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**BIOGRAPHICAL SKETCH**

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NAME Wade G. Regehr

eRA COMMONS USER NAME: WADEREGEHR

POSITION TITLE

Professor of Neurobiology

INSTITUTION AND LOCATION

DEGREE

MM/YY

FIELD OF STUDY

University of Regina, Regina, Sask., Canada

B.S. (Hons)

1982

Physics

California Institute of Technology

Ph.D.

1988

Applied Physics

**A. Personal Statement****B. Positions and Honors****Positions**

1993-98 Assistant Professor, Department of Neurobiology, Harvard Medical School

1998-2001 Associate Professor Department of Neurobiology, Harvard Medical School

2001-present Professor, Department of Neurobiology, Harvard Medical School

**Honors**

McKnight Award 1993

Klingenstein Award 1993

Javits Award 2005-2012

NIH NTRC Study Section Member 2003- 2010, NIH NTRC Study Section Head 2008-2010.

**Selected Peer-reviewed Publications (from over 100 papers)**1. **Regehr** WG, Connor JA and Tank DW (1989) Optical imaging of calcium accumulation in hippocampal pyramidal cells during synaptic activation. **Nature** 341:533-536.2. **Regehr** WG and Tank DW (1990) Postsynaptic NMDA receptor-mediated calcium accumulation in hippocampal CA1 pyramidal cell dendrites. **Nature** 345:807-810.3. **Regehr** WG and Tank DW (1991) The maintenance of LTP at hippocampal mossy fiber synapses is independent of sustained presynaptic calcium. **Neuron** 7:451-459.4. **Regehr** WG, Mintz IM. (1994) Participation of multiple calcium channel types in transmission at single climbing fiber to Purkinje cell synapses. **Neuron**. 12: 605-613.5. Brown SP, Brenowitz SD, **Regehr** WG (2003) Brief presynaptic bursts evoke synapse-specific retrograde inhibition mediated by endogenous cannabinoids. *Nat Neurosci* 6:1048-1057.6. Brown SP, Safo PK, **Regehr** WG (2004) Endocannabinoids inhibit transmission at granule cell to Purkinje cell synapses by modulating three types of presynaptic calcium channels. *J Neurosci* 24:5623-5631.7. Brenowitz SD, **Regehr** WG (2005) Associative short-term synaptic plasticity mediated by eCBs. *Neuron* 45:419-431.8. Safo PK, **Regehr** WG (2005) Endocannabinoids regulate of cerebellar LTD. *Neuron* 48:647-659.9. Brenowitz SD, Best AR, **Regehr** WG (2006) Sustained elevation of dendritic calcium evokes widespread endocannabinoid release and suppression of synapses onto cerebellar Purkinje cells. *J Neurosci* 26:6841-6850.10. **Regehr** WG, Atluri PP. (1995) Calcium transients in cerebellar granule cell presynaptic terminals. **Biophysical Journal**. 68: 2156-2170.11. Mintz IM, Sabatini BL **Regehr** WG (1995) Calcium control of transmitter release at a cerebellar synapse. **Neuron**. 15: 675-688.12. Tank DW, **Regehr** WG and Delaney KR. (1995) A quantitative model of calcium dynamics that contribute to short term synaptic enhancement. **J. Neurosci**. 15(12): 7940-7952.13. Sabatini BL and **Regehr** WG (1995) Detecting changes in calcium influx which contribute to synaptic modulation in mammalian brain slice **Neuropharmacology**. 34(11): 1453-1467.14. Dittman JS and **Regehr** WG (1996) Contributions of calcium-dependent and calcium-independent mechanisms to presynaptic inhibition at a cerebellar synapse. **J. Neurosci**. 16(5): 1623-1633.15. Atluri PP, **Regehr** WG (1996) Determinants of the time course of facilitation at the granule cell to Purkinje cell synapse. **J. Neurosci**. 16(18). 5661-5671.16. Sabatini BL and **Regehr** WG (1996) Timing of neurotransmission at fast synapses in the mammalian CNS. **Nature** 384, 170-172.17. Chen, C. and **Regehr** WG(1997). The mechanism of cAMP-mediated enhancement at a cerebellar synapse. **J. Neurosci**. 17(22): 8687-94.18. Dittman, J. S. and W. G. **Regehr** WG(1997). Mechanism and kinetics of heterosynaptic depression at a cerebellar synapse. **J. Neurosci**. 17(23): 9048-59.19. Sabatini, B. L. and W. G. **Regehr** (1997). Control of neurotransmitter release by presynaptic waveform at the granule cell to Purkinje cell synapse. **J. Neurosci**. 17: 3425-3435.

