

## BIOGRAPHICAL SKETCH

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NAME Gary L. Westbrook	POSITION TITLE Senior Scientist, Professor of Neurology, Co-Director, Vollum Institute		
eRA COMMONS USER NAME westbrookg			
EDUCATION/TRAINING (Begin with baccalaureate or other initial professional education, such as nursing, and include postdoctoral training.)			
INSTITUTION AND LOCATION	DEGREE (if applicable)	YEAR(s)	FIELD OF STUDY
Miami University, Oxford, OH	BA	1970	Zoology
Case Western Reserve University, Cleveland OH	MSE	1974	Biomedical Engineering
Case Western Reserve University, Cleveland OH	MD	1976	Medicine

### A. Positions and Honors.

#### CLINICAL TRAINING

Mt. Auburn Hospital, Harvard, Cambridge, MA 1976-78 Intern, Resident in Internal Medicine  
Barnes Hospital, Washington Univ. St. Louis 1978-81 Resident in Neurology

#### RESEARCH AND PROFESSIONAL EXPERIENCE

PRAT Fellow, Pharmacol Sci Program, NIGMS, NIH, Bethesda, MD (1981-83); Staff & Senior Staff Fellow, Lab Developmental Neurobiol, NIH, Bethesda, MD (1983-87); Asst Prof (Neurology); Asst Scientist (Vollum Inst), Oregon Health Sci Univ, Portland OR (1987-); Associate Professor of Neurology (1988-92); Attending Neurologist, University Hospital, Portland OR (1988- ), Physician, Epilepsy Program (1989-03); Senior Scientist, Vollum Institute (1990- ); Professor of Neurology and Physiology & Pharmacology (1992- ); Co-Director, Vollum Institute, (2005 -).

#### AWARDS AND HONORS

magna cum laude, Phi Beta Kappa, Omicron Delta Kappa, Miami University (1970); NIH Predoctoral Trainee in Biomedical Engineering (1970-73); Diplomate, American Board of Internal Medicine (1979); Irwin Levy Resident Teaching Award, Dept. Neurology, Washington University (1980); American Board of Psychiatry & Neurology, Part I (1982); McKnight Endowment Fund for Neuroscience Development Award (1988); Klingenstein Fellowship in Neuroscience (1990); Excellence in Teaching Award, Graduate Program, Oregon Health & Science University (1993); Javits Neuroscience Investigator Award, NINDS, NIH (1993); MERIT Award, NIMH, NIH (1997); Special Lecturer, Japan Neuroscience Society (1999); Special Lecturer, Society for Neuroscience meeting (2000). Max Planck Research Award for International Cooperation (2003).

#### PROFESSIONAL SERVICE

Associate Editor, Cellular Neuroscience Section, *Journal of Neuroscience* (1988-93); Behavioral & Neuroscience Study Section, Subcommittee 1, DRG, NIH (1988-91); Ad hoc, Neurological Sciences I and NINDS Program Project A Study Section (1993-94); Cellular and Molecular Neuroscience Study Section, NIMH, NIH (1995-96); Editorial Board, *Molecular Pharmacology* (1995-98); Section Editor, Cellular Neuroscience, *Journal of Neuroscience* (1995-97); Program Committee, Society for Neuroscience (1996-99); NIH CSR Working Group on MDCN study sections, 2000; NIMH Conte Center Review Group (2003,'05,'06); Senior Editor, Cellular and Molecular Neuroscience, *Journal of Neuroscience* (1997-2002). Editor-In-Chief *Journal of Neuroscience* (2003-2007); Member, Dana Alliance (2005- ); Scientific Advisory Boards: Myelin Repair Foundation (2004-present; Chairman 2007-); Max Planck Institute for Experimental Medicine (Chairman ad hoc, 2006-present); Advisory Council, NINDS, NIH (2006- present); Council of Councils, NIH Director's office, NIH (2007 – present); NINDS Strategic Planning Committee on Basic Science, NIH (Chairman, 2008).

