

LONNIE P. WOLLMUTH

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PERSONAL:

Born: Garrison, North Dakota, Jan. 21, 1959
Married: Marilyn J. Hiebert, Aug. 11, 1989

EDUCATION:

B.A. 1983, with Honors in Psychology & Anthropology, Portland State Univ., Portland, OR.
M.S. 1988, Biology, Portland State Univ. *Dr. L. I. Crawshaw* - supervisor.
Ph.D. 1992, Physiology & Biophysics, Univ. of Washington, Seattle, WA. *Dr. B. Hille* - supervisor.

POSTGRADUATE TRAINING:

Senior Fellow, Dept. of Physiology & Biophysics, Univ. of Washington, Seattle, WA. *Dr. B. Hille* - supervisor. 1/93 to 10/93. Molecular mechanism of modulation of N-type calcium channels.
Senior Fellow, Division of Cell Physiology, Max-Planck-Institute for Medical Research, Heidelberg, Germany. *Professor Dr. B. Sakmann* - supervisor. 10/93 to 9/98. Structure/function of glutamate receptor channels.

FACULTY POSITIONS HELD:

Assistant Professor, Dept. of Neurobiology and Behavior, State Univ. of New York at Stony Brook, Stony Brook, NY. 9/98 to 8/03.
Associate Professor, Dept. of Neurobiology and Behavior, State Univ. of New York at Stony Brook, Stony Brook, NY. 9/03 to present.
Director, Graduate Program in Neuroscience, State Univ. of New York at Stony Brook, Stony Brook, NY. 9/06 to present.

AWARDS AND HONORS:

1986 Travel Grant, Portland State Univ. to present paper at FASEB meeting (St. Louis).
1987 Travel Grant, Portland State Univ. to present paper at Society for Neuroscience meeting (New Orleans).
1987 Scholander Award for best paper by a young investigator in Comparative Physiology, Fall Joint Meeting, American Physiological Society and American Society of Zoologists.
1989-1992 Competitive Pre-doctoral Fellowship in Neurobiology, Univ. of Washington (NIH Institutional Grant).
1993 National Research Scientist Award Post-doctoral fellowship, awarded.
1993-1995 International Human Frontier Science Program Long-term Fellowship.
1996-1997 Alexander von Humboldt Post-doctoral Fellowship.
1999-2002 Alexandrine and Alexander Sinsheimer Scholars Award (\$120,000).
2004 Invited speaker. Ion Channel Gordon Research Conference, Tilton, New Hampshire.

GRANTS:**Completed**

NIH/NINDS RO1 Research Grant entitled "Calcium Transport in Glutamate Receptor Channels" 1999-2004

NIH/NINDS Administrative Supplement for Parkinson's Disease entitled "Mechanisms of Interaction of Anti-parkinsonian Agents with NMDA Receptor Channels" 2001

NSF-NATO Postdoctoral Fellowship in Science and Engineering for Maria Yelshansky "The Location of the Gates in Glutamate Receptor Channels" 2000-2001

American Parkinson Disease Association entitled "Mechanism of Interaction of Anti-Parkinsonian Agents with NMDA Receptor Channels" 2002-2003

On-going

NIH/NIMH RO1 Research Grant entitled "Functional Architecture of Glutamate Receptor Channels" 2003-2007 (no-cost extension to 2008)

NIH/NEI RO1 Research Grant entitled "Molecular Properties of Synapses in the Visual Cortex" 2005-2009 (this is the competitive renewal for NINDS RO1 awarded in 1999).

MEMBERSHIP (PROFESSIONAL SOCIETIES):

