

# Bibliography

- [Abbott et al., 1997] Abbott, L. F., Varela, J. A., Sen, K., & Nelson, S. B. (1997). Synaptic depression and cortical gain control. *Science*, 275(5297), 220–224. [22](#)
- [Abraham, 2003] Abraham, W. C. (2003). How long will long-term potentiation last? *Philos. Trans. R. Soc. Lond B Biol. Sci.*, 358(1432), 735–744. [24](#)
- [Abraham & Bear, 1996] Abraham, W. C. & Bear, M. F. (1996). Metaplasticity: the plasticity of synaptic plasticity. *Trends Neurosci.*, 19(4), 126–130. [15](#)
- [Abraham et al., 1991] Abraham, W. C., Dragunow, M., & Tate, W. P. (1991). The role of immediate early genes in the stabilization of long-term potentiation. *Mol. Neurobiol.*, 5(2-4), 297–314. [23](#)
- [Abraham et al., 2001] Abraham, W. C., Mason-Parker, S. E., Bear, M. F., Webb, S., & Tate, W. P. (2001). Heterosynaptic metaplasticity in the hippocampus *in vivo*: a BCM-like modifiable threshold for LTP. *Proc. Natl. Acad. Sci. U. S. A.*, 98(19), 10924–10929. [15](#)

- [Akbar et al., 1996] Akbar, M. T., Rattray, M., Powell, J. F., & Meldrum, B. S. (1996). Altered expression of group I metabotropic glutamate receptors in the hippocampus of amygdala-kindled rats. *Brain Res. Mol. Brain Res.*, 43(1-2), 105–116. 123
- [Akirav & Richter-Levin, 1999] Akirav, I. & Richter-Levin, G. (1999). Biphasic modulation of hippocampal plasticity by behavioral stress and basolateral amygdala stimulation in the rat. *J. Neurosci.*, 19(23), 10530–10535. 15
- [Albertson & Joy, 1987] Albertson, T. E. & Joy, R. M. (1987). Increased inhibition in dentate gyrus granule cells following exposure to GABA-uptake blockers. *Brain Res.*, 435(1-2), 283–292. 57, 103, 113
- [Ango et al., 2002] Ango, F., Robbe, D., Tu, J. C., Xiao, B., Worley, P. F., Pin, J. P., Bockaert, J., & Fagnani, L. (2002). Homer-dependent cell surface expression of metabotropic glutamate receptor type 5 in neurons. *Mol. Cell Neurosci.*, 20(2), 323–329. 9
- [Anwyl, 1999] Anwyl, R. (1999). Metabotropic glutamate receptors: electrophysiological properties and role in plasticity. *Brain Res. Brain Res. Rev.*, 29(1), 83–120. 7
- [Ari & Represa, 1990] Ari, Y. B. & Represa, A. (1990). Brief seizure episodes induce long-term potentiation and mossy fibre sprouting in the hippocampus. *Trends Neurosci.*, 13(8), 312–318. 122
- [Artola et al., 1990] Artola, A., Brocher, S., & Singer, W. (1990). Different voltage-dependent thresholds for inducing long-term depression and long-term potentiation in slices of rat visual cortex. *Nature*, 347(6288), 69–72. 15, 109

## Bibliography

- [Artola & Singer, 1993] Artola, A. & Singer, W. (1993). Long-term depression of excitatory synaptic transmission and its relationship to long-term potentiation. *Trends Neurosci.*, 16(11), 480–487.
- [Attucci et al., 2001] Attucci, S., Carla, V., Mannaioni, G., & Moroni, F. (2001). Activation of type 5 metabotropic glutamate receptors enhances NMDA responses in mice cortical wedges. *Br. J. Pharmacol.*, 132(4), 799–806. **105, 121**
- [Balazs et al., 1998] Balazs, R., Miller, S., Chun, Y., O'Toole, J., & Cotman, C. W. (1998). Metabotropic glutamate receptor agonists potentiate cyclic AMP formation induced by forskolin or beta-adrenergic receptor activation in cerebral cortical astrocytes in culture. *J. Neurochem.*, 70(6), 2446–2458. **123**
- [Balschun et al., 1999] Balschun, D., Manahan-Vaughan, D., Wagner, T., Behnisch, T., Reymann, K. G., & Wetzel, W. (1999). A specific role for group I mGluRs in hippocampal LTP and hippocampus- dependent spatial learning. *Learn. Mem.*, 6(2), 138–152. **120**
- [Baude et al., 1993] Baude, A., Nusser, Z., Roberts, J. D., Mulvihill, E., McIlhinney, R. A., & Somogyi, P. (1993). The metabotropic glutamate receptor (mGluR1 alpha) is concentrated at perisynaptic membrane of neuronal subpopulations as detected by immunogold reaction. *Neuron*, 11(4), 771–787. **10, 104**
- [Bayer, 1985] Bayer, S. A. (1985). Hippocampal region. In *The Rat Nervous System* book chapter 8, (pp. 335–352). Academic Press Australia. **2**
- [Bear & Abraham, 1996] Bear, M. F. & Abraham, W. C. (1996). Long-term depression in hippocampus. *Annu. Rev. Neurosci.*, 19, 437–462. **108**

- [Bear & Malenka, 1994] Bear, M. F. & Malenka, R. C. (1994). Synaptic plasticity: LTP and LTD. *Curr. Opin. Neurobiol.*, 4(3), 389–399. [14](#), [77](#)
- [Benquet et al., 2002] Benquet, P., Gee, C. E., & Gerber, U. (2002). Two distinct signaling pathways upregulate NMDA receptor responses via two distinct metabotropic glutamate receptor subtypes. *J. Neurosci.*, 22(22), 9679–9686. [123](#)
- [Berridge et al., 1998] Berridge, M. J., Bootman, M. D., & Lipp, P. (1998). Calcium—a life and death signal. *Nature*, 395(6703), 645–648. [121](#)
- [Bienenstock et al., 1982] Bienenstock, E. L., Cooper, L. N., & Munro, P. W. (1982). Theory for the development of neuron selectivity: orientation specificity and binocular interaction in visual cortex. *J. Neurosci.*, 2(1), 32–48. [15](#)
- [Bliss & Collingridge, 1993] Bliss, T. V. & Collingridge, G. L. (1993). A synaptic model of memory: long-term potentiation in the hippocampus. *Nature*, 361(6407), 31–39. [12](#), [13](#), [16](#)
- [Bliss & Lomo, 1973] Bliss, T. V. & Lomo, T. (1973). Long-lasting potentiation of synaptic transmission in the dentate area of the anaesthetized rabbit following stimulation of the perforant path. *J. Physiol.*, 232(2), 331–356. [1](#), [2](#), [10](#), [32](#)
- [Blitzer et al., 1998] Blitzer, R. D., Connor, J. H., Brown, G. P., Wong, T., Shenolikar, S., Iyengar, R., & Landau, E. M. (1998). Gating of CaMKII by cAMP-regulated protein phosphatase activity during LTP. *Science*, 280(5371), 1940–1942. [18](#), [20](#)
- [Blumcke et al., 2000] Blumcke, I., Becker, A. J., Klein, C., Scheiwe, C., Lie, A. A., Beck, H., Waha, A., Friedl, M. G., Kuhn, R.,

## Bibliography

- Emson, P., Elger, C., & Wiestler, O. D. (2000). Temporal lobe epilepsy associated up-regulation of metabotropic glutamate receptors: correlated changes in mGluR1 mRNA and protein expression in experimental animals and human patients. *J. Neuropathol. Exp. Neurol.*, 59(1), 1–10. [123](#)
- [Bock, 1989] Bock, P. (1989). Romeis Mikroskopische Technik. In Urban & Schwarzenberg (Eds.), *Romeis Mikroskopische Technik* (pp. 575–578). Urban and Schwarzenberg. [44](#)
- [Bolshakov & Siegelbaum, 1994] Bolshakov, V. Y. & Siegelbaum, S. A. (1994). Postsynaptic induction and presynaptic expression of hippocampal long-term depression. *Science*, 264(5162), 1148–1152. [108](#)
- [Bourtchouladze et al., 1998] Bourtchouladze, R., Abel, T., Berman, N., Gordon, R., Lapidus, K., & Kandel, E. R. (1998). Different training procedures recruit either one or two critical periods for contextual memory consolidation, each of which requires protein synthesis and PKA. *Learn. Mem.*, 5(4-5), 365–374. [120, 121](#)
- [Boxall & Lancaster, 1998] Boxall, A. R. & Lancaster, B. (1998). Tyrosine kinases and synaptic transmission. *Eur. J. Neurosci.*, 10(1), 2–7. [21](#)
- [Brabet et al., 1995] Brabet, I., Mary, S., Bockaert, J., & Pin, J. P. (1995). Phenylglycine derivatives discriminate between mGluR1- and mGluR5-mediated responses. *Neuropharmacology*, 34(8), 895–903. [72, 108](#)
- [Bradley et al., 1996] Bradley, S. R., Levey, A. I., Hersch, S. M., & Conn, P. J. (1996). Immunocytochemical localization of group III metabotropic glutamate receptors in the hippocampus with