Gary L. Westbrook, page 2

**B. Selected Publications (from total of 116)**

7. Mayer ML, **Westbrook GL**, Guthrie PB (1984) Voltage dependent block by magnesium ions of NMDA responses in spinal cord neurones. *Nature* 309, 261-263.
13. MacDermott AB, Mayer ML, **Westbrook GL**, Smith SJ, Barker JL (1986) NMDA-receptor activation increases cytoplasmic calcium concentration in cultured spinal cord neurones. *Nature* 321, 519-522.
20. **Westbrook GL**, Mayer ML (1987) Micromolar concentrations of zinc antagonize NMDA and GABA responses on hippocampal neurones. *Nature* 328, 640-643.
22. Mayer ML, **Westbrook GL** (1987) The physiology of excitatory amino acids in the mammalian central nervous system. *Prog Neurobiol* 28, 197-276.
33. Lester RAJ, Clements JD, **Westbrook GL**, Jahr CE (1990) Channel kinetics determine the time course of NMDA receptor-mediated synaptic currents. *Nature* 346, 565-567.
38. Clements JD, **Westbrook GL** (1991) Activation kinetics reveal the number of ligand binding sites on the NMDA receptor. *Neuron* 7, 605-613.
44. Clements JD, Lester RAJ, Tong G, Jahr CE, **Westbrook GL** (1992) The time course of glutamate in the synaptic cleft. *Science* 258, 1498-1501.
47. Rosenmund C, **Westbrook GL** (1993) Calcium-induced actin depolymerization reduces NMDA channel activity. *Neuron* 10, 805-814.
50. Rosenmund C, Clements JD and **Westbrook GL** (1993). Nonuniform probability of glutamate release at a hippocampal synapse. *Science* 262, 764-767.
52. Rosenmund C, Carr DW, Bergeson SE, Nilaver G, Scott JD and **Westbrook GL** (1994). Anchoring of protein kinase A is required for modulation of AMPA/kainate receptors on hippocampal neurons. *Nature* 368, 853-855.
61. Jones MV, **Westbrook GL** (1995). Desensitized states prolong GABAA channel responses to brief agonist pulses. *Neuron* 15, 181-191.
62. Jones MV, **Westbrook GL** (1996). The impact of receptor desensitization on fast synaptic transmission. *Trends Neurosci* 19,96-101.
69. Jones MV, **Westbrook GL** (1997). Shaping of inhibitory postsynaptic currents by endogenous calcineurin activity. *J Neurosci* 17,7626-7633.
74. Clements JD, Feltz A, Sahara Y and **Westbrook GL** (1998). Activation kinetics of AMPA receptors reveal the number of agonist binding sites. *J Neurosci* 18, 119-127.
75. Krupp JJ, Vissel B, Heinemann SF and **Westbrook GL** (1998). N-terminal domains in the NR2 subunit control desensitization of NMDA receptors. *Neuron* 20, 317-327.
76. Jones MV, Dzubay JA, Sahara Y and **Westbrook GL** (1998). Defining affinity with the GABAA receptor. *J Neurosci* ,18, 8590-8604.
77. Schoppa NE, Kinzie JM, Sahara Y, Segerson TP and **Westbrook GL** (1998). Dendrodendritic inhibition at reciprocal synapses in the olfactory bulb is driven by NMDA receptor activity. *J Neurosci* , 18, 6790-6802.
78. Tovar KR and **Westbrook GL** (1999). The incorporation of NMDA receptors with a distinct subunit composition at nascent hippocampal synapses in vitro. *J Neurosci* 19, 4180-4188.
79. Krupp JJ, Vissel B, Thomas, CG, Heinemann SF and **Westbrook GL** (1999). Interactions of calmodulin and alpha-actinin with the NR1 subunit modulate Ca<sup>2+</sup>-dependent inactivation of NMDA receptors. *J Neurosci* 19, 1165-1178.
80. Schoppa NE, **Westbrook GL** (1999). Regulation of synaptic timing in the olfactory bulb by an A-type potassium current. *Nature Neurosci* 2, 1106-1113.
81. Tovar KR and **Westbrook GL** (2000). NMDA EPSCs in NR2B-knockout mice show rapid kinetics. *J Neurophysiol.* 83, 616-620
82. Krupp JJ and **Westbrook GL** (2000). An orphan glutamate channel points the way to the gates. *Nature Neurosci* 3, 301-302.
83. **Westbrook GL** (2000). Seizures and epilepsy. In Principles of Neural Science, 4th Edition (ER Kandel, JH Schwartz, TM Jessell, eds.), pp 910-935.