Society for Neuroscience

Biophysical Society

PUBLICATIONS**REVIEWED ARTICLES**

1. Wollmuth, L. P., L. I. Crawshaw, R. B. Forbes, and D. A. Grahn (1987) Temperature selection in developing *Rana cascadae* tadpoles. Physiological Zoology 60:472-480.
2. Wollmuth, L. P., L. I. Crawshaw, and H. Panayiotides-Djaferis (1987) Thermoregulatory effects of intracranial norepinephrine injections in goldfish. American Journal of Physiology 253:R821-R826.
3. Wollmuth, L. P. and L. I. Crawshaw (1988) The effect of development and season on temperature selection in bullfrog tadpoles. Physiological Zoology 61:461-469.
4. Wollmuth, L. P., L. I. Crawshaw, and R. N. Rausch (1988) Adrenoceptors and temperature regulation in goldfish. American Journal of Physiology 255:R600-R604.
5. Crawshaw, L. I., L. P. Wollmuth, and C. S. O'Connor (1989) Intracranial ethanol and ambient anoxia elicit selection of cooler water by goldfish. American Journal of Physiology 256:R133-R137.
6. Wollmuth, L. P., L. I. Crawshaw, and H. Panayiotides-Djaferis (1989) The effects of dopamine on temperature regulation in goldfish. Journal of Comparative Physiology B 159:83-89.
7. Crawshaw, L. I., R. N. Rausch, L. P. Wollmuth, and E. J. Bauer (1992) Seasonal rhythms of development and temperature selection in larval bullfrogs, *Rana catesbeiana* shaw. Physiological Zoology 65:346-359.
8. Crawshaw, L. I. and L. P. Wollmuth (1992) The effective loci and roles of acetylcholine in temperature regulation of goldfish. American Journal of Physiology 263:R596-R601.
9. Wollmuth, L. P. and B. Hille (1992) Ionic selectivity of I_h channels of rod photoreceptors in tiger salamanders. Journal of General Physiology 100:749-765.
10. Wollmuth, L. P. (1992) Ionic selectivity and permeation of I_h channels of rod photoreceptors in tiger salamanders. Ph.D. Thesis. Univ. of Washington.

11. Wollmuth, L. P. (1994) Mechanism of Ba²⁺ block of M-like K channels of rod photoreceptors of tiger salamanders. Journal of General Physiology 103:45-66.
12. Shapiro, M. S., L. P. Wollmuth, and B. Hille (1994) Angiotensin II inhibits calcium and M current channels in rat sympathetic neurons via G proteins. Neuron 12:1319-1329.
13. Shapiro, M. S., L. P. Wollmuth, and B. Hille (1994) Modulation of Ca²⁺ channels by PTX-sensitive G-proteins is blocked by N-ethylmaleimide in rat sympathetic neurons. Journal of Neuroscience 14:7109-7116.
14. Wollmuth, L. P. (1995) Multiple ion binding sites in I_h channels of rod photoreceptors from tiger salamanders. Pflügers Arch 430:34-43.
15. Wollmuth, L. P., M. S. Shapiro, and B. Hille (1995) Pancreatic polypeptide inhibits calcium channels in rat sympathetic neurons via two signaling pathways. Journal of Neurophysiology 73:1323-1328.
16. Wollmuth, L. P., T. Kuner, P. H. Seeburg, and B. Sakmann (1996) The NR1- and NR2A-subunits contribute differentially to the selectivity filter of NMDAR channels. Journal of Physiology 491:779-797.
17. Kuner, T., L. P. Wollmuth, A. Karlin, P. H. Seeburg, and B. Sakmann (1996) Structure of the NMDA receptor channel M2 segment inferred from the accessibility of substituted cysteines. Neuron 17:343-352.
18. Wollmuth, L. P., T. Kuner, and B. Sakmann (1998) Adjacent asparagines in the NR2-subunit of the NMDA receptor channel control the voltage dependent block by extracellular Mg²⁺. Journal of Physiology 506:13-32.
19. Wollmuth, L. P., T. Kuner, and B. Sakmann (1998) Intracellular Mg²⁺ interacts with structural determinants of the narrow constriction contributed by the NR1-subunit in the NMDA receptor channel. Journal of Physiology 506:33-52.
20. Rozov A., Y. Zilberter, L. P. Wollmuth, and N. Burnashev (1998) Facilitation of currents through rat Ca²⁺-permeable AMPA receptor channels by activity-dependent relief from polyamine block. Journal of Physiology 511:361-377.
21. Wollmuth, L. P. and B. Sakmann (1998) Different mechanisms of Ca²⁺ transport in NMDA and Ca²⁺-permeable AMPA glutamate receptor channels. Journal of General Physiology 112:623-636.
22. Beck, C., L. P. Wollmuth, P. H. Seeburg, B. Sakmann, and T. Kuner (1999) NMDAR channel segments forming the extracellular vestibule inferred from the accessibility of substituted cysteines. Neuron 22:559-570.
1. Wollmuth, L. P., T. Kuner, C. Jatzke, P. H. Seeburg, N. Heintz and J. Zuo (2000) The lurcher mutation identifies $\delta 2$ as an AMPA/kainate receptor-like channel that is potentiated by Ca²⁺. Journal of Neuroscience 20:5973-5980.
24. Jatzke, C., J. Watanabe, and L. P. Wollmuth (2002) Voltage and concentration dependence of Ca²⁺ permeability in recombinant glutamate receptor subtypes. Journal of Physiology, 538:25-39.
25. Sobolevsky, A. I., C. Beck, and L. P. Wollmuth (2002) Molecular rearrangements of the extracellular vestibule in NMDAR channels during gating. Neuron, 33:75-85.
26. Watanabe, J., C. Beck, T. Kuner, L. Premkumar, and L. P. Wollmuth (2002) DRPEER: A motif in the extracellular vestibule conferring high Ca²⁺ flux rates in NMDA receptor channels. Journal of Neuroscience, 22:10209-10216.
27. Sobolevsky, A. I., L. Rooney, and L. P. Wollmuth (2002) Staggering of subunits in NMDA receptor channels. Biophysical Journal, 83:3304-3314.
28. Jatzke, C., M. Hernandez, and L. P. Wollmuth. (2003) Extracellular vestibule determinants of Ca²⁺ influx in Ca²⁺-permeable AMPA receptor channels. Journal of Physiology, 549:439-452.
29. Sobolevsky, A. I., M. Yelshansky, and L. P. Wollmuth. (2003) Different gating mechanisms in glutamate receptor and K⁺ channels. Journal of Neuroscience. 23:7559-7568.

