

## 6. Anhang

### 6.1. Literatur

- Apel ED, Litchfield DW, Clark RH, Krebs EG, Storm DR, 1991. Phosphorylation of neuromodulin (GAP-43) by casein kinase II. Identification of phosphorylation sites and regulation by calmodulin. *J Biol Chem.* Jun 5;266(16):10544-51.
- Apel ED, Storm DR, 1992. Functional domains of neuromodulin (GAP-43). *Perspect Dev Neurobiol*;1(1):3-11. Review.
- Bayliss RJ, Duch C, Levine RB, 2001. Nerve-muscle interactions regulate motor terminal growth and myoblast distribution during muscle development. *Dev Biol.* Mar 15;231(2):348-63.
- Barria A, Muller D, Derkach V, Griffith LC, Soderling TR, 1997. Regulatory phosphorylation of AMPA-type glutamate receptors by CaM-KII during long-term potentiation. *Science.* Jun 27;276(5321):2042-5.
- Benfenati F, Valtorta F, Rubenstein JL, Gorelick FS, Greengard P, Czernik AJ, 1992. Synaptic vesicle-associated Ca<sup>2+</sup>/calmodulin-dependent protein kinase II is a binding protein for synapsin I. *Nature.* Oct 1;359(6394):417-20.
- Benquet P, Frere S, Pichon Y, Tiaho F, 2000. Properties and development of Calcium currents in embryonic cockroach neurons. *Neurosci Lett.* 294(1):49-52.
- Bell RA and Joachim FA, 1976. Techniques for rearing laboratory colonies of tobacco hornworms and pink ballworms. *Ann Entomol Soc Am.* 69:365-73
- Berridge MJ. Neuronal calcium signaling. *Neuron.* 1998 Jul;21(1):13-26. Review.
- Blaustein MP, Lederer WJ, 1999. Sodium/Calcium exchange: its physiological implications. *Physiol Rev.* Jul;79(3):763-854. Review.
- Braak S, Fahrman M, 2003. Organ-specific distribution of the calcium sensor CaMKII in *Locusta migratoria*. *Arch Insect Biochem Physiol.* Mar;52(3):155-62.
- Burkert P and Duch C: Changes in CaM kinase II activity and localisation correlate with distinct phases of motoneuron dendritic growth during *Manduca* metamorphosis. Proceedings of the 29th Göttingen Neurobiology Conference. Elsner N, Zimmermann H, ed, Thieme Stuttgart, New York, abstr 94.
- Caniglia C, Vignoli AL, Biagioni S, Augusti-Tocco G, Giorgi M, 1997. Calmodulin-dependent cyclic nucleotide phosphodiesterase in adult and developing chick spinal cord. *J Neurosci Res.* Jul 15;49(2):186-96.
- Chen N, Furuya S, Doi H, Hashimoto Y, Kudo Y, Higashi H, 2003. Ganglioside/calmodulin kinase II signal inducing cdc42-mediated neuronal aktin reorganization. *Neuroscience.* 120(1):163-76.

