

List of Publications

Tobias Bonhoeffer

Original Papers (88)

- Cambridge SB, D Geissler, F Calegari, K Anastassiadis, MT Hasan, AF Stewart, WB Huttner, V Hagen, T Bonhoeffer (2009): Doxycycline-dependent photoactivated gene expression in eukaryotic systems. *Nature Methods* 6:527–531.
- Holtmaat A, T Bonhoeffer, D Chow, J Chuckowree, V De Paola, SB Hofer, M Hübener, T Keck, G Knott, W-CA Lee, R Mostany, TD Mrsic-Flögel, E Nedivi, C Portera-Cailliau, K Svoboda, JT Trachtenberg, L Wilbrecht (2009) Long-term, high-resolution imaging in the mouse neocortex through a chronic cranial window. *Nature Protocols* 4:1128–1144.
- Hofer SB, TD Mrsic-Flögel, T Bonhoeffer, M Hübener (2009) Experience leaves a lasting structural trace in cortical circuits. *Nature* 457:313–317.
- Nägerl UV, KI Willig, B Hein, SW Hell, T Bonhoeffer (2008) Live-cell imaging of dendritic spines by STED microscopy. *Proc. Natl. Acad. Sci. USA* 105:18982–18987.
- Mank M, AF Santos, S Drenth, TD Mrsic-Flögel, SB Hofer, V Stein, T Hendel, DF Reiff, C Levelt, A Borst, T Bonhoeffer, M Hübener, O Griesbeck (2008) A genetically encoded calcium indicator for chronic in vivo two-photon imaging. *Nat Methods* 5:805–811.
- Becker N, CJ Wierenga*, R Fonseca*, T Bonhoeffer, UV Nägerl (2008) LTD induction causes morphological changes of presynaptic boutons and reduces their contacts with spines. *Neuron* 60:590–7. *equal contributions.
- Wierenga CJ, N Becker, T Bonhoeffer (2008) GABAergic synapses are formed without the involvements of dendritic protrusions. *Nature Neurosci* 11:1044–1052.
- Keck T, TD Mrsic-Flögel, M Vaz Afonso, UT Eysel, T Bonhoeffer, M Hübener (2008) Massive restructuring of neuronal circuits during functional reorganization of adult visual cortex. *Nature Neurosci* 11:1162–1167.
- Lohmann C and Bonhoeffer, T (2008) A role for local calcium signaling in rapid synaptic partner selection by dendritic

filopodia. *Neuron* 59:253–260.

Lucic V, AH Kossel, T Yang, T Bonhoeffer, W Baumeister, A Sartori (2007) Multiscale imaging of neurons grown in culture: From light microscopy to cryo-electron tomography. *J. Structural Biology* 160:146–156.

Nägerl UV, G Köstinger, JC Anderson, KAC Martin, T Bonhoeffer (2007) Protracted synaptogenesis after activity-dependent spinogenesis in hippocampal neurons. *J. Neurosci* 27:8149–8156.

Mrsic-Flogel TD, SB Hofer, K Ohki, RC Reid, T Bonhoeffer, M Hübener (2007) Homeostatic regulation of eye-specific responses in visual cortex during ocular dominance plasticity. *Neuron* 54:961–972.

Lang SB, V Stein, T Bonhoeffer, C Lohmann (2007) Endogenous brain-derived neurotrophic factor triggers fast calcium transients at synapses in developing dendrites. *J Neurosci* 27: 1097–1105.

Lang SB, T Bonhoeffer, C Lohmann (2006) Simultaneous imaging of morphological plasticity and calcium dynamics in dendrites. *Nature Protocols* 1:1859–1864.

Fonseca R, RM Vabulas, FU Hartl, T Bonhoeffer, UV Nägerl (2006) A balance of protein synthesis and proteasome-dependent degradation determines the maintenance of LTP. *Neuron* 52:239–245.

Ohki K, S Chung, P Kara, M Hübener, T Bonhoeffer, RC Reid (2006) Highly ordered arrangement of single neurons in orientation pinwheels. *Nature* 442:925–928.

Hofer SB, TD Mrsic-Flogel, T Bonhoeffer, M Hübener (2006) Lifelong learning: ocular dominance plasticity in mouse visual cortex. *Curr. Opin Neurobiol.* 16:451–459.