30. Sobolevsky, A. I., M. Yelshansky, and L. P. Wollmuth. (2004) The outer pore of the glutamate receptor ion channel has two-fold rotational symmetry. Neuron. 41: 367-378.
31. Yelshansky, M., A. I. Sobolevsky, C. Jatzke, and L. P. Wollmuth. (2004) Block of AMPA receptor desensitization by a point mutation outside the ligand-binding domain. Journal of Neuroscience. 24: 4728-4736.
32. Sobolevsky, A. I., M. Yelshansky, and L. P. Wollmuth. (2005) State-dependent changes in the electrostatic potential in the pore of a GluR channel. Biophysical Journal. 88:235-242.
33. Watanabe, J., A. Rozov, and L. P. Wollmuth. (2005) Target-specific regulation of synaptic amplitudes in the neocortex. Journal of Neuroscience. 25:1024-1033.
34. Sobolevsky, A. I., M. Prodromou, M. Yelshansky, and L. P. Wollmuth. (2007) Subunit-specific contribution of pore-forming domains to NMDA receptor channel structure and gating. Journal of General Physiology. 129:509-525.

Prieto, M. and L. P. Wollmuth. A trapping gate located at the external entrance of the glutamate receptor channel. Biophysical Journal, In preparation.

Helm, J. and L. P. Wollmuth. Rescue of synaptic amplitudes by intracellular glutamate is an all-or-nothing phenomena at pyramidal-to-interneuron synapses in the visual cortex. In preparation.