- Christie BR, Eliot LS, Ito K, Miyakawa H, Johnston D, 1995. Different  $\text{Ca}^{2+}$  channels in soma and dendrites of hippocampal pyramidal neurons mediate spike-induced  $\text{Ca}^{2+}$  influx. *J Neurophysiol.* Jun;73(6):2553-7.
- Cline HT, 2001. Dendritic arbor development and synaptogenesis. *Curr Opin Neurobiol.* Feb;11(1):118-26. Review.
- Colbran RJ, 1993. Inactivation of  $\text{Ca}^{2+}$ /calmodulin-dependent protein kinase II by basal autophosphorylation. *J Biol Chem.* Apr 5;268(10):7163-70.
- Colbran RJ, Brown AM, 2004. Calcium/calmodulin-dependent protein kinase II and synaptic plasticity. *Curr Opin Neurobiol.* Jun;14(3):318-27.
- Consoulas C, Kent KS, Levine RB. Remodeling of the peripheral processes and presynaptic terminals of leg motoneurons during metamorphosis of the hawkmoth, *Manduca sexta*, 1996. *J Comp Neurol.* Aug 26;372(3):415-34.
- Conti M, Nemoz G, Sette C, Vicini E, 1995. Recent progress in understanding the hormonal regulation of phosphodiesterases. *Endocr Rev.* Jun;16(3):370-89. Review.
- Dash PK, Karl KA, Colicos MA, Prywes R, Kandel ER, 1991. cAMP response element-binding protein is activated by  $\text{Ca}^{2+}$ /calmodulin- as well as cAMP-dependent protein kinase. *Proc Natl Acad Sci U S A.* Jun 1;88(11):5061-5.
- De Koninck P, Schulman H, 1998. Sensitivity of CaM kinase II to the frequency of  $\text{Ca}^{2+}$  oscillations. *Science.* 279(5348):227-30.
- Dosemeci A, Tao-Cheng JH, Vinade L, Winters CA, Pozzo-Miller L, Reese TS, 2001. Glutamate-induced transient modification of the postsynaptic density. *Proc Natl Acad Sci U S A.* Aug 28;98(18):10428-32. Epub 2001 Aug 21.
- Dubuque SH, Schachtner J, Nighorn AJ, Menon KP, Zinn K, Tolbert LP, 2001. Immunolocalization of synaptotagmin for the study of synapses in the developing antennal lobe of *Manduca sexta*. *J Comp Neurol.* Dec 24;441(4):277-87.
- Duch C, Levine RB, 2000. Remodeling of membrane properties and dendritic architecture accompanies the postembryonic conversion of a slow into a fast motoneuron. *J Neurosci.* 20(18):6950-61.
- Duch C, Levine RB, 2002. Changes in Calcium signaling during postembryonic dendritic growth in *Manduca sexta*. *J Neurophysiol.* 87(3):1415-25.
- Duch C, Mentel T, 2003. Stage-specific activity patterns affect motoneuron axonal retraction and outgrowth during the metamorphosis of *Manduca sexta*. *Eur J Neurosci.* 17(5):945-62.
- Evers JF, Muench D, Pflueger HJ, Duch C, 2004. Dendritic growth, filopodia shape, and synaptogenesis in *Manduca sexta*: roles of calcium and activity. Program No. 611.7. *Abstract Viewer/Itinerary Planner.* Washington, DC: Society for Neuroscience, 2004. Online.

- Evers JF, Schmitt S, Sibila M, Duch C, 2004. Progress in functional neuroanatomy: precise automatic geometric reconstruction of neuronal morphology from confocal image stacks. *J Neurophysiol.* Nov 10
- He Q, Dent EW, Meiri KF, 1997. Modulation of actin filament behavior by GAP-43 (neuro-modulin) is dependent on the phosphorylation status of serine 41, the protein kinase C site. *J Neurosci.* May 15;17(10):3515-24.
- Fink CC, Bayer KU, Myers JW, Ferrell JE Jr, Schulman H, Meyer T, 2003. Selective regulation of neurite extension and synapse formation by the beta but not the alpha isoform of CaMKII. *Neuron.* 39(2):283-97.
- Fink CC, Meyer T, 2002. Molecular mechanisms of CaMKII activation in neuronal plasticity. *Curr Opin Neurobiol.* Jun;12(3):293-9.
- Fox K, 2003. Synaptic plasticity: the subcellular location of CaMKII controls plasticity. *Curr Biol.* Feb 18;13(4):R143-5. Review.
- Fukunaga K, Soderling TR, Miyamoto E, 1992. Activation of Ca<sup>2+</sup>/calmodulin-dependent protein kinase II and protein kinase C by glutamate in cultured rat hippocampal neurons. *J Biol Chem.* Nov 5;267(31):22527-33.
- Gaudilliere B, Konishi Y, de la Iglesia N, Yao G, Bonni A, 2004. A CaMKII-NeuroD Signaling Pathway Specifies Dendritic Morphogenesis. *Neuron.* Jan 22;41(2):229-41.
- Geddis MS, Rehder V, 2003. The phosphorylation state of neuronal processes determines growth cone formation after neuronal injury. *J Neurosci Res.* Oct 15;74(2):210-20
- Giorgi M, Giordano D, Rosati J, Tata AM, Augusti-Tocco G, 2002. Differential expression and localization of calmodulin-dependent phosphodiesterase genes during ontogenesis of chick dorsal root ganglion. *J Neurochem.* Mar;80(6):970-9.
- Goldberg DJ, 1988. Local role of Ca<sup>2+</sup> in formation of veils in growth cones. *J Neurosci.* 1988 Jul;8(7):2596-605.
- Goodman CS, 1996. Mechanisms and molecules that control growth cone guidance. *Annu Rev Neurosci.*;19:341-77. Review.
- Goshima Y, Ohsako S, Yamauchi T, 1993. Overexpression of Ca<sup>2+</sup>/calmodulin-dependent protein kinase II in Neuro2a and NG108-15 neuroblastoma cell lines promotes neurite outgrowth and growth cone motility. *J Neurosci.* Feb;13(2):559-67.
- Greene LA, Tischler AS, 1976. Establishment of a noradrenergic clonal line of rat adrenal pheochromocytoma cells which respond to nerve growth factor. *Proc Natl Acad Sci U S A.* Jul;73(7):2424-8.