Roth-Alpermann C, RGM Morris, M Korte, T Bonhoeffer (2006) Homeostatic shutdown of long-term potentiation in the adult hippocampus. *Proc. Natl. Acad. Sci. USA* 103:11039–11044.

Fonseca R, UV Nägerl, T Bonhoeffer (2006) Neuronal activity determines the protein synthesis-dependence of late-phase LTP. *Nature Neurosci.* 9:478–480.

Gärtner A, DG Polnau, V Staiger, C Sciarretta, L Minichiello, H Thoenen, T Bonhoeffer, M Korte (2006) Hippocampal Long-Term-Potentiation is Supported by Pre- and Postsynaptic TrkB-

- Mediated PLC γ signaling. *J. Neurosci* 26:3496–3504.
- Hofer SB, TD Mrcic-Flögel, T Bonhoeffer, M Hübener (2006) Prior experience enhances plasticity in adult visual cortex. *Nature Neurosci* 9:127–132.
- Zagrebelsky M, A Holz, G Dechant, YA Barde, T Bonhoeffer, M Korte (2005): The p75 neurotrophin receptor negatively modulates dendrite complexity and spine density in hippocampal neurons. *J. Neurosci* 25:9989–9999.
- Mrcic-Flögel T, SB Hofer, C Creutzfeldt, I Cloëz-Tayarani, JP Changeux, T Bonhoeffer, M Hübener (2005): Altered map of visual space in the superior colliculus of mice lacking early retinal waves. *J. Neurosci* 25:6921–6928.
- Kawakami N, UV Nägerl, F Odoardi, T Bonhoeffer, H Wekerle, A Flügel (2005): Live imaging of intense effector cell trafficking and autoantigen recognition within the unfolding autoimmune encephalomyelitis lesion. *The Journal of Experimental Medicine* 201: 1805–1814.
- Rösch H, R Schweigreiter, T Bonhoeffer, YA Barde, M Korte (2005): The neurotrophin receptor p75^{NTR} modulates long-term depression and regulates the expression of AMPA receptor subunits in the hippocampus. *Proc. Natl. Acad. Sci. USA* 102:7362–7367.
- Hübener M, T Bonhoeffer (2005): Visual cortex: two-photon excitement. *Current Biology* 6:R205–208.
- Lohmann C, A Finski, T Bonhoeffer (2005): Local calcium transients regulate the spontaneous motility of dendritic filopodia. *Nature Neurosci.* 8:305–312.
- Fonseca R, UV Nägerl, RG Morris, T Bonhoeffer (2004): Competing for memory: hippocampal LTP under regimes of reduced protein synthesis. *Neuron* 44:1011–1020.
- Nägerl UV, N Eberhorn, SB Cambridge, T Bonhoeffer (2004) Bidirectional activity-dependent morphological plasticity in hippocampal neurons. *Neuron* 44: 759–767.
- Grinvald A, T Bonhoeffer, I Vanzetta, A Pollack, E Aloni, R Ofri, D Nelson (2004) High-resolution functional optical imaging: from the neocortex to the eye. *Opthalmol Clin N Am* 17: 53–67.
- Yuste R, T Bonhoeffer (2004) Genesis of dendritic spines: Insights from ultrastructural and imaging studies. *Nature Reviews Neuroscience* 5: 24–34.

Grunwald IC, M Korte, G Adelmann, A Plueck, K Kullander, R Adams, M Frotscher, T Bonhoeffer*, R Klein* (2004) Hippocampal plasticity requires postsynaptic ephrinBs. *Nature Neurosci.* 7: 33–40.

*equal contribution

Mrsic-Flögel T, M Hübener, T Bonhoeffer (2003) Brain mapping: new wave optical imaging. *Current Biology* 13: R778–R780.

Deller T, M Korte, S Chabanis, A Drakew, H Schwegler, G Good Stefani, A Zuniga, K Schwarz, T Bonhoeffer, R Zeller, M Frotscher, P Mundel (2003) Synaptopodin-deficient mice lack a spine apparatus and show deficits in synaptic plasticity. *Proc. Natl. Acad. Sci. USA* 100:10494–10499.

Kind PC, DE Mitchell, B Ahmed, C Blakemore, T Bonhoeffer, F Sengpiel (2002) Correlated binocular activity guides recovery from monocular deprivation. *Nature* 416: 430–433.