21. **Regehr, W. G.** (1997). Interplay between sodium and calcium dynamics in granule cell presynaptic terminals. **Biophysical Journal** 72: 2476-2488.
22. Sabatini BL and **Regehr WG** (1998) Optical detection of presynaptic Ca currents. **Biophysical J.** 73; 1549-63.
22. Dittman, J. S. and **WG Regehr** (1998) Calcium-dependence and recovery kinetics of presynaptic depression at the climbing fiber to Purkinje cell synapse **J. Neurosci.** 18; 6147-62.
23. Atluri, P and **WG Regehr** (1998) Delayed release of neurotransmitter from cerebellar granule cells. **J. Neurosci.** 18; 8214-8227.
24. Xu-Friedman, M.A. and **W.G. Regehr** (1999) Presynaptic strontium dynamics and synaptic transmission. **Biophysical Journal** 76, 2029-2042.
25. Chen, C. and **W.G. Regehr** (1999) Participation of residual calcium in rapid neurotransmitter release. **J. Neurosci.** (in press).
26. Chen C, **Regehr WG.** (1999) Participation of residual calcium in rapid neurotransmitter release. **J. Neurosci.** 19(15) 6257-6266.
27. Dittman JS, Kreitzer AC, and **Regehr WG.** (2000) Interplay between facilitation, depression and residual calcium at three presynaptic terminals. **J. Neurosci.** 20 1374-1385.
28. Kreitzer AC, **Regehr WG.** (2000) Modulation of short-term synaptic dynamics. **J. Neurosci.** 20 1348-1357.
29. Carter A, **Regehr WG.** (2000) Properties and consequences of spillover at the cerebellar granule cell to stellate cell synapse. **J. Neurosci.** 20(12), 4423-4434.
30. Xu-Friedman MA, **Regehr WG.** (2000) Probing fundamental properties of synaptic transmission with strontium. **J. Neurosci.** 20(12), 4414-4422.
31. Kreitzer AC, **Regehr WG.** (2000) Monitoring presynaptic calcium dynamics in projection fibers by in vivo loading of a novel calcium indicator. **Neuron.** 27, 25-32.
32. Chen C, **Regehr WG.** (2000) Developmental remodeling of the retinogeniculate synapse. **Neuron.** 28. 955-966.
33. Vogt KE, **Regehr WG** (2001) Cholinergic modulation of excitatory transmission in the CA3 area of the hippocampus. **J. Neurosci.** 21(1), 75-83.
34. Kreitzer AC, **Regehr WG.** (2001) Retrograde inhibition of presynaptic calcium influx by endogenous cannabinoids at excitatory synapses onto Purkinje cells. **Neuron.** 29, 717-727.
35. Xu-Friedman MA, Harris KM, **Regehr WG** (2001) Three-dimensional comparison of ultrastructural characteristics at depressing and facilitating synapses onto cerebellar Purkinje cells. **J. Neurosci.** 21(17), 6666-6672.
36. Kreitzer AC, **Regehr WG.** (2001) Cerebellar depolarization-induced suppression of inhibition is mediated by endogenous cannabinoids. **J. Neurosci.** 21, RC174.
37. Carter AG, Vogt KE, Foster KA , **Regehr WG** (2002) Assessing the role of calcium-induced calcium release in short-term presynaptic plasticity at excitatory central synapses. **J. Neurosci.** 22, 21-28.
38. Chen C, Blitz DM, **Regehr WG** (2002) Contributions of receptor desensitization and saturation to plasticity at the retinogeniculate synapse. **Neuron.** 33, 779-788.
39. Kreitzer AC, Carter AG and **Regehr WG** (2002) Inhibition of interneuron firing extends the spread of endocannabinoid signaling in the cerebellum. **Neuron.** 34, 787-796.
- Carter, AG and **WG Regehr** (2002). "Quantal events shape cerebellar interneuron firing." **Nat Neurosci** 5(12): 1309-18.
40. Foster, KA, AC Kreitzer, and **Regehr WG.** (2002). Interaction of postsynaptic receptor saturation with presynaptic mechanisms produces a reliable synapse. **Neuron** 36(6): 1115-26.
41. Chen, C. and **Regehr WG** (2003). Presynaptic modulation of the retinogeniculate synapse. **J Neurosci** 23(8): 3130-5.
42. Xu-Friedman, M. A. and **Regehr WG** (2003). Ultrastructural contributions to desensitization at cerebellar mossy fiber to granule cell synapses. **J Neurosci** 23(6): 2182-92.
43. Blitz DM, **Regehr WG** (2003) Retinogeniculate synaptic properties controlling spike number and timing in relay neurons. **J Neurophysiol** 90:2438-2450.
44. Beierlein M, Gee KR, Martin VV, **Regehr WG** (2004) Presynaptic calcium measurements at physiological temperatures using a new class of dextran-conjugated indicators. **J Neurophysiol** 92:591-599.
45. Foster KA, **Regehr WG** (2004) Variance-mean analysis in the presence of a rapid antagonist indicates vesicle depletion underlies depression at the climbing fiber synapse. **Neuron** 43:119-131.
46. Foster KA, Crowley JJ, **Regehr WG** (2005) The influence of multivesicular release and postsynaptic receptor saturation on transmission at granule cell to Purkinje cell synapses. **J Neurosci** 25:11655-11665.
47. Xu-Friedman MA, **Regehr WG** (2005a) Dynamic-clamp analysis of the effects of convergence on spike timing. II. Few synaptic inputs. **J Neurophysiol** 94:2526-2534.