- Griffith LC, 1997. *Drosophila melanogaster* as a model system for the study of the function of calcium/calmodulin-dependent protein kinase II in synaptic plasticity. *Invert Neurosci. Sep-Dec*;3(2-3):93-102. Review.
- Griffith LC, 2004. Calcium/calmodulin-dependent protein kinase II: an unforgettable kinase. *J Neurosci. Sep 29*;24(39):8391-3.
- Griffith LC, 2004. Regulation of calcium/calmodulin-dependent protein kinase II activation by intramolecular and intermolecular interactions. *J Neurosci. Sep 29*;24(39):8394-8.
- Griffith LC, Greenspan RJ, 1993. The diversity of calcium/calmodulin-dependent protein kinase II isoforms in *Drosophila* is generated by alternative splicing of a single gene. *J Neurochem. Oct*;61(4):1534-7.
- Griffith LC, Verselis LM, Aitken KM, Kyriacou CP, Danho W, Greenspan RJ, 1993. Inhibition of calcium/calmodulin-dependent protein kinase in *Drosophila* disrupts behavioral plasticity. *Neuron. Mar*;10(3):501-9.
- Guerini D, 1997. Calcineurin: not just a simple protein phosphatase. *Biochem Biophys Res Commun. Jun 18*;235(2):271-5. Review.
- GuptaRoy B, Griffith LC, 1996. Functional heterogeneity of alternatively spliced isoforms of *Drosophila* Ca<sup>2+</sup>/calmodulin-dependent protein kinase II. *J Neurochem. Mar*;66(3):1282-8.
- GuptaRoy B, Marwaha N, Pla M, Wang Z, Nelson HB, Beckingham K, Griffith LC, 2000. Alternative splicing of *Drosophila* Calcium/calmodulin-dependent protein kinase II regulates substrate specificity and activation. *Brain Res Mol Brain Res. Aug 14*;80(1):26-34.
- Hanson PI, Schulman H, 1992. Neuronal Ca<sup>2+</sup>/calmodulin-dependent protein kinases. *Annu Rev Biochem. 61*:559-601. Review.
- Hanson PI, Schulman H, 1992. Inhibitory autophosphorylation of multifunctional Ca<sup>2+</sup>/calmodulin-dependent protein kinase analyzed by site-directed mutagenesis. *J Biol Chem. Aug 25*;267(24):17216-24.
- Hildebrandt H, Müller U, 1995. Octopamine mediates rapid stimulation of protein kinase A in the antennal lobe of honeybees. *J Neurobiol. May*;27(1):44-50.
- Hockerman GH, Peterson BZ, Johnson BD, Catterall WA, 1997. Molecular determinants of drug binding and action on L-type Calcium channels. *Annu Rev Pharmacol Toxicol. 37*:361-96. Review.
- Hook SS, Means AR. Ca<sup>2+</sup>/CaM-dependent kinases: from activation to function. *Annu Rev Pharmacol Toxicol. 2001*;41:471-505. Review.
- Huang KP, 1990. Role of protein kinase C in cellular regulation. *Biofactors. Jul*;2(3):171-8. Review.

