, J. and Tsien, R.W. (2001) Visualizing recycling synaptic vesicles in hippocampal neurons by FM 1-43 photoconversion. *Proc Natl Acad Sci U S A*. **98**(22):12748-53.
75. Barres, B.A. and Smith, S.J (2001) Cholesterol--making or breaking the synapse. *Science*, **294**(5545):1296-7.
76. Hopf, F.W., Waters, J., Mehta, S. and Smith, S.J (2002) Stability and plasticity of developing synapses in hippocampal neuronal cultures. *J. Neurosci.* **22**(3):775-781
77. Ahmari, S.E. and Smith, S.J (2002) Minireview: Knowing a nascent synapse when you see it. *Neuron*, **34**, 333-336.
78. Waters, J. and Smith, S.J (2002) Vesicle pool partitioning influences presynaptic diversity and weighting in rat hippocampal synapses. *J. Physiol.*, **541**(Pt 3):811-23.
79. Thrush E, Levi O, Wang K, Wistey M, Harris JS, Smith SJ. (2002) Integrated semiconductor fluorescent detection system for biochip and biomedical applications. *Proc. SPIE*, 4626: 289-297.
80. Meyer, M.P., Niell, C.M, and Smith, S.J (2003) Brain Imaging: How stable are synaptic connections? *Curr. Biol.*, **13**(5):R180-2.
81. Micheva, K.D., Buchanan, J., Holz, R.W. and Smith. S.J (2003) Evidence for retrograde regulation of synaptic vesicle endocytosis and recycling. *Nature Neurosci.* **6**, 925-932.
82. Thrush E, Levi O, Wang K, Wistey MA, Harris JS, Smith SJ. (2003) High throughput integration of optoelectronics devices for biochip fluorescent detection. *Proc. SPIE*, 4982: 162-169.
83. Thrush E, Levi O, Ha W, Wang K, Smith SJ and Harris JS, Jr. (2003) Integrated bio-fluorescence sensor. *J. Chromatography A*, 1013: 103-110.
84. Waters, J. and Smith, S.J (2003) Mitochondria and release at hippocampal synapses. *Pflügers Archiv* 447(3):363-70.
85. Niell, C.M., Meyer, M.P and Smith, S.J (2004) *In vivo* imaging of synapse formation on a growing dendritic arbor. *Nature Neurosci.* **7**: 254-260.
86. Niell, C.M. and Smith, S.J (2004) Live optical imaging of nervous system development. *Ann. Rev. Physiol.*, **66** : 771-798.
87. Hua, Y and Smith, S.J (2004) Neural activity and the dynamics of central nervous system development. *Nature Neurosci.* **7**:327-32.
88. Jontes, J.D., Emond, M.R., Smith, S.J (2004) In vivo trafficking and targeting of N-cadherin to nascent presynaptic terminals. *J. Neurosci.* **24**(41):9027-34.

89. Thrush, E., Levi, O., Ha, W., Carey, G., Cook, L.J., Deich, J., Smith, S.J, Moerner W.E. and Harris J.S., Jr. (2004) Integrated semiconductor vertical-cavity surface-emitting lasers and PIN photodetectors for bio-medical fluorescence sensing." *Journal of Quantum Electronics*, 40: 491-499.
90. Thrush E., Levi O., Cook L.J., Smith S.J. and Harris J.S., Jr. (2004) Greater than 10^6 optical isolation in integrated optoelectronic fluorescence sensor. *IEEE-EMBS Special Topic Conference on Microtechnologies in Medicine & Biology*, 2080-2081.
91. Christopher M. Niell, C.M and Smith, S.J (2005) Functional imaging reveals rapid development of visual response properties in the zebrafish tectum. *Neuron* 45: 941-951.
92. Hua, Y., Smear, M.C., Baier, H. and Smith, S.J (2005) Activity-Based Competition Regulates Axon Growth in Vivo. *Nature* 434: 1022-1026.
93. Meyer, M.P., Trimmer, J.S., Gilthorpe, J.D., and Smith, S.J (2005) Characterization of Zebrafish PSD-95 Gene Family Members. *J. Neurobiol.* 63:91-105.
94. Thrush, E., Levi, O., Cook, L.J., Deich, J., Kurtz, A., Smith, S.J, Moerner W.E. and Harris J.S., Jr. (2005) Monolithically integrated fluorescence sensor for microfluidic applications. *Sensor and Actuators B* 105: 393-399.
95. Okumoto, S., Looger, L.L., Micheva, K.D., Reimer, R.J., Smith, S.J, and Frommer, W.B. (2005) Detection of glutamate release from neurons by genetically encoded surface-displayed FRET nanosensors. *Proc. Natl. Acad. Sci., USA*, 102:8740-8745.
96. Micheva, K.D. and Smith, S.J (2005) Strong effects of sub-physiological temperature on the function and plasticity of mammalian presynaptic terminals. *J. Neurosci.* 25: 7481-7488.
97. Meyer, M.P. & Smith, S.J (2006) Evidence from in vivo imaging that synaptogenesis guides the growth and branching of axonal arbors by two distinct mechanisms. *J. Neurosci.* 26:3604-14.
98. Micheva, K.D., Taylor, C.P. & Smith, S.J (2006) Pregabalin reduces the release of synaptic vesicles from cultured hippocampal neurons. *Mol. Pharm. (in press)*.