- subtype-specific antibodies. *J. Neurosci.*, 16(6), 2044–2056. 9, 115, 117, 119
- [Brakeman et al., 1997] Brakeman, P. R., Lanahan, A. A., O'Brien, R., Roche, K., Barnes, C. A., Huganir, R. L., & Worley, P. F. (1997). Homer: a protein that selectively binds metabotropic glutamate receptors. *Nature*, 386(6622), 284–288. 105
- [Braunewell et al., 2003] Braunewell, K. H., Brackmann, M., & Manahan-Vaughan, D. (2003). Group I mGlu receptors regulate the expression of the neuronal calcium sensor protein VILIP-1 in vitro and in vivo: implications for mGlu receptor-dependent hippocampal plasticity? *Neuropharmacology*, 44(6), 707–715. 105
- [Braunewell & Manahan-Vaughan, 2001] Braunewell, K. H. & Manahan-Vaughan, D. (2001). Long-term depression: a cellular basis for learning? *Rev. Neurosci.*, 12(2), 121–140. 22
- [Bruno et al., 2001] Bruno, V., Battaglia, G., Copani, A., D'Onofrio, M., Iorio, P. D., Blasi, A. D., Melchiorri, D., Flor, P. J., & Nicoletti, F. (2001). Metabotropic glutamate receptor subtypes as targets for neuroprotective drugs. *J. Cereb. Blood Flow Metab*, 21(9), 1013–1033. 129
- [Camodeca et al., 1999] Camodeca, N., Breakwell, N. A., Rowan, M. J., & Anwyl, R. (1999). Induction of LTD by activation of group I mGluR in the dentate gyrus in vitro. *Neuropharmacology*, 38(10), 1597–1606. 13, 26, 99, 108, 112
- [Camon et al., 1998] Camon, L., Vives, P., de Vera, N., & Martinez, E. (1998). Seizures and neuronal damage induced in the rat by activation of group I metabotropic glutamate receptors with their selective agonist 3,5-dihydroxyphenylglycine. *J. Neurosci. Res.*, 51(3), 339–348. 123

## Bibliography

- [Carroll et al., 1998] Carroll, R. C., Nicoll, R. A., & Malenka, R. C. (1998). Effects of PKA and PKC on miniature excitatory postsynaptic currents in CA1 pyramidal cells. *J. Neurophysiol.*, 80(5), 2797–2800. [20](#)
- [Cartmell & Schoepp, 2000] Cartmell, J. & Schoepp, D. D. (2000). Regulation of neurotransmitter release by metabotropic glutamate receptors. *J. Neurochem.*, 75(3), 889–907. [119](#)
- [Chance et al., 2002] Chance, F. S., Abbott, L. F., & Reyes, A. D. (2002). Gain modulation from background synaptic input. *Neuron*, 35(4), 773–782. [22](#)
- [Chapman et al., 2000] Chapman, A. G., Nanan, K., Williams, M., & Meldrum, B. S. (2000). Anticonvulsant activity of two metabotropic glutamate group I antagonists selective for the mGlu5 receptor: 2-methyl-6-(phenylethynyl)-pyridine (MPEP), and (E)-6-methyl-2-styryl-pyridine (SIB 1893). *Neuropharmacology*, 39(9), 1567–1574. [124](#)
- [Chapman et al., 2001] Chapman, A. G., Talebi, A., Yip, P. K., & Meldrum, B. S. (2001). Anticonvulsant activity of a mGlu(4alpha) receptor selective agonist, (1S,3R,4S)-1-aminocyclopentane-1,2,4-tricarboxylic acid. *Eur. J. Pharmacol.*, 424(2), 107–113. [118](#)
- [Chavis et al., 1996] Chavis, P., Fagni, L., Lansman, J. B., & Bockaert, J. (1996). Functional coupling between ryanodine receptors and L-type calcium channels in neurons. *Nature*, 382(6593), 719–722. [101](#)
- [Chebib & Johnston, 1999] Chebib, M. & Johnston, G. A. (1999). The 'ABC' of GABA receptors: a brief review. *Clin. Exp. Pharmacol. Physiol.*, 26(11), 937–940. [6](#)

- [Cho et al., 2001] Cho, K., Aggleton, J. P., Brown, M. W., & Bashir, Z. I. (2001). An experimental test of the role of postsynaptic calcium levels in determining synaptic strength using perirhinal cortex of rat. *J. Physiol.*, 532(Pt 2), 459–466. [77](#), [109](#)
- [Cho & Bashir, 2002] Cho, K. & Bashir, Z. I. (2002). Cooperation between mglu receptors: a depressing mechanism? *Trends Neurosci.*, 25(8), 405–411. [14](#)
- [Clark et al., 1997] Clark, B. P., Baker, S. R., Goldsworthy, J., Harris, J. R., & Kingston, A. E. (1997). (+)-2-Methyl-4-carboxyphenylglycine (LY367385) selectively antagonises metabotropic glutamate mGlu1 receptors. *Biorg. Med. Chem. Lett.*, 7, 2777–2780. [55](#), [101](#)
- [Cohen & Eichenbaum, 1991] Cohen, N. J. & Eichenbaum, H. (1991). The theory that wouldn't die: a critical look at the spatial mapping theory of hippocampal function. *Hippocampus*, 1(3), 265–268. [1](#)
- [Conn & Pin, 1997] Conn, P. J. & Pin, J. P. (1997). Pharmacology and functions of metabotropic glutamate receptors. *Annu. Rev. Pharmacol. Toxicol.*, 37, 205–237.
- [Contractor et al., 1998] Contractor, A., Gereau, R. W., Green, T., & Heinemann, S. F. (1998). Direct effects of metabotropic glutamate receptor compounds on native and recombinant N-methyl-D-aspartate receptors. *Proc. Natl. Acad. Sci. U. S. A.*, 95(15), 8969–8974. [102](#), [119](#)
- [Cormier et al., 2001] Cormier, R. J., Greenwood, A. C., & Connor, J. A. (2001). Bidirectional synaptic plasticity correlated with the magnitude of dendritic calcium transients above a threshold. *J. Neurophysiol.*, 85(1), 399–406. [110](#)

## Bibliography

- [Cozzi et al., 2002] Cozzi, A., Meli, E., Carla, V., Pellicciari, R., Moroni, F., & Pellegrini-Giampietro, D. E. (2002). Metabotropic glutamate 1 (mGlu1) receptor antagonists enhance GABAergic neurotransmission: a mechanism for the attenuation of post-ischemic injury and epileptiform activity? *Neuropharmacology*, 43(2), 119–130. [102](#), [103](#)
- [Davis et al., 2003] Davis, S., Bozon, B., & Laroche, S. (2003). How necessary is the activation of the immediate early gene zif268 in synaptic plasticity and learning? *Behav. Brain Res.*, 142(1-2), 17–30. [23](#)
- [Debanne & Thompson, 1996] Debanne, D. & Thompson, S. M. (1996). Associative long-term depression in the hippocampus in vitro. *Hippocampus*, 6(1), 9–16. [24](#)
- [Dev et al., 2000] Dev, K. K., Nakajima, Y., Kitano, J., Braithwaite, S. P., Henley, J. M., & Nakanishi, S. (2000). PICK1 interacts with and regulates PKC phosphorylation of mGLUR7. *J. Neurosci.*, 20(19), 7252–7257. [9](#)
- [Dev et al., 2001] Dev, K. K., Nakanishi, S., & Henley, J. M. (2001). Regulation of mglu(7) receptors by proteins that interact with the intracellular C-terminus. *Trends Pharmacol. Sci.*, 22(7), 355–361. [9](#)
- [Dineley et al., 2001] Dineley, K. T., Weeber, E. J., Atkins, C., Adams, J. P., Anderson, A. E., & Sweatt, J. D. (2001). Leitmotifs in the biochemistry of LTP induction: amplification, integration and coordination. *J. Neurochem.*, 77(4), 961–971. [16](#)
- [DiScenna & Teyler, 1994] DiScenna, P. G. & Teyler, T. J. (1994). Development of inhibitory and excitatory synaptic transmission in the rat dentate gyrus. *Hippocampus*, 4(5), 569–576. [11](#), [103](#)