- Hudmon A, Schulman H, 2002a. Neuronal Ca<sup>2+</sup>/calmodulin-dependent protein kinase II: the role of structure and autoregulation in cellular function. *Annu Rev Biochem.* 71:473-510. Review.
- Hudmon A, Schulman H, 2002b. Structure-function of the multifunctional Ca<sup>2+</sup>/calmodulin-dependent protein kinase II. *Biochem J.* Jun 15;364(Pt 3):593-611. Review.
- Jin P, Griffith LC, Murphey RK. Presynaptic calcium/calmodulin-dependent protein kinase II regulates habituation of a simple reflex in adult *Drosophila*. *J Neurosci.* 1998 Nov 1;18(21):8955-64.
- Joiner MA, Griffith LC, 1997. CaM kinase II and visual input modulate memory formation in the neuronal circuit controlling courtship conditioning. *J Neurosci.* Dec 1;17(23):9384-91.
- Joiner MA, Griffith LC, 1999. Mapping of the anatomical circuit of CaM kinase-dependent courtship conditioning in *Drosophila*. *Learn Mem.* Mar-Apr;6(2):177-92.
- Jourdain P, Fukunaga K, Muller D, 2003. Calcium/calmodulin-dependent protein kinase II contributes to activity-dependent filopodia growth and spine formation. *J Neurosci.* Nov 19;23(33):10645-9
- Kakkar R, Raju RV, Sharma RK, 1999. Calmodulin-dependent cyclic nucleotide phosphodiesterase (PDE1). *Cell Mol Life Sci.* Jul;55(8-9):1164-86. Review.
- Kater SB, Mills LR, 1991. Regulation of growth cone behavior by calcium. *J Neurosci.* Apr;11(4):891-9.
- Lautermilch NJ, Spitzer NC, 2000. Regulation of calcineurin by growth cone calcium waves controls neurite extension. *J Neurosci.* Jan 1;20(1):315-25.
- Levine RB, Weeks JC, 1990. Hormonally mediated changes in simple reflex circuits during metamorphosis in *Manduca*. *J Neurobiol.* 21(7):1022-36. Review.
- Libersat F, Duch C, 2002. Morphometric analysis of dendritic remodeling in an identified motoneuron during postembryonic development. *J Comp Neurol.* Aug 19;450(2):153-66.
- Libersat F, Duch C, 2004. Mechanisms of dendritic maturation. *Mol Neurobiol.* Jun;29(3):303-20.
- Lisman J, 1989. A mechanism for the Hebb and the anti-Hebb processes underlying learning and memory. *Proc Natl Acad Sci U S A.* Dec;86(23):9574-8.
- Liu YC, Storm DR, 1989. Dephosphorylation of neuromodulin by calcineurin. *J Biol Chem.* Aug 5;264(22):12800-4.
- Llinas R, McGuinness TL, Leonard CS, Sugimori M, Greengard P, 1985. Intraterminal injection of synapsin I or calcium/calmodulin-dependent protein kinase II alters neurotransmitter release at the squid giant synapse. *Proc Natl Acad Sci U S A.* May;82(9):3035-9.