CHAPTERS AND REVIEWS

1. Crawshaw, L., D. Grahn, L. Wollmuth, and L. Simpson (1985) CNS regulation of body temperature in vertebrates-- comparative aspects. International Journal of Pharmacology and Therapeutics 30:19-30.
2. Crawshaw, L. I., L. P. Wollmuth, C. S. O'Connor, and R. N. Rausch (1990) Body temperature regulation in vertebrates: Comparative aspects and neuronal elements. In: International Encyclopedia of Pharmacology and Therapeutics, Section 131, THERMOREGULATION. Physiology and Biochemistry, E. Schonbaum and P. Lomax, eds. Pergamon Press, New York, pp. 209-220.
3. Crawshaw, L. I., C. S. O'Connor, and L. P. Wollmuth (1992) Ethanol and the neurobiology of temperature regulation. In: Alcohol and Neurobiology: Brain development and hormone regulation and neurophysiology R.R. Watson, ed. CRC Press, Boca Raton, pp 341-360.
4. Hille, B., D. J. Beech, L. Bernheim, A. Mathie, M. S. Shapiro, and L. P. Wollmuth (1995) Multiple G-protein-coupled pathways inhibit N-type Ca channels of neurons. In: "Subtypes of Muscarinic Receptors: Proc. of Sixth International Symposium on Subtypes of Muscarinic Receptors" Life Sciences 56:989-992.
5. Kuner, T., L. P. Wollmuth, and B. Sakmann (1999) The ion conducting pore of glutamate receptor channels. In: Handbook of Experimental Pharmacology, H. Monyer and P. Jonas, eds. Springer-Verlag, Berlin Heidelberg. 141: 219-249.
6. Wollmuth, L. P. and A. I. Sobolevsky (2004) Structure and Gating of the Glutamate Receptor Ion Channel. Trends in Neuroscience. Invited Review. 27: 321-328.

PUBLISHED MEETING ABSTRACTS

1. Crawshaw, L. I., D. A. Grahn, L. P. Wollmuth, and D. Keith (1985) Temperature selection in fed and starved fish following intraperitoneal and intrahypo-thalamic injections of triiodothyronine (T₃). Federation Proceedings 44:999.
2. Wollmuth, L. P., L. I. Crawshaw, R. B. Forbes, and D. A. Grahn (1986) Temperature selection in developing *Rana cascadae* tadpoles. Federation Proceedings 45:642.
3. Wollmuth, L. P., L. I. Crawshaw, and H. Panayiotides-Djaferis (1987) Thermoregulatory effects of intracranial norepinephrine injections in goldfish. Federation Proceedings 46:323.

4. Crawshaw, L. I., L. P. Wollmuth, and C. S. O'Connor (1987) Anoxia and intrahypothalamic ethanol injections decrease the water temperature selected by goldfish (*Carassius auratus*). Federation Proceedings 46:792.
5. Wollmuth, L. P., L. I. Crawshaw, and R. N. Rausch (1987) Central catecholamines and behavioral thermoregulation in goldfish. Physiologist 30:120.
6. Crawshaw, L. I. and L. P. Wollmuth (1987) Temperature selection in developing bullfrog (*Rana catesbiana*) tadpoles. Physiologist 30:236.
7. Wollmuth, L. P., L. I. Crawshaw, and R. N. Rausch (1987) Intracranial injections of acetylcholine affect behavioral thermoregulation in goldfish. Society for Neuroscience 17:1716.
8. Wollmuth, L. P., L. I. Crawshaw, and R. N. Rausch (1988) Decrease in selected temperature after intracranial dopamine injections in goldfish. FASEB Journal 2:A934.
9. Crawshaw, L. I. and L. P. Wollmuth (1989) Neuroanatomical loci of hypothermic effects in goldfish following intrahypothalamic injections of ethanol, acetylcholine (ACh), norepinephrine (NE) and dopamine (DA). FASEB Journal 3:A530.
10. Crawshaw, L. I., R. N. Rausch, L. P. Wollmuth, and E. J. Bauer (1990) The effects of season and photoperiod on development and temperature selection in bullfrog tadpoles. FASEB Journal 4:A551.
11. Wollmuth, L. P. and B. Hille (1991) Permeability and block in I_h channels of rod photoreceptors. Biophysical Journal 59:269a.
12. Wollmuth, L. P. and B. Hille (1992) Mechanism of ion permeation in I_h channels. Biophysical Journal 61:289a.
13. Shapiro, M.S., J. Herrington, L. P. Wollmuth, and B. Hille (1993) Angiotensin II inhibits Ca^{2+} currents in rat sympathetic neurons via a G-protein. Society for Neuroscience 19:1479.
14. Shapiro, M. S., L. P. Wollmuth, and B. Hille. (1994) N-ethylmaleimide suppresses the actions of PTX-sensitive G proteins on Ca^{2+} channels in rat sympathetic neurons. Biophysical Journal 66:50a.
15. Wollmuth, L. P., T. Kuner, P. H. Seeburg, and B. Sakmann (1995) The NR1- and NR2A-subunits contribute differentially to the permeation pathway of NMDAR channels. FEBS 23rd Meeting:93.
16. Wollmuth, L. P., T. Kuner, P. H. Seeburg, and B. Sakmann (1995) The NR1- and NR2A-subunits contribute asymmetrically to the selectivity filter of NMDAR channels. Society for Neuroscience 21:86.
17. Kuner, T., L. P. Wollmuth, B. Sakmann, and P. H. Seeburg (1995) Probing the cytoplasmic face of the NMDA receptor channel pore in cysteine-substitution mutants. Society for Neuroscience 21:85.
18. Wollmuth, L. P., T. Kuner, D.-S. Koh, P. H. Seeburg, and B. Sakmann (1996) Ca^{2+} selectivity and permeation in NMDAR channels. Society for Neuroscience 22:589.
19. Rozov A., Y. Zilberter, L. Wollmuth, and N. Burnashev (1997) Relief from intracellular polyamine block underlies activity-dependent facilitation of currents through Ca^{2+} permeable AMPAR channels. Journal of Physiology 501.P: 18P.
20. Wollmuth, L. P. and B. Sakmann (1997) Flux coupling mediates Ca^{2+} transport in NMDA but not AMPA glutamate receptor channels. Society for Neuroscience 23:1391.
21. Premkumar, L. S., L. P. Wollmuth, T. Kuner, and A. Auerbach (1997) Single-channel analysis of recombinant NMDA receptors with N to G mutation in M2 segment. Society for Neuroscience 23:1391.
22. Wollmuth, L. P., C. Beck, P. H. Seeburg, and B. Sakmann (1998) Determinants of Ca^{2+} transport in NMDA receptor channels reside in the M3 segment of the NR1-subunit. Society for Neuroscience 24:840.
23. Zuo, J., L. Wollmuth, C. Beck, P. Seeburg, N. Heintz, and T. Kuner (1998) Glutamate receptor delta 2 subunit (GRID2) with Lurcher mutation forms an AMPA-like channel. Society for Neuroscience 24:841.