- [Doherty et al., 2000] Doherty, A. J., Palmer, M. J., Bortolotto, Z. A., Hargreaves, A., Kingston, A. E., Ornstein, P. L., Schoepp, D. D., Lodge, D., & Collingridge, G. L. (2000). A novel, competitive mGlu(5) receptor antagonist (LY344545) blocks DHPG-induced potentiation of NMDA responses but not the induction of LTP in rat hippocampal slices. *Br. J. Pharmacol.*, 131(2), 239–244. **104**
- [Doherty et al., 1997] Doherty, A. J., Palmer, M. J., Henley, J. M., Collingridge, G. L., & Jane, D. E. (1997). (RS)-2-chloro-5-hydroxyphenylglycine (CHPG) activates mGlu5, but no mGlu1, receptors expressed in CHO cells and potentiates NMDA responses in the hippocampus. *Neuropharmacology*, 36(2), 265–267. **70, 104**
- [Dudek & Bear, 1992] Dudek, S. M. & Bear, M. F. (1992). Homosynaptic long-term depression in area CA1 of hippocampus and effects of N-methyl-D-aspartate receptor blockade. *Proc. Natl. Acad. Sci. U. S. A.*, 89(10), 4363–4367. **11, 12**
- [Dunwiddie & Lynch, 1978] Dunwiddie, T. & Lynch, G. (1978). Long-term potentiation and depression of synaptic responses in the rat hippocampus: localization and frequency dependency. *J. Physiol.*, 276, 353–367. **109**
- [Exton, 2000] Exton, J. H. (2000). Phospholipase D. *Ann. N. Y. Acad. Sci.*, 905, 61–68. **21**
- [Exton, 2002] Exton, J. H. (2002). Regulation of phospholipase D. *FEBS Lett.*, 531(1), 58–61. **21**
- [Faas et al., 2002] Faas, G. C., Adwanikar, H., Gereau, R. W., & Saggau, P. (2002). Modulation of presynaptic calcium transients by metabotropic glutamate receptor activation: a differential role

## Bibliography

- in acute depression of synaptic transmission and long-term depression. *J. Neurosci.*, 22(16), 6885–6890. [107](#), [112](#), [113](#)
- [Fagni et al., 2002] Fagni, L., Worley, P. F., & Ango, F. (2002). Homer as both a scaffold and transduction molecule. *Sci. STKE.*, 2002(137), RE8. [105](#)
- [Fitzjohn et al., 1999] Fitzjohn, S. M., Kingston, A. E., Lodge, D., & Collingridge, G. L. (1999). DHPG-induced LTD in area CA1 of juvenile rat hippocampus; characterisation and sensitivity to novel mGlu receptor antagonists. *Neuropharmacology*, 38(10), 1577–1583. [107](#), [112](#)
- [Fitzjohn et al., 2001] Fitzjohn, S. M., Palmer, M. J., May, J. E., Neeson, A., Morris, S. A., & Collingridge, G. L. (2001). A characterisation of long-term depression induced by metabotropic glutamate receptor activation in the rat hippocampus in vitro. *J. Physiol.*, 537(Pt 2), 421–430. [109](#), [112](#), [113](#)
- [Fotuhi et al., 1994] Fotuhi, M., Standaert, D. G., Testa, C. M., J. B. Penney, J., & Young, A. B. (1994). Differential expression of metabotropic glutamate receptors in the hippocampus and entorhinal cortex of the rat. *Brain Res. Mol. Brain Res.*, 21(3-4), 283–292. [9](#), [10](#)
- [French et al., 2001] French, P. J., O'Connor, V., Jones, M. W., Davis, S., Errington, M. L., Voss, K., Truchet, B., Wotjak, C., Stean, T., Doyere, V., Maroun, M., Laroche, S., & Bliss, T. V. (2001). Subfield-specific immediate early gene expression associated with hippocampal long-term potentiation in vivo. *Eur. J. Neurosci.*, 13(5), 968–976. [23](#)
- [Frey et al., 1988] Frey, U., Krug, M., Reymann, K. G., & Matthies, H. (1988). Anisomycin, an inhibitor of protein synthesis, blocks

- late phases of LTP phenomena in the hippocampal CA1 region in vitro. *Brain Res.*, 452(1-2), 57–65. 105, 113
- [Frey & Morris, 1997] Frey, U. & Morris, R. G. (1997). Synaptic tagging and long-term potentiation. *Nature*, 385(6616), 533–536. 113
- [Fukunaga et al., 1995] Fukunaga, K., Muller, D., & Miyamoto, E. (1995). Increased phosphorylation of Ca<sup>2+</sup>/calmodulin-dependent protein kinase II and its endogenous substrates in the induction of long-term potentiation. *J. Biol. Chem.*, 270(11), 6119–6124. 16
- [Gasparini et al., 2002] Gasparini, F., Kuhn, R., & Pin, J. P. (2002). Allosteric modulators of group I metabotropic glutamate receptors: novel subtype-selective ligands and therapeutic perspectives. *Curr. Opin. Pharmacol.*, 2(1), 43–49. 8
- [Gasparini et al., 1999] Gasparini, F., Lingenhohl, K., Stoehr, N., Flor, P. J., Heinrich, M., Vranesic, I., Biollaz, M., Allgeier, H., Heckendorf, R., Urwyler, S., Varney, M. A., Johnson, E. C., Hess, S. D., Rao, S. P., Sacaan, A. I., Santori, E. M., Velicelebi, G., & Kuhn, R. (1999). 2-Methyl-6-(phenylethynyl)-pyridine (MPEP), a potent, selective and systemically active mGlu5 receptor antagonist. *Neuropharmacology*, 38(10), 1493–1503. 47, 104
- [Gereau & Conn, 1994] Gereau, R. W. & Conn, P. J. (1994). Presynaptic enhancement of excitatory synaptic transmission by beta-adrenergic receptor activation. *J. Neurophysiol.*, 72(3), 1438–1442. 10, 115, 117
- [Gubellini et al., 2001] Gubellini, P., Saulle, E., Centonze, D., Bonsi, P., Pisani, A., Bernardi, G., Conquet, F., & Calabresi, P. (2001). Selective involvement of mGlu1 receptors in corticostriatal LTD. *Neuropharmacology*, 40(7), 839–846. 109

## Bibliography

- [Halasy & Somogyi, 1993] Halasy, K. & Somogyi, P. (1993). Subdivisions in the multiple GABAergic innervation of granule cells in the dentate gyrus of the rat hippocampus. *Eur. J. Neurosci.*, 5(5), 411–429. 57
- [Harvey & Collingridge, 1993] Harvey, J. & Collingridge, G. L. (1993). Signal transduction pathways involved in the acute potentiation of NMDA responses by 1S,3R-ACPD in rat hippocampal slices. *Br. J. Pharmacol.*, 109(4), 1085–1090. 105
- [Heidinger et al., 2002] Heidinger, V., Manzerra, P., Wang, X. Q., Strasser, U., Yu, S. P., Choi, D. W., & Behrens, M. M. (2002). Metabotropic glutamate receptor 1-induced upregulation of NMDA receptor current: mediation through the Pyk2/Src-family kinase pathway in cortical neurons. *J. Neurosci.*, 22(13), 5452–5461. 102
- [Heinemann et al., 2000] Heinemann, U., Schmitz, D., Eder, C., & Gloveli, T. (2000). Properties of entorhinal cortex projection cells to the hippocampal formation. *Ann. N. Y. Acad. Sci.*, 911, 112–126. 3
- [Heuss et al., 1999] Heuss, C., Scanziani, M., Gähwiler, B. H., & Gerber, U. (1999). G-protein-independent signaling mediated by metabotropic glutamate receptors. *Nat. Neurosci.*, 2(12), 1070–1077. 8
- [Holland & Wagner, 1998] Holland, L. L. & Wagner, J. J. (1998). Primed facilitation of homosynaptic long-term depression and de-potentiation in rat hippocampus. *J. Neurosci.*, 18(3), 887–894. 15
- [Hsia et al., 1995] Hsia, A. Y., Salin, P. A., Castillo, P. E., Aiba, A., Abeliovich, A., Tonegawa, S., & Nicoll, R. A. (1995). Evidence

against a role for metabotropic glutamate receptors in mossy fiber LTP: the use of mutant mice and pharmacological antagonists. *Neuropharmacology*, 34(11), 1567–1572. 110

[Huang et al., 1999] Huang, L., Rowan, M. J., & Anwyl, R. (1999). Induction of long-lasting depression by (+)-alpha-methyl-4-carboxyphenylglycine and other group II mGlu receptor ligands in the dentate gyrus of the hippocampus in vitro. *Eur. J. Pharmacol.*, 366(2-3), 151–158. 14

[Huang et al., 2001] Huang, Y., Lu, W., Ali, D. W., Pelkey, K. A., Pitcher, G. M., Lu, Y. M., Aoto, H., Roder, J. C., Sasaki, T., Salter, M. W., & MacDonald, J. F. (2001). CAKbeta/Pyk2 kinase is a signaling link for induction of long-term potentiation in CA1 hippocampus. *Neuron*, 29(2), 485–496. 110