- Lohmann C, Myhr KL, Wong RO, 2002. Transmitter-evoked local calcium release stabilizes developing dendrites. *Nature*. Jul 11;418(6894):177-81.
- Lohr C, Tucker E, Oland LA, Tolbert LP, 2002. Development of depolarisation-induced Calcium transients in insect glial cells is dependent on the presence of afferent axons. *J Neurobiol*. 52(2):85-98
- Ludvig N, Burmeister V, Jobe PC, Kincaid RL, 1991. Electron microscopic immunocytochemical evidence that the calmodulin-dependent cyclic nucleotide phosphodiesterase is localized predominantly at postsynaptic sites in the rat brain. *Neuroscience*.;44(2):491-500.
- Malinow R, Otmakhov N, Blum KI, Lisman J, 1994. Visualizing hippocampal synaptic function by optical detection of Ca<sup>2+</sup> entry through the N-methyl-D-aspartate channel. *Proc Natl Acad Sci U S A*. Aug 16;91(17):8170-4.
- Masse T, Kelly PT, 1997. Overexpression of Ca<sup>2+</sup>/calmodulin-dependent protein kinase II in PC12 cells alters cell growth, morphology, and nerve growth factor-induced differentiation. *J Neurosci*. Feb 1;17(3):924-31.
- Matheson SF, Levine RB, 1999. Steroid hormone enhancement of neurite outgrowth in identified insect motor neurons involves specific effects on growth cone form and function. *J Neurobiol*. 38(1):27-45.
- Mattson MP, Kater SB, 1987. Calcium regulation of neurite elongation and growth cone motility. *J Neurosci*. Dec;7(12):4034-43.
- McNeill RB, Colbran RJ, 1995. Interaction of autophosphorylated Ca<sup>2+</sup>/calmodulin-dependent protein kinase II with neuronal cytoskeletal proteins. Characterization of binding to a 190-kDa postsynaptic density protein. *J Biol Chem*. Apr 28;270(17):10043-9.
- Menegon A, Verderio C, Leoni C, Benfenati F, Czernik AJ, Greengard P, Matteoli M, Valtorta F, 2002. Spatial and temporal regulation of Ca<sup>2+</sup>/calmodulin-dependent protein kinase II activity in developing neurons. *J Neurosci*. Aug 15;22(16):7016-26.
- Miller FD, Kaplan DR, 2003. Signaling mechanisms underlying dendrite formation. *Curr Opin Neurobiol*. Jun;13(3):391-8. Review.
- Miller SG, Kennedy MB, 1986. Regulation of brain type II Ca<sup>2+</sup>/calmodulin-dependent protein kinase by autophosphorylation: a Ca<sup>2+</sup>-triggered molecular switch. *Cell*. 44(6):861-70.
- Miskevich F, Lu W, Lin SY, Constantine-Paton M, 2002. Interaction between metabotropic and NMDA subtypes of glutamate receptors in sprout suppression at young synapses. *J Neurosci*. Jan 1;22(1):226-38.
- Müller U, 1997. Insect 86 kDa protein kinase C substrate is a filament interacting protein regulated by Ca<sup>2+</sup>/calmodulin and phosphorylation. *Brain Research* 757:24-30
- Müller U, 2000. Prolonged activation of cAMP-dependent protein kinase during conditioning induces long-term memory in honeybees. *Neuron*. Jul;27(1):159-68.