48. Xu-Friedman MA, **Regehr** WG (2005b) Dynamic-clamp analysis of the effects of convergence on spike timing. I. Many synaptic inputs. **J Neurophysiol** 94:2512-2525.
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50. Beierlein M, **Regehr** WG (2006) Local interneurons regulate synaptic strength by retrograde release of endocannabinoids. **J Neurosci** 26:9935-9943.
51. Beierlein M, **Regehr** WG (2006) Brief bursts of parallel fiber activity trigger calcium signals in Bergmann glia. **J Neurosci** 26:6958-6967.
52. Crowley JJ, Carter AG, **Regehr** WG. (2007) Fast vesicle replenishment and rapid recovery from desensitization at a single synaptic release site. **J Neurosci.** 27(20):5448-60.
53. Beierlein M, Fioravante D, **Regehr** WG. (2007) Differential expression of posttetanic potentiation and retrograde signaling mediate target-dependent short-term synaptic plasticity. **Neuron** 54(6):949-59.
54. Brenowitz SD, **Regehr** WG.(2007) Reliability and heterogeneity of calcium signaling at single presynaptic boutons of cerebellar granule cells. **J Neurosci.** 27(30):7888-98.
55. Acuna-Goycolea C, Brenowitz SD, **Regehr** WG. (2008) Active dendritic conductances dynamically regulate GABA release from thalamic interneurons. **Neuron** 57(3):420-31.
56. Best AR, **Regehr** WG. (2008) Serotonin evokes endocannabinoid release and retrogradely suppresses excitatory synapses. **J Neurosci.** 28(25):6508-15. PMID: PMC2720684.
57. Carey MR, **Regehr** WG. Noradrenergic control of associative synaptic plasticity by selective modulation of instructive signals. **Neuron** 62(1):112-22. PMID: PMC2837271.
58. Best AR, **Regehr** WG. (2009) Inhibitory regulation of electrically coupled neurons in the inferior olive is mediated by asynchronous release of GABA. **Neuron** 62(4):555-65. PMID: PMC2837271.
59. Myoga MH, Beierlein M, **Regehr** WG. (2009) Somatic spikes regulate dendritic signaling in small neurons in the absence of backpropagating action potentials. **J Neurosci.** 29(24):7803-14. PMID: PMC2840263.
60. Kim JC, Cook MN, Carey MR, Shen C, **Regehr** WG, Dymecki SM. (2009) Linking genetically defined neurons to behavior through a broadly applicable silencing allele. **Neuron** 63(3):305-15. PMID: PMC2814245.
61. Crowley JJ, Fioravante D, **Regehr** WG. (2009) Dynamics of fast and slow inhibition from cerebellar Golgi cells allow flexible control of synaptic integration. **Neuron** 63(6):843-53. PMID: NIHMS167854.
62. Antal M, Acuna-Goycolea C, Pressler RT, Blitz DM, **Regehr** WG. (2010) Cholinergic activation of M2 receptors leads to context-dependent modulation of feedforward inhibition in the visual thalamus. **PLoS Biol.** 8(4):e1000348. PMID: PMC2850378.
63. Myoga, M. H., and **Regehr**, WG (2011) Calcium microdomains near R-type calcium channels control the induction of presynaptic long-term potentiation at parallel fiber to Purkinje cell synapses. **J Neurosci** 31, 5235-5243. PMID: PMC3089026.
64. Fioravante D., Chu Y., Myoga M.H., Leitges M. and **Regehr**, W.G. (2011) Calcium-dependent isoforms of protein kinase C mediate post-tetanic potentiation at the calyx of Held. **Neuron** 70(5): 1005-19. PMID: PMC3113702.
65. Hull, C and **Regehr**. WG (2012) A newly identified cerebellar circuit sets the timing of synaptic inhibition onto Golgi cells, **Neuron** 73. 149-158.
66. Chu Y, Fioravante D, Thanawala M, Leitges M, **Regehr** WG (2012) Calcium-dependent isoforms of protein kinase C mediate glycine-induced synaptic enhancement at the calyx of Held. **J. Neurosci.** 32:13796-13804.
67. Fioravante D, Myoga MH, Leitges M, **Regehr** WG (2012) Adaptive regulation maintains posttetanic potentiation at cerebellar granule cell synapses in the absence of calcium-dependent PKC. **J. Neurosci.** 32:13004-13009.
68. Tsai PT, Hull C, Chu Y, Greene-Colozzi E, Sadowski AR, Leech JM, Steinberg J, Crawley JN, **Regehr** WG, Sahin M (2012) Autistic-like behaviour and cerebellar dysfunction in Purkinje cell Tsc1 mutant mice. **Nature** 488:647-651.
69. Chu Y, Fioravante D, Thanawala M, Leitges M, **Regehr** WG (2012) Calcium-dependent isoforms of protein kinase C mediate glycine-induced synaptic enhancement at the calyx of Held. **J. Neurosci.** 32:13796-13804. [\[pdf\]](#)
70. Fioravante D, Myoga MH, Leitges M, **Regehr** WG (2012) Adaptive regulation maintains posttetanic potentiation at cerebellar granule cell synapses in the absence of calcium-dependent PKC. **J. Neurosci.** 32:13004-13009. [\[pdf\]](#)