[Huber et al., 2000] Huber, K. M., Kayser, M. S., & Bear, M. F. (2000). Role for rapid dendritic protein synthesis in hippocampal mGluR-dependent long-term depression. *Science*, 288(5469), 1254–1257. 26, 99, 100, 112, 121

[Huber et al., 2001] Huber, K. M., Roder, J. C., & Bear, M. F. (2001). Chemical induction of mGluR5- and Protein Synthesis-Dependent Long-Term Depression in Hippocampal Area CA1. *J. Neurophysiol.*, 86(1), 321–325. 13, 70, 99, 107, 113

[Hudson et al., 2002] Hudson, L. J., Bevan, S., McNair, K., Gentry, C., Fox, A., Kuhn, R., & Winter, J. (2002). Metabotropic glutamate receptor 5 upregulation in A-fibers after spinal nerve injury: 2-methyl-6-(phenylethynyl)-pyridine (MPEP) reverses the induced thermal hyperalgesia. *J. Neurosci.*, 22(7), 2660–2668. 124

[Izquierdo et al., 2002] Izquierdo, L. A., Barros, D. M., Vianna, M. R., Coitinho, A., deDavid e Silva, Choi, H., Moletta, B., Med-

## Bibliography

- ina, J. H., & Izquierdo, I. (2002). Molecular pharmacological dissection of short- and long-term memory. *Cell Mol. Neurobiol.*, 22(3), 269–287. [120](#), [121](#)
- [Jia et al., 1998] Jia, Z., Lu, Y., Henderson, J., Taverna, F., Romano, C., Abramow-Newerly, W., Wojtowicz, J. M., & Roder, J. (1998). Selective abolition of the NMDA component of long-term potentiation in mice lacking mGluR5. *Learn. Mem.*, 5(4-5), 331–343. [104](#), [120](#)
- [Jones et al., 2001] Jones, M. W., Errington, M. L., French, P. J., Fine, A., Bliss, T. V., Garel, S., Charnay, P., Bozon, B., Laroche, S., & Davis, S. (2001). A requirement for the immediate early gene Zif268 in the expression of late LTP and long-term memories. *Nat. Neurosci.*, 4(3), 289–296. [23](#)
- [Jouvincéau et al., 2002] Jouvincéau, A., Potier, B., Poindessous-Jazat, F., Dutar, P., Slama, A., Epelbaum, J., & Billard, J. M. (2002). Decrease in calbindin content significantly alters LTP but not NMDA receptor and calcium channel properties. *Neuropharmacology*, 42(4), 444–458. [109](#)
- [Joy & Albertson, 1993] Joy, R. M. & Albertson, T. E. (1993). NMDA receptors have a dominant role in population spike-paired pulse facilitation in the dentate gyrus of urethane-anesthetized rats. *Brain Res.*, 604(1-2), 273–282. [11](#)
- [Kahle & Cotman, 1993] Kahle, J. S. & Cotman, C. W. (1993). Adenosine, L-AP4, and baclofen modulation of paired-pulse potentiation in the dentate gyrus: interstimulus interval-dependent pharmacology. *Exp. Brain Res.*, 94(1), 97–104. [12](#), [103](#), [113](#)
- [Kandel & Squire, 2000] Kandel, E. R. & Squire, L. R. (2000). Neu-

roscience: breaking down scientific barriers to the study of brain and mind. *Science*, 290(5494), 1113–1120. 1

[Kawabata et al., 1996] Kawabata, S., Tsutsumi, R., Kohara, A., Yamaguchi, T., Nakanishi, S., & Okada, M. (1996). Control of calcium oscillations by phosphorylation of metabotropic glutamate receptors. *Nature*, 383(6595), 89–92. 121

[Kemp & Bashir, 1999] Kemp, N. & Bashir, Z. I. (1999). Induction of LTD in the adult hippocampus by the synaptic activation of AMPA/kainate and metabotropic glutamate receptors. *Neuropharmacology*, 38(4), 495–504. 107

[Kemp & Bashir, 2001] Kemp, N. & Bashir, Z. I. (2001). Long-term depression: a cascade of induction and expression mechanisms. *Prog. Neurobiol.*, 65(4), 339–365. 13, 17, 19, 66

[Kim & Yoon, 1998] Kim, J. J. & Yoon, K. S. (1998). Stress: metaplastic effects in the hippocampus. *Trends Neurosci.*, 21(12), 505–509. 15

[Kitano et al., 2002] Kitano, J., Kimura, K., Yamazaki, Y., Soda, T., Shigemoto, R., Nakajima, Y., & Nakanishi, S. (2002). Tamalin, a PDZ domain-containing protein, links a protein complex formation of group 1 metabotropic glutamate receptors and the guanine nucleotide exchange factor cytohesins. *J. Neurosci.*, 22(4), 1280–1289. 9

[Kleppisch et al., 2001] Kleppisch, T., Voigt, V., Allmann, R., & Ofermanns, S. (2001). G(alpha)q-deficient mice lack metabotropic glutamate receptor-dependent long-term depression but show normal long-term potentiation in the hippocampal CA1 region. *J. Neurosci.*, 21(14), 4943–4948. 127

## Bibliography

- [Koerner & Cotman, 1981] Koerner, J. F. & Cotman, C. W. (1981). Micromolar L-2-amino-4-phosphonobutyric acid selectively inhibits perforant path synapses from lateral entorhinal cortex. *Brain Res.*, 216(1), 192–198. [5](#), [9](#), [117](#)
- [Kogan et al., 2000] Kogan, J. H., Frankland, P. W., & Silva, A. J. (2000). Long-term memory underlying hippocampus-dependent social recognition in mice. *Hippocampus*, 10(1), 47–56. [121](#)
- [Koninck & Schulman, 1998] Koninck, P. D. & Schulman, H. (1998). Sensitivity of CaM kinase II to the frequency of Ca<sup>2+</sup> oscillations. *Science*, 279(5348), 227–230. [121](#)
- [Kotecha et al., 2003] Kotecha, S. A., Jackson, M. F., Mahrouki, A. A., Roder, J. C., Orser, B. A., & MacDonald, J. F. (2003). Co-stimulation of mGluR5 and N-methyl-D-aspartate receptors is required for potentiation of excitatory synaptic transmission in hippocampal neurons. *J. Biol. Chem.*, 278(30), 27742–27749. [111](#), [125](#)
- [Lafon-Cazal et al., 1999] Lafon-Cazal, M., Viennois, G., Kuhn, R., Malitschek, B., Pin, J. P., Shigemoto, R., & Bockaert, J. (1999). mGluR7-like receptor and GABA(B) receptor activation enhance neurotoxic effects of N-methyl-D-aspartate in cultured mouse striatal GABAergic neurones. *Neuropharmacology*, 38(10), 1631–1640. [119](#), [124](#)
- [Lan et al., 2001] Lan, J. Y., Skeberdis, V. A., Jover, T., Zheng, X., Bennett, M. V., & Zukin, R. S. (2001). Activation of metabotropic glutamate receptor 1 accelerates NMDA receptor trafficking. *J. Neurosci.*, 21(16), 6058–6068. [102](#), [123](#)
- [Lee et al., 2000] Lee, H. K., Barbarosie, M., Kameyama, K., Bear, M. F., & Huganir, R. L. (2000). Regulation of distinct AMPA

- receptor phosphorylation sites during bidirectional synaptic plasticity. *Nature*, 405(6789), 955–959. 13
- [Lee et al., 2002] Lee, O., Lee, C. J., & Choi, S. (2002). Induction mechanisms for L-LTP at thalamic input synapses to the lateral amygdala: requirement of mGluR5 activation. *Neuroreport*, 13(5), 685–691. 52, 104
- [Lisman, 1989] Lisman, J. (1989). A mechanism for the Hebb and the anti-Hebb processes underlying learning and memory. *Proc. Natl. Acad. Sci. U. S. A.*, 86(23), 9574–9578. 14, 18
- [Lisman, 1994] Lisman, J. (1994). The CaM kinase II hypothesis for the storage of synaptic memory. *Trends Neurosci.*, 17(10), 406–412. 123
- [Lisman et al., 1997] Lisman, J., Malenka, R. C., Nicoll, R. A., & Malinow, R. (1997). Learning mechanisms: the case for CaM-KII. *Science*, 276(5321), 2001–2002. 16
- [Lisman et al., 2002] Lisman, J., Schulman, H., & Cline, H. (2002). The molecular basis of CaMKII function in synaptic and behavioural memory. *Nat. Rev. Neurosci.*, 3(3), 175–190. 16, 18
- [Lisman & Goldring, 1988] Lisman, J. E. & Goldring, M. A. (1988). Feasibility of long-term storage of graded information by the Ca<sup>2+</sup>/calmodulin-dependent protein kinase molecules of the post-synaptic density. *Proc. Natl. Acad. Sci. U. S. A.*, 85(14), 5320–5324. 16
- [Lisman & Zhabotinsky, 2001] Lisman, J. E. & Zhabotinsky, A. M. (2001). A model of synaptic memory: a CaMKII/PP1 switch that potentiates transmission by organizing an AMPA receptor anchoring assembly. *Neuron*, 31(2), 191–201. 18