- Nairn AC, Bhagat B, Palfrey HC, 1985. Identification of calmodulin-dependent protein kinase III and its major Mr 100,000 substrate in mammalian tissues. *Proc Natl Acad Sci USA*. Dec;82(23):7939-43.
- Nijhout HF, Williams CM, 1974. Control of moulting and metamorphosis in the tobacco hornworm, *Manduca sexta* (L.): growth of the last-instar larva and the decision to pupate. *J Exp Biol*. Oct;61(2):481-91.
- Ninan I, Arancio O, 2004. Presynaptic CaMKII is necessary for synaptic plasticity in cultured hippocampal neurons. *Neuron*. Apr 8;42(1):129-41.
- Ohsako S, Nishida Y, Ryo H, Yamauchi T, 1993. Molecular characterization and expression of the *Drosophila* Ca<sup>2+</sup>/calmodulin-dependent protein kinase II gene. Identification of four forms of the enzyme generated from a single gene by alternative splicing. *J Biol Chem*. Jan 25;268(3):2052-62.
- Otmakhov N, Griffith LC, Lisman JE, 1997. Postsynaptic inhibitors of calcium/calmodulin-dependent protein kinase type II block induction but not maintenance of pairing-induced long-term potentiation. *J Neurosci*. Jul 15;17(14):5357-65.
- Park D, Coleman MJ, Hodge JJ, Budnik V, Griffith LC, 2002. Regulation of neuronal excitability in *Drosophila* by constitutively active CaMKII. *J Neurobiol*. Jul;52(1):24-42.
- Petersen JD, Chen X, Vinade L, Dosemeci A, Lisman JE, Reese TS, 2003. Distribution of postsynaptic density (PSD)-95 and Ca<sup>2+</sup>/calmodulin-dependent protein kinase II at the PSD. *J Neurosci*. Dec 3;23(35):11270-8.
- Rajan I, Cline HT, 1998. Glutamate receptor activity is required for normal development of tectal cell dendrites in vivo. *J Neurosci*. Oct 1;18(19):7836-46.
- Reed TM, Browning JE, Blough RI, Vorhees CV, Repaske DR, 1998. Genomic structure and chromosome location of the murine PDE1B phosphodiesterase gene. *Mamm Genome*. Jul;9(7):571-6.
- Reh TA, Constantine-Paton M, 1985. Eye-specific segregation requires neural activity in three-eyed *Rana pipiens*. *J Neurosci*. May;5(5):1132-43.
- Schmidt U, Pilgrim C, Beyer C, 1998. Differentiative effects of dopamine on striatal neurons involve stimulation of the cAMP/PKA pathway. *Mol Cell Neurosci*. May;11(1-2):9-18.
- Schulman H, 2004. Activity-dependent regulation of calcium/calmodulin-dependent protein kinase II localization. *J Neurosci*. Sep 29;24(39):8399-403.
- Shanavas A, Dutta-Gupta A, Murthy CR, 1998. Identification, characterization, immunocytochemical localization, and developmental changes in the activity of Calcium/calmodulin-dependent protein kinase II in the CNS of *Bombyx mori* during postembryonic development. *J Neurochem*. 70(4):1644-51.

- Shen K, Meyer T, 1999. Dynamic control of CaMKII translocation and localization in hippocampal neurons by NMDA receptor stimulation. *Science*. Apr 2;284(5411):162-6.
- Shen K, Teruel MN, Connor JH, Shenolikar S, Meyer T, 2000. Molecular memory by reversible translocation of Calcium/calmodulin-dependent protein kinase II. *Nat Neurosci*. Sep;3(9):881-6.
- Shen K, Teruel MN, Subramanian K, Meyer T, 1998. CaMKII  $\beta$  functions as an F-aktin targeting module that localizes CaMKIIalpha/beta heterooligomers to dendritic spines. *Neuron*. Sep;21(3):593-606.
- Siegel RW, Hall JC, 1979. Conditioned responses in courship behaviour of normal and mutant *Drosophila*. *Proc Natl Acad Sci USA* 76:565-578
- Soderling TR, 1999. The Ca-calmodulin-dependent protein kinase cascade. *Trends Biochem Sci*. Jun;24(6):232-6. Review.
- Soderling TR, Chang B, Brickey D, 2001. Cellular signaling through multifunctional Ca<sup>2+</sup>/calmodulin-dependent protein kinase II. *J Biol Chem*. Feb 9;276(6):3719-22.
- Sogawa Y, Yoshimura Y, Otaka A, Yamauchi T, 2000. Ca<sup>2+</sup>-independent activity of Ca<sup>2+</sup>/calmodulin-dependent protein kinase II involved in stimulation of neurite outgrowth in neuroblastoma cells. *Brain Res*. 881(2):165-75.
- Spruston N, Schiller Y, Stuart G, Sakmann B, 1995. Activity-dependent action potential invasion and Calcium influx into hippocampal CA1 dendrites. *Science*. Apr 14;268(5208):297-300.
- Südhof TC, 2004. The synaptic vesicle cycle. *Annu Rev Neurosci*.;27:509-47.
- Sun D, Ziegler R, Milligan CE, Fahrbach S, Schwartz LM, 1995. Apolipoprotein III is dramatically up-regulated during the programmed death of insect skeletal muscle and neurons. *J Neurobiol*. Jan;26(1):119-29.
- Sun P, Enslin H, Myung PS, Maurer RA, 1994. Differential activation of CREB by Ca<sup>2+</sup>/calmodulin-dependent protein kinases type II and type IV involves phosphorylation of a site that negatively regulates activity. *Genes Dev*. Nov 1;8(21):2527-39.
- Sun XX, Hodge JJ, Zhou Y, Nguyen M, Griffith LC, 2004. The *eag* potassium channel binds and locally activates calcium/calmodulin-dependent protein kinase II. *J Biol Chem*. Mar 12; 279(11):10206-14.
- Tashima K, Yamamoto H, Setoyama C, Ono T, Miyamoto E, 1996. Overexpression of Ca<sup>2+</sup>/calmodulin-dependent protein kinase II inhibits neurite outgrowth of PC12 cells. *J Neurochem*. 66(1):57-64.
- Thiagarajan TC, Piedras-Renteria ES, Tsien RW, 2002. alpha- and betaCaMKII. Inverse regulation by neuronal activity and opposing effects on synaptic strength. *Neuron*. Dec 19;36(6):1103-14.