Gary L. Westbrook, page 3

84. Overstreet LO, Jones MV, **Westbrook GL** (2000). Slow desensitization regulates the availability of synaptic GABA<sub>A</sub> receptors. *J Neurosci* 20, 7914-7921.
85. **Westbrook GL** (2000). Ligand-gated ion channels. In *Cell Physiology Source Book*, 3rd Edition (N Sperelakis, ed.), Academic Press.
86. Jones MV, Jonas P, Sahara Y, **Westbrook GL** (2001). Microscopic kinetics and energetics distinguish GABA<sub>A</sub> receptor agonists from antagonists. *Biophysical J* 81, 2660-2670.
87. Chavis P, **Westbrook GL** (2001). Integrin-mediated maturation of presynaptic and postsynaptic compartments at a hippocampal synapse. *Nature* 411, 317-321.
88. Krupp JJ, Vissel B, Heinemann SF and **Westbrook GL** (2001). Use-dependent tyrosine dephosphorylation regulates NMDA receptor activity. *Nature Neurosci* 4, 587-596.
89. Christie JM, Schoppa NE, **Westbrook GL** (2001). Tufted cell dendrodendritic inhibition is dependent on interneuronal NMDA receptor activity. *J Neurophysiol* 85, 169-173.
90. Schoppa NE and **Westbrook GL** (2001). Glomerulus-specific synchronization of mitral cells in the olfactory bulb. *Neuron* 31, 639-651.
91. Overstreet LS and **Westbrook GL** (2001). Paradoxical reduction of synaptic inhibition by vigabatrin. *J Neurophysiol* 86, 596-603.
92. Schoppa NE and **Westbrook GL** (2001). NMDA receptors turn to another channel for inhibition. *Neuron* 31, 877-879.
93. Tovar KR, Westbrook GL (2002). Mobile NMDA receptors at hippocampal synapses. *Neuron* 34, 255-264.
94. Vissel B, Krupp JJ, Heinemann SF and **Westbrook GL** (2002). Intracellular domains of NR2 alter calcium-dependent inactivation of NMDA receptors. *Mol Pharmacol* 61, 595-605.
95. Krupp JJ, Vissel B, Thomas CG, Heinemann SF and **Westbrook GL** (2002). Calcineurin acts via the C-terminus of NR2A to modulate desensitization of NMDA receptors. *Neuropharmacol* 42, 593-602.
96. Schoppa NE and **Westbrook GL** (2002). AMPA autoreceptors drive correlated spiking in olfactory bulb glomeruli. *Nature Neurosci* 5, 1194-1202.
97. Overstreet LO and **Westbrook GL** (2003). Synaptic density regulates independence at unitary inhibitory synapses. *J Neurosci* 23, 2618-2626.
98. Christie JM and **Westbrook GL** (2003). Regulation of backpropagating action potentials in mitral cell lateral dendrites by A-type potassium currents. *J Neurophysiol* 89, 2466-2472.
99. Overstreet LO, **Westbrook GL** and Jones MV (2003). Measuring and modeling the spatiotemporal profile of GABA at the synapse. In *Transmembrane transporters* (M.V. Quick, ed.), Wiley-Liss Inc, pp. 259-275.
100. Overstreet LO, Hentges ST, Bumashny VF, Junqueira deSouza FS, Smart JL, Santangelo AM, Low MJ, **Westbrook GL** and Rubenstein M, (2004). A Transgenic Marker for Newly Born Granule Cells in Dentate Gyrus. *J Neurosci*, 23, 3251-3259.
101. De Saint Jan D and **Westbrook GL** (2005). Detecting glomerular activity with astrocyte recording. *J Neurosci* 25, 2917-2924.
102. Christie JM, Bark C, Hormuzdi SG, Helbig I, Monyer H, **Westbrook GL** (2005). Connexin 36 mediates spike synchrony in olfactory bulb glomeruli. *Neuron* 46, 761-772.
103. Maher, B and **Westbrook GL** (2005). SK channel regulation of dendritic excitability and dendrodendritic inhibition in the olfactory bulb. *J Neurophysiol*, 94, 3743-3750.
104. Overstreet Wadiche LS, Bromberg DA, Bensen LA and **Westbrook GL** (2005). GABAergic signaling to newborn neurons in dentate gyrus. *J Neurophysiol*, 94, 4528-4532.
105. Thomas CG, Miller AJ and **Westbrook GL** (2005). Synaptic and extrasynaptic NMDA receptor NR2 subunits in cultured hippocampal neurons. *J Neurophysiol*, 95, 1727-1734.
106. Thomas CG, Krupp JJ, Bagley EE, Bauzon R, Heinemann SF, Vissel B and **Westbrook GL** (2006). Probing NMDA receptor desensitization with the substituted cysteine accessibility method. *Mol Pharmacol*, 69, 1296-1303.
107. Overstreet Wadiche LS, Bensen LA and **Westbrook GL** (2006) Delayed development of adult-generated granule cells in dentate gyrus. *J Neurosci*, 26, 3436-3445.
108. Christie JM and **Westbrook GL** (2006). Lateral excitation in olfactory bulb glomeruli. *J. Neurosci*, 26, 2269-2277.