## Bibliography

- [Lu et al., 1999] Lu, W. Y., Xiong, Z. G., Lei, S., Orser, B. A., Dudek, E., Browning, M. D., & MacDonald, J. F. (1999). G-protein-coupled receptors act via protein kinase C and Src to regulate NMDA receptors. *Nat. Neurosci.*, 2(4), 331–338. [18](#), [110](#)
- [Lu et al., 1997] Lu, Y. M., Jia, Z., Janus, C., Henderson, J. T., Gerlai, R., Wojtowicz, J. M., & Roder, J. C. (1997). Mice lacking metabotropic glutamate receptor 5 show impaired learning and reduced CA1 long-term potentiation (LTP) but normal CA3 LTP. *J. Neurosci.*, 17(13), 5196–5205. [120](#)
- [Lujan et al., 1996] Lujan, R., Nusser, Z., Roberts, J. D., Shigemoto, R., & Somogyi, P. (1996). Perisynaptic location of metabotropic glutamate receptors mGluR1 and mGluR5 on dendrites and dendritic spines in the rat hippocampus. *Eur. J. Neurosci.*, 8(7), 1488–1500. [9](#), [10](#), [107](#), [108](#), [112](#)
- [Lujan et al., 1997] Lujan, R., Roberts, J. D., Shigemoto, R., Ohishi, H., & Somogyi, P. (1997). Differential plasma membrane distribution of metabotropic glutamate receptors mGluR1 alpha, mGluR2 and mGluR5, relative to neurotransmitter release sites. *J. Chem. Neuroanat.*, 13(4), 219–241. [10](#), [104](#)
- [Luscher & Frerking, 2001] Luscher, C. & Frerking, M. (2001). Restless AMPA receptors: implications for synaptic transmission and plasticity. *Trends Neurosci.*, 24(11), 665–670. [18](#)
- [Lynch et al., 1977] Lynch, G. S., Dunwiddie, T., & Gribkoff, V. (1977). Heterosynaptic depression: a postsynaptic correlate of long-term potentiation. *Nature*, 266(5604), 737–739. [11](#)
- [Macek et al., 1996] Macek, T. A., Winder, D. G., Gereau, R. W., Ladd, C. O., & Conn, P. J. (1996). Differential involvement of group II and group III mGluRs as autoreceptors at lateral and

- medial perforant path synapses. *J. Neurophysiol.*, 76(6), 3798–3806. 115, 117
- [Maiese et al., 2000] Maiese, K., Vincent, A., Lin, S. H., & Shaw, T. (2000). Group I and group III metabotropic glutamate receptor subtypes provide enhanced neuroprotection. *J. Neurosci. Res.*, 62(2), 257–272. 117, 124
- [Malenka, 1994] Malenka, R. C. (1994). Synaptic plasticity in the hippocampus: LTP and LTD. *Cell*, 78(4), 535–538. 14, 24, 77
- [Malenka et al., 1986] Malenka, R. C., Madison, D. V., & Nicoll, R. A. (1986). Potentiation of synaptic transmission in the hippocampus by phorbol esters. *Nature*, 321(6066), 175–177. 18
- [Malenka & Nicoll, 1999] Malenka, R. C. & Nicoll, R. A. (1999). Long-term potentiation—a decade of progress? *Science*, 285(5435), 1870–1874. 16, 18
- [Malherbe et al., 2002] Malherbe, P., Kew, J. N., Richards, J. G., Knoflach, F., Kratzeisen, C., Zenner, M. T., Faull, R. L., Kemp, J. A., & Mutel, V. (2002). Identification and characterization of a novel splice variant of the metabotropic glutamate receptor 5 gene in human hippocampus and cerebellum. *Brain Res. Mol. Brain Res.*, 109(1-2), 168–178. 127
- [Malinow & Malenka, 2002] Malinow, R. & Malenka, R. C. (2002). AMPA receptor trafficking and synaptic plasticity. *Annu. Rev. Neurosci.*, 25, 103–126. 13, 18, 22
- [Manahan-Vaughan, 1997] Manahan-Vaughan, D. (1997). Group 1 and 2 metabotropic glutamate receptors play differential roles in hippocampal long-term depression and long-term potentiation in freely moving rats. *J. Neurosci.*, 17(9), 3303–3311. 13, 14, 107

## Bibliography

- [Manahan-Vaughan, 2000] Manahan-Vaughan, D. (2000). Group III metabotropic glutamate receptors modulate long-term depression in the hippocampal CA1 region of two rat strains *in vivo*. *Neuropharmacology*, 39(11), 1952–1958. [14](#), [115](#), [117](#)
- [Manahan-Vaughan et al., 1999a] Manahan-Vaughan, D., Behnisch, T., & Reymann, K. G. (1999a). ACPD-mediated slow-onset potentiation is associated with cell death in the rat CA1 region *in vivo*. *Neuropharmacology*, 38(4), 487–494. [25](#), [44](#), [46](#), [90](#), [117](#), [123](#), [129](#)
- [Manahan-Vaughan & Braunewell, 1999] Manahan-Vaughan, D. & Braunewell, K. H. (1999). Novelty acquisition is associated with induction of hippocampal long-term depression. *Proc. Natl. Acad. Sci. U. S. A.*, 96(15), 8739–8744. [15](#), [24](#), [122](#)
- [Manahan-Vaughan et al., 1998] Manahan-Vaughan, D., Braunewell, K. H., & Reymann, K. G. (1998). Subtype-specific involvement of metabotropic glutamate receptors in two forms of long-term potentiation in the dentate gyrus of freely moving rats. *Neuroscience*, 86(3), 709–721. [12](#), [13](#), [14](#), [47](#), [101](#)
- [Manahan-Vaughan et al., 1999b] Manahan-Vaughan, D., Herrero, I., Reymann, K. G., & Sanchez-Prieto, J. (1999b). Presynaptic group 1 metabotropic glutamate receptors may contribute to the expression of long-term potentiation in the hippocampal CA1 region. *Neuroscience*, 94(1), 71–82. [13](#), [104](#), [112](#)
- [Manahan-Vaughan et al., 2000] Manahan-Vaughan, D., Kulla, A., & Frey, J. U. (2000). Requirement of translation but not transcription for the maintenance of long-term depression in the CA1 region of freely moving rats. *J. Neurosci.*, 20(22), 8572–8576. [83](#), [100](#)

- [Manahan-Vaughan et al., 2003] Manahan-Vaughan, D., Ngomba, R. T., Storto, M., Kulla, A., Catania, M. V., Chiechio, S., Rampello, L., Passarelli, F., Capece, A., Reymann, K. G., & Nicoletti, F. (2003). An increased expression of the mGlu5 receptor protein following LTP induction at the perforant path-dentate gyrus synapse in freely moving rats. *Neuropharmacology*, 44(1), 17–25. 105
- [Manahan-Vaughan et al., 1996] Manahan-Vaughan, D., Reiser, M., Pin, J. P., Wilsch, V., Bockaert, J., Reymann, K. G., & Riedel, G. (1996). Physiological and pharmacological profile of trans-azetidine-2,4-dicarboxylic acid: metabotropic glutamate receptor agonism and effects on long-term potentiation. *Neuroscience*, 72(4), 999–1008. 13
- [Manahan-Vaughan & Reymann, 1995a] Manahan-Vaughan, D. & Reymann, K. G. (1995a). 1S,3R-ACPD dose dependently induces a slow onset potentiation in the dentate gyrus in vivo. *Eur. J. Pharmacol.*, 294(2-3), 497–503. 112, 117
- [Manahan-Vaughan & Reymann, 1995b] Manahan-Vaughan, D. & Reymann, K. G. (1995b). 1S,3R-ACPD dose-dependently induces a slow-onset potentiation in the rat hippocampal CA1 region in vivo. *Neuropharmacology*, 34(8), 1103–1105. 117
- [Manahan-Vaughan & Reymann, 1995c] Manahan-Vaughan, D. & Reymann, K. G. (1995c). Regional and developmental profile of modulation of hippocampal synaptic transmission and LTP by AP4-sensitive mGluRs in vivo. *Neuropharmacology*, 34(8), 991–1001. 14, 112, 115, 116, 118
- [Manahan-Vaughan & Reymann, 1996] Manahan-Vaughan, D. & Reymann, K. G. (1996). Metabotropic glutamate receptor subtype agonists facilitate long-term potentiation within a distinct