- Tolbert LP, Matsumoto SG, Hildebrand JG, 1983. Development of synapses in the antennal lobes of the moth *Manduca sexta* during metamorphosis. *J Neurosci.* Jun;3(6):1158-75.
- Tompkins L, Siegel RW, Gailey DA, Hall JC, 1983. Conditioned courtship in *Drosophila* and its mediation by association of chemical cues. *Behav Genet.* Nov;13(6):565-78.
- Tucker WC, Chapman ER, 2002. Role of synaptotagmin in Ca<sup>2+</sup>-triggered exocytosis. *Biochem J.* Aug 15;366(Pt 1):1-13. Review.
- Walter MF, Kiger JA Jr, 1984. The Dunce gene of *Drosophila*: roles of Ca<sup>2+</sup> and calmodulin in adenosine 3':5'-cyclic monophosphate-specific phosphodiesterase activity. *J Neurosci.* Feb;4(2):495-501.
- Wang Z, Palmer G, Griffith LC, 1998. Regulation of *Drosophila* Ca<sup>2+</sup>/calmodulin-dependent protein kinase II by autophosphorylation analyzed by site-directed mutagenesis. *J Neurochem.* Jul;71(1):378-87.
- Weeks JC, Levine RB, 1995. Steroid hormone effects on neurons subserving behavior. *Curr Opin Neurobiol.*;5(6):809-15. Review.
- Weeks JC, 2003. Thinking globally, acting locally: steroid hormone regulation of the dendritic architecture, synaptic connectivity and death of an individual neuron. *Prog Neurobiol.* Aug;70(5):421-42. Review.
- Welsby PJ, Wang H, Wolfe JT, Colbran RJ, Johnson ML, Barrett PQ, 2003. A mechanism for the direct regulation of T-type calcium channels by Ca<sup>2+</sup>/calmodulin-dependent kinase II. *J Neurosci.* Nov 5;23(31):10116-21.
- Williams EJ, Mittal B, Walsh FS, Doherty P, 1995. A Ca<sup>2+</sup>/calmodulin kinase inhibitor, KN-62, inhibits neurite outgrowth stimulated by CAMs and FGF. *Mol Cell Neurosci.* 6(1):69-79.
- Wu GY, Cline HT, 1998. Stabilization of dendritic arbor structure in vivo by CaMKII. *Science.* Jan 9;279(5348):222-6.
- Wu G, Malinow R, Cline HT, 1996. Maturation of a central glutamatergic synapse. *Science.* Nov 8;274(5289):972-6.
- Yamamoto H, Yamauchi E, Taniguchi H, Ono T, Miyamoto E, 2002. Phosphorylation of microtubule-associated protein tau by Ca<sup>2+</sup>/calmodulin-dependent protein kinase II in its tubulin binding sites. *Arch Biochem Biophys.* 408(2):255-62.
- Yamamoto KK, Gonzalez GA, Biggs WH 3rd, Montminy MR, 1988. Phosphorylation-induced binding and transcriptional efficacy of nuclear factor CREB. *Nature.* Aug 11;334(6182):494-8.
- Yan C, Zhao AZ, Bentley JK, Loughney K, Ferguson K, Beavo JA, 1995. Molecular cloning and characterization of a calmodulin-dependent phosphodiesterase enriched in olfactory sensory neurons. *Proc Natl Acad Sci U S A.* Oct 10;92(21):9677-81.