109. Overstreet Wadiche LS and **Westbrook GL** (2006). Functional maturation of adult-generated granule cells. *Hippocampus*, 16, 208-215.
110. Overstreet Wadiche LS, Bromberg DA, Bensen LA and **Westbrook GL** (2006). Seizures accelerate functional integration of adult-generated granule cells. *J Neurosci*, 26,4095-4103.
111. De Saint Jan D and **Westbrook GL** (2007). Disynaptic amplification of mGluR1 responses in the olfactory bulb. *J Neurosci* 27, 132-140.109.
112. **Westbrook GL** (2008). Seizures and Epilepsy. In Principles of Neural Science, 5th Edition (ER Kandel, TM Jessell, SA Siegelbaum, eds.), in press.
113. McCormick, DA and **Westbrook GL** (2008). Sleep dreaming and disorders of sleep. In Principles of Neural Science, 5th Edition (ER Kandel, TM Jessell, SA Siegelbaum, eds.), in press.
114. Maher BJ and **Westbrook GL** (2008). Co-transmission of dopamine and GABA in periglomerular cells. *J Neurophysiol* in press.
115. Luikart BW, Zhang W, Wayman GA, Kwon C-H, **Westbrook GL**, Parada LF (2008). Neurotrophin dependent dendritic filopodial motility – A convergence on PI3K signaling. *J Neurosci*, pending revisions.

### C. Research Support

#### Primary laboratory support

R01 NS26494-21 Westbrook, Gary L. (PI) 7/1/88-12/31/08

NIH  
Synaptic mechanisms in the mammalian CNS  
This grant examines the mechanisms of synaptic transmission at dendrodendritic synapses in the olfactory bulb, and the circuitry of the olfactory cortex. Formerly Javits Award (1992-1999).

R01 MH46613-18 Westbrook, Gary L. (PI) 4/1/90-6/30/12

NIH  
Synapses and circuits in the hippocampus  
This grant addresses excitatory and inhibitory synaptic integration and synapse formation with newly generated neurons in the dentate gyrus of the hippocampus. Formerly MERIT Award (1997-2007).

#### Other

R25 MH076777-03 Westbrook (PI) 10/1/05-8/31/08  
NIH no-cost extension for 07-08

Course development in the neurobiology of disease.  
This is a course development grant for a core course in the neuroscience graduate program. The course covers basic mechanisms of neurological disease, overviews of modern techniques for disease-oriented research and clinical demonstrations of neurological and psychiatric disease. For further information see [www.ohsu.edu/nod](http://www.ohsu.edu/nod).

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