Schuett S, T Bonhoeffer, M Hübener (2002) Mapping retinotopic structure in mouse visual cortex with optical imaging. *J Neurosci* 22: 6549–6559.

Minichiello L, AM Calella, DL Medina, T Bonhoeffer, R Klein, M Korte (2002) Mechanism of TrkB-mediated hippocampal long-term potentiation. *Neuron* 36: 121–137.

Bonhoeffer T, R Yuste (2002) Spine motility: phenomenology, mechanisms and function. *Neuron* 35: 1019–1027.

Sengpiel F, T Bonhoeffer (2002) Orientation specificity of contrast adaptation in visual cortical pinwheel centres and iso-orientation domains. *Eur J Neurosci* 15: 876–886.

Kossel A, SB Cambridge, U Wagner, T Bonhoeffer (2001) A caged Ab reveals an immediate/instructive effect of BDNF during hippocampal synaptic potentiation. *Proc. Natl. Acad. Sci. USA* 98: 14702–14707.

Sengpiel F, TCB Freeman, T Bonhoeffer, C Blakemore (2001) On the relationship between interocular suppression in the primary visual cortex and binocular rivalry. *Brain and Mind* 2: 39–54.

Grunwald IC, M Korte, D Wolfer, GA Wilkinson, K Unsicker, HP Lipp, T Bonhoeffer, R Klein (2001) Kinase-independent requirement of EphB2 receptors in hippocampal synaptic plasticity. *Neuron* 32: 1027–1040.

Schwartz T, T Bonhoeffer (2001) In vivo optical mapping of epileptic foci and surround inhibition in ferret cerebral cortex. *Nature Medicine* 7

1063–1067.

- Yuste RY, T Bonhoeffer (2001) Morphological changes in dendritic spine associated with long-term synaptic plasticity. *Ann. Rev. Neurosci.* 24: 1071–1089.
- Schuett S, T Bonhoeffer, M Hübener (2001) Pairing-induced changes of orientation maps in cat visual cortex. *Neuron* 32: 325–337.
- Meister M, T Bonhoeffer (2001) Tuning and topography in an odor map on the rat olfactory bulb. *J. Neurosci.* 21: 1351–1360.
- Swindale NV, D Shoham, A Grinvald, T Bonhoeffer, M Hübener (2000) Visual cortex maps are optimized for uniform coverage. *Nature Neurosci.* 3: 822–826.
- Müller M, M. Stetter, M. Hübener, F. Sengpiel, T Bonhoeffer, I Gödecke, Chapman, S Löwel, K Obermayer (2000) An analysis of orientation and ocular dominance patterns in the visual cortex of cats and ferrets. *Neural Computation* 12: 2574–2595.
- Stetter M, I Schiebl, T Otto, F Sengpiel, M Hübener, T Bonhoeffer, K Obermayer (2000) Principal component analysis and blind separation of sources for optical imaging of intrinsic signals. *Neuroimage* 11: 482–490.
- Korte M, L Minichiello, R Klein, T Bonhoeffer (2000) Shc-binding site in the TrkB receptor is not required for hippocampal long-term potentiation. *Neuropharmacol.* 39:717–724.
- Hübener M, T Bonhoeffer (1999) Eyes wide shut. *Nature Neurosci.* 2: 1043–1045.
- Minichiello L, M Korte, D Wolfer, R Kühn, K Unsicker, V Cestari, C Rossi-Arnaud, H-P Lipp, T Bonhoeffer, R Klein (1999) Essential role for TrkB receptors in hippocampus-mediated learning. *Neuron* 24: 401–414.
- Sengpiel F, Stawinski P, Bonhoeffer T (1999). Influence of experience on orientation maps in cat visual cortex. *Nature Neurosci.* 2: 727–732
- Engert, F, T Bonhoeffer (1999) Dendritic spine changes associated with hippocampal long-term synaptic plasticity. *Nature* 399:66–70.
- Yousef T, T Bonhoeffer, D-S Kim, U T Eysel, E Tóth, Z F Kisvárday (1999) Orientation topography of layer 4 lateral networks revealed by optical imaging in cat visual cortex (area 18). *European J. Neurosci.* 11: 4291–4308.
- Chapman B, I Gödecke, T Bonhoeffer (1999) Development of orientation preference in the mammalian visual cortex. *J.*

Neurobiology 41: 18–24.