Yoshimura Y, Shinkawa T, Taoka M, Kobayashi K, Isobe T, Yamauchi T, 2002. Identification of protein substrates of  $\text{Ca}^{2+}$ /calmodulin-dependent protein kinase II in the postsynaptic density by protein sequencing and mass spectrometry. *Biochem Biophys Res Commun.* Jan 25;290(3):948-54.

Zhao AZ, Yan C, Sonnenburg WK, Beavo JA, 1997. Recent advances in the study of  $\text{Ca}^{2+}$ /CaM-activated phosphodiesterases: expression and physiological functions. *Adv Second Messenger Phosphoprotein Res.*;31:237-51. Review.

Zou DJ, Cline HT, 1999. Postsynaptic Calcium/calmodulin-dependent protein kinase II is required to limit elaboration of presynaptic and postsynaptic neuronal arbors. *J Neurosci.* 19(20):8909-18.

## 6.2. Verwendete Abkürzungen

Abb.	Abbildung
ANOVA	Varianzanalyse („analysis of variance“)
aqua dest	destilliertes Wasser
ATP	Adenosintriphosphat
cAMP	zyklisches Adenosinmonophosphat („cyclic adenosine monophosphate“)
cGMP	zyklisches Guanosinmonophosphat („cyclic guanosine monophosphate“)
CaM	Calmodulin
CaM Kinase II	Ca <sup>2+</sup> /Calmodulin-abhängige Proteinkinase II
<i>et. al.</i>	<i>et alii</i> , und andere
h	Stunde
λ	Wellenlänge
LTP	Langzeitpotenzierung („long term potentiation“)
mA	Milliampere, 10 <sup>-3</sup> Ampere
min	Minute
μl	Mikroliter, 10 <sup>-6</sup> Liter
μm	Mikrometer, 10 <sup>-6</sup> Meter
μM	„mikromolar“, 10 <sup>-6</sup> mol/l
M	„molar“, 1 mol/l
MΩ	Megaohm, 10 <sup>6</sup> Ohm
nA	Nanoampere, 10 <sup>-9</sup> Ampere
p	Signifikanzniveau
PDE	Phosphodiesterase
PKA	cAMP-abhängige Proteinkinase

## ANHANG

---

PSD	elektronendichte Struktur in der Postsynapse („postsynaptic density“)
s	Sekunde
t	Zeit

### **6.3. Danksagung**

Mein besonderer Dank gilt Dr. Carsten Duch, der mir die Möglichkeit gegeben hat, in seiner Arbeitsgruppe meine Promotion vorzubereiten, für sein Interesse an meiner Arbeit, sehr engagierte Betreuung und gute Zusammenarbeit.

Prof. Dr. Hans-Joachim Pflüger, mit dessen Arbeitsgruppe wir eng zusammengearbeitet haben, danke ich für die Übernahme des Erstgutachtens.

Besonders hervorzuheben ist Prof. Dr. Ulrich Müller, in dessen Labor ich die biochemischen Experimente durchgeführt habe und der bei Fragen und Problemen immer eine große Hilfe war. Ihm danke ich auch, weil er sich trotz seines Wechsels nach Saarbrücken bereit erklärt hat, Zweitgutachter zu sein und der Promotionskommission anzugehören.

Besonders herzlich danke ich auch Jan Felix Evers, der mir bei EDV-Problemen oft geholfen hat.

Nicht zuletzt bedanke ich mich auch bei allen Anderen für die freundliche Atmosphäre am Institut, für viele Gespräche und Diskussionen, Grillabende, Parties, etc.

### **6.4. Erklärung**

Ich versichere hiermit, diese Arbeit selbstständig verfaßt und nur die angegebenen Hilfsmittel und Hilfen in Anspruch genommen zu haben.

Berlin, den 7. Dezember 2004