## Bibliography

- time window in the dentate gyrus in vivo. *Neuroscience*, 74(3), 723–731. 7, 13, 47, 101, 104
- [Manahan-Vaughan & Reymann, 1997] Manahan-Vaughan, D. & Reymann, K. G. (1997). Group 1 metabotropic glutamate receptors contribute to slow-onset potentiation in the rat CA1 region in vivo. *Neuropharmacology*, 36(11-12), 1533–1538. 117
- [Mannaioni et al., 2001] Mannaioni, G., Marino, M. J., Valenti, O., Traynelis, S. F., & Conn, P. J. (2001). Metabotropic glutamate receptors 1 and 5 differentially regulate CA1 pyramidal cell function. *J. Neurosci.*, 21(16), 5925–5934. 52, 104
- [Martin et al., 2000] Martin, S. J., Grimwood, P. D., & Morris, R. G. (2000). Synaptic plasticity and memory: an evaluation of the hypothesis. *Annu. Rev. Neurosci.*, 23, 649–711. 23
- [Mayford et al., 1995] Mayford, M., Wang, J., Kandel, E. R., & O'Dell, T. J. (1995). CaMKII regulates the frequency-response function of hippocampal synapses for the production of both LTD and LTP. *Cell*, 81(6), 891–904. 18
- [McEachern & Shaw, 1999] McEachern, J. C. & Shaw, C. A. (1999). The plasticity-pathology continuum: defining a role for the LTP phenomenon. *J. Neurosci. Res.*, 58(1), 42–61. 22, 25
- [McNaughton, 1982] McNaughton, B. L. (1982). Long-term synaptic enhancement and short-term potentiation in rat fascia dentata act through different mechanisms. *J. Physiol.*, 324, 249–262. 12, 103, 113
- [Menzel, 1996] Menzel, R. (1996). Neurowissenschaften - Vom Molekül zur Kognition. In J. D. R. Menzel R. F. Schmidt (Ed.), *Neurowissenschaften - Vom Molekül zur Kognition*. Springer, 1. edition. 4

- [Mion et al., 2001] Mion, S., Corti, C., Neki, A., Shigemoto, R., Corsi, M., Fumagalli, G., & Ferraguti, F. (2001). Bidirectional regulation of neurite elaboration by alternatively spliced metabotropic glutamate receptor 5 (mGluR5) isoforms. *Mol. Cell Neurosci.*, 17(6), 957–972. [127](#)
- [Morris & Frey, 1997] Morris, R. G. & Frey, U. (1997). Hippocampal synaptic plasticity: role in spatial learning or the automatic recording of attended experience? *Philos. Trans. R. Soc. Lond B Biol. Sci.*, 352(1360), 1489–1503. [1](#)
- [Moser, 1996] Moser, E. I. (1996). Altered inhibition of dentate granule cells during spatial learning in an exploration task. *J. Neurosci.*, 16(3), 1247–1259. [11, 57, 103](#)
- [Mulkey et al., 1994] Mulkey, R. M., Endo, S., Shenolikar, S., & Malenka, R. C. (1994). Involvement of a calcineurin/inhibitor-1 phosphatase cascade in hippocampal long-term depression. *Nature*, 369(6480), 486–488. [18](#)
- [Mulkey & Malenka, 1992] Mulkey, R. M. & Malenka, R. C. (1992). Mechanisms underlying induction of homosynaptic long-term depression in area CA1 of the hippocampus. *Neuron*, 9(5), 967–975. [12, 77](#)
- [Muller et al., 1996] Muller, R. U., Stead, M., & Pach, J. (1996). The hippocampus as a cognitive graph. *J. Gen. Physiol.*, 107(6), 663–694. [1](#)
- [Nadel & Moscovitch, 1997] Nadel, L. & Moscovitch, M. (1997). Memory consolidation, retrograde amnesia and the hippocampal complex. *Curr. Opin. Neurobiol.*, 7(2), 217–227. [1](#)
- [Naie & Manahan-Vaughan, 2003] Naie, K. & Manahan-Vaughan, D. (2003). Regulation by metabotropic glutamate receptor 5 of

## Bibliography

- LTP in the dentate gyrus of freely moving rats: relevance for learning and memory formation. In Press. 120
- [Nakajima et al., 1993] Nakajima, Y., Iwakabe, H., Akazawa, C., Nawa, H., Shigemoto, R., Mizuno, N., & Nakanishi, S. (1993). Molecular characterization of a novel retinal metabotropic glutamate receptor mGluR6 with a high agonist selectivity for L-2-amino-4-phosphonobutyrate. *J. Biol. Chem.*, 268(16), 11868–11873. 9
- [Nakanishi, 1992] Nakanishi, S. (1992). Molecular diversity of glutamate receptors and implications for brain function. *Science*, 258(5082), 597–603. 6
- [Nakanishi et al., 1998] Nakanishi, S., Nakajima, Y., Masu, M., Ueda, Y., Nakahara, K., Watanabe, D., Yamaguchi, S., Kawabata, S., & Okada, M. (1998). Glutamate receptors: brain function and signal transduction. *Brain Res. Brain Res. Rev.*, 26(2-3), 230–235. 121
- [Neki et al., 1996] Neki, A., Ohishi, H., Kaneko, T., Shigemoto, R., Nakanishi, S., & Mizuno, N. (1996). Pre- and postsynaptic localization of a metabotropic glutamate receptor, mGluR2, in the rat brain: an immunohistochemical study with a monoclonal antibody. *Neurosci. Lett.*, 202(3), 197–200. 9
- [Nguyen et al., 1994] Nguyen, P. V., Abel, T., & Kandel, E. R. (1994). Requirement of a critical period of transcription for induction of a late phase of LTP. *Science*, 265(5175), 1104–1107. 23
- [Nicoletti et al., 1986] Nicoletti, F., Meek, J. L., Iadarola, M. J., Chuang, D. M., Roth, B. L., & Costa, E. (1986). Coupling of in-

- ositol phospholipid metabolism with excitatory amino acid recognition sites in rat hippocampus. *J. Neurochem.*, 46(1), 40–46. 5
- [Nicoll et al., 1998] Nicoll, R. A., Oliet, S. H., & Malenka, R. C. (1998). NMDA receptor-dependent and metabotropic glutamate receptor-dependent forms of long-term depression coexist in CA1 hippocampal pyramidal cells. *Neurobiol. Learn. Mem.*, 70(1-2), 62–72. 10, 13
- [O'Dell et al., 1991] O'Dell, T. J., Kandel, E. R., & Grant, S. G. (1991). Long-term potentiation in the hippocampus is blocked by tyrosine kinase inhibitors. *Nature*, 353(6344), 558–560. 21
- [Ohishi et al., 1993a] Ohishi, H., Shigemoto, R., Nakanishi, S., & Mizuno, N. (1993a). Distribution of the messenger RNA for a metabotropic glutamate receptor, mGluR2, in the central nervous system of the rat. *Neuroscience*, 53(4), 1009–1018. 9
- [Ohishi et al., 1993b] Ohishi, H., Shigemoto, R., Nakanishi, S., & Mizuno, N. (1993b). Distribution of the mRNA for a metabotropic glutamate receptor (mGluR3) in the rat brain: an in situ hybridization study. *J. Comp Neurol.*, 335(2), 252–266. 9
- [Oliet et al., 1997] Oliet, S. H., Malenka, R. C., & Nicoll, R. A. (1997). Two distinct forms of long-term depression coexist in CA1 hippocampal pyramidal cells. *Neuron*, 18(6), 969–982. 107, 108
- [O'Mara et al., 1995] O'Mara, S. M., Rowan, M. J., & Anwyl, R. (1995). Metabotropic glutamate receptor-induced homosynaptic long-term depression and depotentiation in the dentate gyrus of the rat hippocampus in vitro. *Neuropharmacology*, 34(8), 983–989. 13
- [Otani et al., 2002] Otani, S., Daniel, H., Takita, M., & Crepel, F. (2002). Long-term depression induced by postsynaptic group II