24. Zhu, Y., T. Kuner, L. P. Wollmuth, and A. Auerbach (1998) A single-channel study of external Mg²⁺ block and permeation in recombinant NMDA receptor channels. Society for Neuroscience 24:279.
25. Sobolevsky, A. I., C. Beck, and L. P. Wollmuth. (2001) Functional architecture of the extracellular vestibule in NMDA receptor channels. Society for Neuroscience. 704.6.
26. Jatzke, C., J. Watanabe, and L. P. Wollmuth. (2001) Determinants of calcium influx in calcium-permeable AMPA receptor channels. Society for Neuroscience. 480.1
27. Watanabe, J., C. Jatzke, and L. P. Wollmuth. (2001) Domains underlying the block of NMDA receptor channels by extracellular Ca²⁺. Society for Neuroscience. 703.10
28. Sobolevsky, A. I., L. Rooney, and L. P. Wollmuth. (2002) Staggering of NR1 and NR2 subunits forming the extracellular vestibule in NMDA receptor channels. Biophysical Society.
29. Sobolevsky, A. I., M. Yelshansky, and L. P. Wollmuth. (2002) Structural determinants of the core of the extracellular vestibule in AMPA receptor channels. Society for Neuroscience.
30. Yelshansky, M., C. Jatzke, and L. P. Wollmuth. (2002) Block of desensitization by a point mutation in a pore domain in AMPA receptor channels. Society for Neuroscience.
31. Watanabe, J., J. Rosebaum, S. Haleboua, and L.P. Wollmuth. (2002) Potentiation of currents in NMDAR channels by bovine serum albumin. Society for Neuroscience.
32. Bhat, S., J. Z-H Qi, J. Watanabe, L. S. Premkumar, and L. P. Wollmuth. (2002) Correlation between single channel conductance and Ca²⁺ influx in NMDA receptor channels. Society for Neuroscience.
33. Sobolevsky, A. I., M. V. Yelshansky, and L. P. Wollmuth. (2003) Cadmium scan of cysteine-substituted AMPA receptor channels. Society for Neuroscience.
34. Yelshansky, M. V., A. I. Sobolevsky, and L. P. Wollmuth. (2003) State-dependent and subunit-specific movement of the M3-S2 linker in AMPAR channels during gating. Society for Neuroscience.
35. Watanabe, J., A. Rozov, and L.P. Wollmuth. (2003). Mechanisms contributing to synaptic depression in the rat visual cortex. Society for Neuroscience.
36. Sobolevsky, A. I., M. V. Yelshansky, and L. P. Wollmuth. (2004) State-dependent changes in the transmembrane electrostatic potential in AMPAR channels. Biophysical Society.
37. Sobolevsky, A. I., M. V. Yelshansky, and L. P. Wollmuth. (2004) The M4 segment is necessary for functional AMPA receptor channels. Society for Neuroscience
38. Prieto, M., and L. P. Wollmuth. (2005) Polyamine block of AMPA receptors and conformational changes in the M2 loop. Society for Neuroscience
39. Prodromou, M. L., and L. P. Wollmuth. (2006) Glycine dependent gating rearrangements in the NMDAR NR1 subunit. Society for Neuroscience
40. Prieto, M., and L. P. Wollmuth. (2006) Effects of AMPA receptor activation on block by polyamines and cadmium. Society for Neuroscience