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71. Pressler RT, Regehr WG (2013) Metabotropic glutamate receptors drive global persistent inhibition in the visual thalamus. *J. Neurosci.* : 33:2494-2506.
72. Thanawala MS, Regehr WG (2013) Presynaptic calcium influx controls neurotransmitter release in part by regulating the effective size of the readily releasable pool. *J. Neurosci.* : 33:4625-4633.

### Reviews and Book Chapters (selected)

1. Sabatini, B.L. and **Regehr** WG (1999) Timing of synaptic transmission. *Annu. Rev. Physiol.* 61:521-42.
- Zucker RS and **Regehr** WG (2002) Short term synaptic plasticity. *Annu. Rev. Physiol.* 64: 355-405.
2. Xu-Friedman MA, **Regehr** WG (2004) Structural contributions to short-term plasticity. *Physiol Rev* 84:69-85.
3. Abbott LF, **Regehr** WG (2004) Synaptic computation. *Nature* 431:796-803.
71. Blitz DM, Foster KA, **Regehr** WG (2004) Short-term synaptic plasticity: a comparison of two synapses. *Nat Rev Neurosci* 5:630-640.
4. Beierlein M, **Regehr** WG (2005) Conventional synapses for unconventional cells. *Neuron* 46:694-696.
5. Xu-Friedman MA, **Regehr** WG (2008) Retrograde tuning of tuning. *Neuron* 59:3-5.
74. **Regehr** WG, Carey MR, Best AR. (2009) Activity-dependent regulation of synapses by retrograde messengers. *Neuron* 63(2):154-70.
6. Regehr, W. G., Carey, M. R., and Best, A. R. (2009). Activity-dependent regulation of synapses by retrograde messengers. *Neuron* 63, 154-170.
7. Carey MR, **Regehr** WG. (2010) Phosphatase activity controls the ups and downs of cerebellar learning. *Neuron* 67(4):525-6.
8. Best, A. R., and Regehr, W. G. (2010). Identification of the synthetic pathway producing the endocannabinoid that mediates the bulk of retrograde signaling in the brain. *Neuron* 65, 291-292.
9. Carey, M. R., and Regehr, W. G. (2010). Phosphatase activity controls the ups and downs of cerebellar learning. *Neuron* 67, 525-526.
10. Fioravante, D., and Regehr, W. G. (2011). Short-term forms of presynaptic plasticity. *Curr Opin Neurobiol.* . 21(2), 269-74.
80. **Regehr**, W.G. (2012) Short-Term Synaptic Plasticity. in *Synapses* (Cold Spring Harbor Labs) in press.

### D. Research Support

R01 (NS32405) (Regehr, Wade, PI) 5/1/12 – 4/30/16  
NIH Short-Term Synaptic Plasticity in the CNS

T32 (NS007484) (Regehr, Wade, PI) 7/1/00 – 4/31/15  
NIH Postdoctoral training grant provides support for 8 postdocs per year to be trained in ~40 different labs.