## Bibliography

- metabotropic glutamate receptors linked to phospholipase C and intracellular calcium rises in rat prefrontal cortex. *J. Neurosci.*, 22(9), 3434–3444. 8
- [Otmakhov et al., 1993] Otmakhov, N., Shirke, A. M., & Malinow, R. (1993). Measuring the impact of probabilistic transmission on neuronal output. *Neuron*, 10(6), 1101–1111. 22
- [Ozawa et al., 1998] Ozawa, S., Kamiya, H., & Tsuzuki, K. (1998). Glutamate receptors in the mammalian central nervous system. *Prog. Neurobiol.*, 54(5), 581–618. 13
- [Palmer et al., 1997] Palmer, M. J., Irving, A. J., Seabrook, G. R., Jane, D. E., & Collingridge, G. L. (1997). The group I mGlu receptor agonist DHPG induces a novel form of LTD in the CA1 region of the hippocampus. *Neuropharmacology*, 36(11-12), 1517–1532. 70, 75, 108, 112
- [Paxinos & Watson, 2003] Paxinos, G. & Watson, C. (2003). *The Rat Brain in Stereotaxic Coordinates*. San Diego; London: Academic Press, Inc., fourth edition edition. 30
- [Peavy & Conn, 1998] Peavy, R. D. & Conn, P. J. (1998). Phosphorylation of mitogen-activated protein kinase in cultured rat cortical glia by stimulation of metabotropic glutamate receptors. *J. Neurochem.*, 71(2), 603–612. 8
- [Pellegrini-Giampietro, 2003] Pellegrini-Giampietro, D. E. (2003). The distinct role of mGlu1 receptors in post-ischemic neuronal death. *Trends Pharmacol. Sci.*, 24(9), 461–470. 103, 123, 124
- [Pellegrini-Giampietro et al., 1996] Pellegrini-Giampietro, D. E., Torregrossa, S. A., & Moroni, F. (1996). Pharmacological characterization of metabotropic glutamate receptors coupled to phos-

- pholipase D in the rat hippocampus. *Br. J. Pharmacol.*, 118(4), 1035–1043. 7, 21
- [Pethig et al., 1989] Pethig, R., Kuhn, M., Payne, R., Adler, E., Chen, T. H., & Jaffe, L. F. (1989). On the dissociation constants of BAPTA-type calcium buffers. *Cell Calcium*, 10(7), 491–498. 109
- [Pin & Duvoisin, 1995] Pin, J. P. & Duvoisin, R. (1995). The metabotropic glutamate receptors: structure and functions. *Neuropharmacology*, 34(1), 1–26. 10
- [Pisani et al., 1997] Pisani, A., Calabresi, P., Centonze, D., & Bernardi, G. (1997). Enhancement of NMDA responses by group I metabotropic glutamate receptor activation in striatal neurones. *Br. J. Pharmacol.*, 120(6), 1007–1014. 104
- [Pontzer et al., 1990] Pontzer, N. J., Chandler, L. J., Stevens, B. R., & Crews, F. T. (1990). Receptors, phosphoinositol hydrolysis and plasticity of nerve cells. *Prog. Brain Res.*, 86, 221–225. 21
- [Rausche et al., 1988] Rausche, G., Sarvey, J. M., & Heinemann, U. (1988). Lowering extracellular calcium reverses paired pulse habituation into facilitation in dentate granule cells and removes a late IPSP. *Neurosci. Lett.*, 88(3), 275–280. 11, 103
- [Rausche et al., 1989] Rausche, G., Sarvey, J. M., & Heinemann, U. (1989). Slow synaptic inhibition in relation to frequency habituation in dentate granule cells of rat hippocampal slices. *Exp. Brain Res.*, 78(2), 233–242. 11, 103
- [Riedel et al., 1995] Riedel, G., Manahan-Vaughan, D., Kozikowski, A. P., & Reymann, K. G. (1995). Metabotropic glutamate receptor agonist trans-azetidine-2,4-dicarboxylic acid facilitates maintenance of LTP in the dentate gyrus in vivo. *Neuropharmacology*, 34(8), 1107–1109. 104

## Bibliography

- [Riedel & Micheau, 2001] Riedel, G. & Micheau, J. (2001). Function of the hippocampus in memory formation: desperately seeking resolution. *Prog. Neuropsychopharmacol. Biol. Psychiatry*, 25(4), 835–853. [1](#), [24](#)
- [Riedel et al., 2003] Riedel, G., Platt, B., & Micheau, J. (2003). Glutamate receptor function in learning and memory. *Behav. Brain Res.*, 140(1-2), 1–47. [24](#)
- [Riedel et al., 1994] Riedel, G., Wetzel, W., & Reymann, K. G. (1994). (R,S)-alpha-methyl-4-carboxyphenylglycine (MCPG) blocks spatial learning in rats and long-term potentiation in the dentate gyrus in vivo. *Neurosci. Lett.*, 167(1-2), 141–144. [24](#)
- [Roberson et al., 1999] Roberson, E. D., English, J. D., Adams, J. P., Selcher, J. C., Kondratick, C., & Sweatt, J. D. (1999). The mitogen-activated protein kinase cascade couples PKA and PKC to cAMP response element binding protein phosphorylation in area CA1 of hippocampus. *J. Neurosci.*, 19(11), 4337–4348. [20](#), [23](#)
- [Rodriguez-Moreno et al., 1998] Rodriguez-Moreno, A., Sistiaga, A., Lerma, J., & Sanchez-Prieto, J. (1998). Switch from facilitation to inhibition of excitatory synaptic transmission by group I mGluR desensitization. *Neuron*, 21(6), 1477–1486. [8](#), [112](#)
- [Romano et al., 1995] Romano, C., Sesma, M. A., McDonald, C. T., O’Malley, K., van den Pol, A. N., & Olney, J. W. (1995). Distribution of metabotropic glutamate receptor mGluR5 immunoreactivity in rat brain. *J. Comp Neurol.*, 355(3), 455–469. [10](#), [112](#)
- [Romano et al., 2002] Romano, C., Smout, S., Miller, J. K., & O’Malley, K. L. (2002). Developmental regulation of metabotropic glutamate receptor 5b protein in rodent brain. *Neuroscience*, 111(3), 693–698. [127](#)

- [Romano et al., 1996] Romano, C., van den Pol, A. N., & O'Malley, K. L. (1996). Enhanced early developmental expression of the metabotropic glutamate receptor mGluR5 in rat brain: protein, mRNA splice variants, and regional distribution. *J. Comp Neurol.*, 367(3), 403–412. [127](#)
- [Rosenblum et al., 2002] Rosenblum, K., Futter, M., Voss, K., Erent, M., Skehel, P. A., French, P., Obosi, L., Jones, M. W., & Bliss, T. V. (2002). The role of extracellular regulated kinases I/II in late-phase long- term potentiation. *J. Neurosci.*, 22(13), 5432–5441. [23](#)
- [Rush et al., 2002] Rush, A. M., Wu, J., Rowan, M. J., & Anwyl, R. (2002). Group I metabotropic glutamate receptor (mGluR)-dependent long-term depression mediated via p38 mitogen-activated protein kinase is inhibited by previous high-frequency stimulation and activation of mGluRs and protein kinase C in the rat dentate gyrus in vitro. *J. Neurosci.*, 22(14), 6121–6128. [107](#)
- [Sakimura et al., 1995] Sakimura, K., Kutsuwada, T., Ito, I., Manabe, T., Takayama, C., Kushiyama, E., Yagi, T., Aizawa, S., Inoue, Y., & Sugiyama, H. (1995). Reduced hippocampal LTP and spatial learning in mice lacking NMDA receptor epsilon 1 subunit. *Nature*, 373(6510), 151–155. [121](#)
- [Saugstad et al., 1994] Saugstad, J. A., Kinzie, J. M., Mulvihill, E. R., Segerson, T. P., & Westbrook, G. L. (1994). Cloning and expression of a new member of the L-2-amino-4- phosphonobutyric acid-sensitive class of metabotropic glutamate receptors. *Mol. Pharmacol.*, 45(3), 367–372. [9](#)
- [Schoepp, 2001] Schoepp, D. D. (2001). Unveiling the functions of presynaptic metabotropic glutamate receptors in the central nervous system. *J. Pharmacol. Exp. Ther.*, 299(1), 12–20. [124](#)

## Bibliography

- [Schoepp et al., 1999] Schoepp, D. D., Jane, D. E., & Monn, J. A. (1999). Pharmacological agents acting at subtypes of metabotropic glutamate receptors. *Neuropharmacology*, 38(10), 1431–1476. 7
- [Seidenbecher et al., 1997] Seidenbecher, T., Reymann, K. G., & Balschun, D. (1997). A post-tetanic time window for the reinforcement of long-term potentiation by appetitive and aversive stimuli. *Proc. Natl. Acad. Sci. U. S. A*, 94(4), 1494–1499. 15
- [Shigemoto et al., 1997] Shigemoto, R., Kinoshita, A., Wada, E., Nomura, S., Ohishi, H., Takada, M., Flor, P. J., Neki, A., Abe, T., Nakanishi, S., & Mizuno, N. (1997). Differential presynaptic localization of metabotropic glutamate receptor subtypes in the rat hippocampus. *J. Neurosci.*, 17(19), 7503–7522. 9, 10, 112
- [Shouval et al., 2002] Shouval, H. Z., Bear, M. F., & Cooper, L. N. (2002). A unified model of NMDA receptor-dependent bidirectional synaptic plasticity. *Proc. Natl. Acad. Sci. U. S. A*, 99(16), 10831–10836. 11
- [Sistiaga et al., 1998] Sistiaga, A., Herrero, I., Conquet, F., & Sanchez-Prieto, J. (1998). The metabotropic glutamate receptor 1 is not involved in the facilitation of glutamate release in cerebrocortical nerve terminals. *Neuropharmacology*, 37(12), 1485–1492. 112
- [Skeberdis et al., 2001] Skeberdis, V. A., Lan, J., Opitz, T., Zheng, X., Bennett, M. V., & Zukin, R. S. (2001). mGluR1-mediated potentiation of NMDA receptors involves a rise in intracellular calcium and activation of protein kinase C. *Neuropharmacology*, 40(7), 856–865. 18, 102
- [Snyder et al., 2001] Snyder, E. M., Philpot, B. D., Huber, K. M., Dong, X., Fallon, J. R., & Bear, M. F. (2001). Internalization of