SERVICE FOR SCIENTIFIC ORGANIZATIONS:

Reviewer—Journals

Biophysical Journal
 British Journal of Pharmacology
 Cell
 EMBO Journal
 FEBS Letters
 Journal of General Physiology
 Journal of Physiology
 Journal of Neurophysiology
 Journal of Neuroscience
 Nature

Nature Neuroscience
 Nature Structural and Molecular Biology
 Neuron
 Proceedings of the National Academy of Sciences
 Science

Reviewer—Funding Agencies

Ad hoc reviewer (2001), The Wellcome Trust, United Kingdom
 Ad hoc reviewer (2004), National Institute of Health, Biophysics of Channels, Synapses, and Transporters (BCST)
 Ad hoc reviewer (2004), National Institute of Health, National Institute of Child Health and Human Development
 Ad hoc reviewer (2005), National Health and Medical Research Council, Australia
 Study Section Member (2004-2006), National Institute of Health, Biophysics of Channels, Synapses, and Transporters (BCST)
 Study Section Member (2006-present), National Institute of Health, Biophysics of Neural Systems (BPNS)
 Ad hoc reviewer for Site Visit (2006), National Institute of Health, National Institute of Child Health and Human Development. Laboratory of Cellular and Synaptic Neurophysiology (Chief, Chris J. McBain).

Scientific Meetings

Society for Neuroscience (2004). Chairperson, Membrane Biophysics Social.

Teaching

Woods Hole Marine Biological Laboratory, Woods Hole, Massachusetts . Invited lecture on Ligand Gated Ion Channels at MBL's 2006 Neurobiology course. Edwin W. McCleskey, Vollum Institute, Portland, OR – Course Director.

INVITED LECTURES (LAST 5 YEARS):

Dept. of Physiology & Biophysics, Albert Einstein School of Medicine, Bronx, New York. Spring, 2002.
 Dept. of Pharmacology, Emory University, Atlanta, Georgia. Fall, 2002.
 Dept. of Pharmacology, University of Iowa, Iowa City, Iowa. Winter, 2003.
 Dept. of Pharmacology, Columbia University, New York, New York. Winter, 2003.
 Dept. of Pharmacology, Yale University, New Haven, Connecticut. Winter, 2003.
 Dept. of Neurobiology, University of Pittsburgh, Pittsburgh, Pennsylvania. Fall, 2003.
 Neuroscience Program, Cold Spring Harbor Laboratory, Cold Spring Harbor, New York. Spring, 2004
 Ion Channel Gordon Research Conference, Tilton, New Hampshire. Summer, 2004.
 Vollum Institute, Portland, Oregon. Fall, 2004.
 Dept. of Neuroscience, Duke University, Durham, North Carolina. Fall, 2005.
 Dept. of Neuroscience, Case Western University, Cleveland, Ohio. Fall, 2005.
 Dept. of Neurobiology & Anatomy, Washington University, St. Louis, Missouri. Spring, 2006.
 Montana Neuroscience Retreat. Spring, 2006.
 Dept. of Neuroscience, University of Illinois, Urbana, Illinois. Spring, 2007.