- ionotropic glutamate receptors in response to mGluR activation. *Nat. Neurosci.*, 4(11), 1079–1085. 112
- [Soderling & Derkach, 2000] Soderling, T. R. & Derkach, V. A. (2000). Postsynaptic protein phosphorylation and LTP. *Trends Neurosci.*, 23(2), 75–80. 16, 20
- [Squire, 1992] Squire, L. R. (1992). Memory and the hippocampus: a synthesis from findings with rats, monkeys, and humans. *Psychol. Rev.*, 99(2), 195–231. 1
- [Squire & Zola, 1998] Squire, L. R. & Zola, S. M. (1998). Episodic memory, semantic memory, and amnesia. *Hippocampus*, 8(3), 205–211. 1
- [Staubli & Ji, 1996] Staubli, U. V. & Ji, Z. X. (1996). The induction of homo- vs. heterosynaptic LTD in area CA1 of hippocampal slices from adult rats. *Brain Res.*, 714(1-2), 169–176. 109
- [Strack et al., 1997] Strack, S., Choi, S., Lovinger, D. M., & Colbran, R. J. (1997). Translocation of autophosphorylated calcium/calmodulin-dependent protein kinase II to the postsynaptic density. *J. Biol. Chem.*, 272(21), 13467–13470. 18
- [Sweatt, 2001] Sweatt, J. D. (2001). The neuronal MAP kinase cascade: a biochemical signal integration system subserving synaptic plasticity and memory. *J. Neurochem.*, 76(1), 1–10. 20, 23
- [Takumi et al., 1999] Takumi, Y., Matsubara, A., Rinvik, E., & Ottersen, O. P. (1999). The arrangement of glutamate receptors in excitatory synapses. *Ann. N. Y. Acad. Sci.*, 868, 474–482. 112
- [Tan et al., 2003] Tan, Y., Hori, N., & Carpenter, D. O. (2003). The mechanism of presynaptic long-term depression mediated by group

## Bibliography

- I metabotropic glutamate receptors. *Cell Mol. Neurobiol.*, 23(2), 187–203. 108
- [Tanabe et al., 1992] Tanabe, Y., Masu, M., Ishii, T., Shigemoto, R., & Nakanishi, S. (1992). A family of metabotropic glutamate receptors. *Neuron*, 8(1), 169–179. 5
- [Teyler et al., 1994] Teyler, T. J., Cavus, I., Coussens, C., DiScenna, P., Grover, L., Lee, Y. P., & Little, Z. (1994). Multideterminant role of calcium in hippocampal synaptic plasticity. *Hippocampus*, 4(6), 623–634. 12
- [Thalmann & Ayala, 1982] Thalmann, R. H. & Ayala, G. F. (1982). A late increase in potassium conductance follows synaptic stimulation of granule neurons of the dentate gyrus. *Neurosci. Lett.*, 29(3), 243–248. 12, 57
- [Todd et al., 2003] Todd, P. K., Mack, K. J., & Malter, J. S. (2003). The fragile X mental retardation protein is required for type-I metabotropic glutamate receptor-dependent translation of PSD-95. *Proc. Natl. Acad. Sci. U. S. A*, Nov 12 [Epub ahead of print]. 125
- [Trombley & Westbrook, 1992] Trombley, P. Q. & Westbrook, G. L. (1992). L-AP4 inhibits calcium currents and synaptic transmission via a G-protein-coupled glutamate receptor. *J. Neurosci.*, 12(6), 2043–2050. 116
- [Tsien et al., 1996] Tsien, J. Z., Huerta, P. T., & Tonegawa, S. (1996). The essential role of hippocampal CA1 NMDA receptor-dependent synaptic plasticity in spatial memory. *Cell*, 87(7), 1327–1338. 121
- [Tsien, 1980] Tsien, R. Y. (1980). New calcium indicators and buffers with high selectivity against magnesium and protons: design,

- synthesis, and properties of prototype structures. *Biochemistry*, 19(11), 2396–2404. 109
- [Tulving & Markowitsch, 1997] Tulving, E. & Markowitsch, H. J. (1997). Memory beyond the hippocampus. *Curr. Opin. Neurobiol.*, 7(2), 209–216. 1
- [Urban et al., 2003] Urban, M. O., Hama, A. T., Bradbury, M., Anderson, J., Varney, M. A., & Bristow, L. (2003). Role of metabotropic glutamate receptor subtype 5 (mGluR5) in the maintenance of cold hypersensitivity following a peripheral mononeuropathy in the rat. *Neuropharmacology*, 44(8), 983–993. 124
- [Vargha-Khadem et al., 1997] Vargha-Khadem, F., Gadian, D. G., Watkins, K. E., Connelly, A., Paesschen, W. V., & Mishkin, M. (1997). Differential effects of early hippocampal pathology on episodic and semantic memory. *Science*, 277(5324), 376–380. 1
- [Victorov et al., 2000] Victorov, I. V., Prass, K., & Dirnagl, U. (2000). Improved selective, simple, and contrast staining of acidophilic neurons with vanadium acid fuchsin. *Brain Res. Brain Res. Protoc.*, 5(2), 135–139. 44
- [Vincent & Maiese, 2000] Vincent, A. M. & Maiese, K. (2000). The metabotropic glutamate system promotes neuronal survival through distinct pathways of programmed cell death. *Exp. Neurol.*, 166(1), 65–82. 117, 124
- [Walker et al., 2001] Walker, K., Reeve, A., Bowes, M., Winter, J., Wotherspoon, G., Davis, A., Schmid, P., Gasparini, F., Kuhn, R., & Urban, L. (2001). mGlu5 receptors and nociceptive function II. mGlu5 receptors functionally expressed on peripheral sensory neurones mediate inflammatory hyperalgesia. *Neuropharmacology*, 40(1), 10–19. 124

## Bibliography

- [Wang & Wagner, 1999] Wang, H. & Wagner, J. J. (1999). Priming-induced shift in synaptic plasticity in the rat hippocampus. *J. Neurophysiol.*, 82(4), 2024–2028. [15](#)
- [Wang & Salter, 1994] Wang, Y. T. & Salter, M. W. (1994). Regulation of NMDA receptors by tyrosine kinases and phosphatases. *Nature*, 369(6477), 233–235. [21](#)
- [Watabe et al., 2002] Watabe, A. M., Carlisle, H. J., & O'Dell, T. J. (2002). Postsynaptic induction and presynaptic expression of group 1 mGluR-dependent LTD in the hippocampal CA1 region. *J. Neurophysiol.*, 87(3), 1395–1403. [13](#), [112](#), [113](#)
- [Winder & Sweatt, 2001] Winder, D. G. & Sweatt, J. D. (2001). Roles of serine/threonine phosphatases in hippocampal synaptic plasticity. *Nat. Rev. Neurosci.*, 2(7), 461–474. [20](#)
- [Witter et al., 2000] Witter, M. P., Naber, P. A., van Haeften, T., Machielsen, W. C., Rombouts, S. A., Barkhof, F., Scheltens, P., & da Silva, F. H. L. (2000). Cortico-hippocampal communication by way of parallel parahippocampal-subicular pathways. *Hippocampus*, 10(4), 398–410. [4](#)
- [Xiao et al., 2000] Xiao, B., Tu, J. C., & Worley, P. F. (2000). Homer: a link between neural activity and glutamate receptor function. *Curr. Opin. Neurobiol.*, 10(3), 370–374. [105](#)
- [Xiao et al., 2001] Xiao, M. Y., Zhou, Q., & Nicoll, R. A. (2001). Metabotropic glutamate receptor activation causes a rapid redistribution of AMPA receptors. *Neuropharmacology*, 41(6), 664–671. [112](#)
- [Yakel, 1997] Yakel, J. L. (1997). Calcineurin regulation of synaptic function: from ion channels to transmitter release and gene transcription. *Trends Pharmacol. Sci.*, 18(4), 124–134. [20](#)