Guiquan, C, R Kolbeck, Y–A Barde, T Bonhoeffer, A Kossel (1999) Relative contribution of endogenous neurotrophins in hippocampal LTP. *J. Neurosci.* 19: 7983–7990.

Korte M, H Kang, T Bonhoeffer, E Schuman (1998) A role for BDNF in the late–phase of hippocampal long–term potentiation. *Neuropharmacol.* 37:553–559.

Sengpiel F, I Gödecke, P Stawinski, M Hübener, S Löwel, T Bonhoeffer (1998) Intrinsic and environmental factors in the development of functional maps in cat visual cortex. *Neuropharmacol.* 37:607–621

Chapman B, T Bonhoeffer (1998) Overrepresentation of horizontal and vertical orientation preferences in developing ferret area 17. *Proc. Natl. Acad. Sci. USA* 95:2609–2614.

Hübener M, D Shoham, A Grinvald, T Bonhoeffer (1997) Spatial relationships among three columnar systems in cat area 17. *J. Neurosci.* 17:9270–9284.

Schmidt, KE, D–S Kim, W Singer, T Bonhoeffer, S Löwel (1997) Functional specificity of long–range intrinsic and interhemispheric connections in the visual cortex of strabismic cats. *J. Neurosci.* 17:5480–5492.

Gödecke I, D–S Kim, T Bonhoeffer, W Singer (1997) Development of orientation preference maps in area 18 of kitten visual cortex. *European J. Neurosci.* 9:1754–1762.

Engert F, T Bonhoeffer (1997) Synapse specificity of long–term potentiation breaks down at short distances. *Nature* 388:279–284.

Maldonado PE, I Gödecke, CM Gray, T Bonhoeffer (1997) Orientation selectivity in pinwheel centers in cat striate cortex. *Science* 276:1551–1555.

Korte M, T Bonhoeffer (1997) Activity–dependent synaptic plasticity: a new face of action for neurotrophins. *Molecular Psychiatry* 2:197–199.

Griesbeck O, M Korte, C Gravel, T Bonhoeffer, H Thoenen (1997) Rapid gene transfer into cultured hippocampal neurons and acute hippocampal slices using adenoviral vectors. *Mol. Brain Res.* 44:171–177.

Shoham D, M Hübener, S Schulze, A Grinvald, T Bonhoeffer (1997) Spatio–temporal frequency domains and their relation to cytochrome oxidase staining in cat visual cortex. *Nature* 385:529–533.

- Korte M, O Griesbeck, C Gravel, P Carroll, V Staiger, H Thoenen, T Bonhoeffer (1996) Virus-mediated gene-transfer into hippocampal CA1-region restores LTP in BDNF-mutant mice. *Proc. Natl. Acad. Sci. USA* 93:12547-12552.
- Korte M, V Staiger, O Griesbeck, H Thoenen, T Bonhoeffer (1996) The involvement of brain-derived neurotrophic factor in hippocampal long-term potentiation revealed by gene targeting experiments. *J. Physiol. Paris*, 90:157-164.
- Chapman B, MP Stryker, and T Bonhoeffer (1996) Development of orientation preference maps in ferret primary visual cortex. *J. Neurosci.* 16:6443-6453.
- Engert F, GG Paulus, T Bonhoeffer (1996) A low cost UV-laser for flash photolysis of caged compounds. *J. Neurosci. Methods* 66:47-54.
- Bonhoeffer T (1996) Neurotrophins and activity-dependent development of the neocortex. *Curr. Opin. Neurobiol.* 6:119-126.
- Gödecke I, T Bonhoeffer (1996) Development of identical orientation maps for two eyes without common visual experience. *Nature* 379:251-254.
- Korte M, P Carroll, E Wolf, G Brem, H Thoenen, and T Bonhoeffer (1995) Hippocampal long-term potentiation is impaired in mice lacking brain-derived neurotrophic factor. *Proc. Natl. Acad. Sci. USA* 92:8856-8860.
- Bonhoeffer T, D-S Kim, D Malonek, D Shoham, and A Grinvald (1995) Optical imaging of the layout of functional domains in area 17 and across the area 17/18 border in cat visual cortex. *Europ. J. Neurosci* 7:1973-1988.
- Bonhoeffer T (1995) Optical imaging of intrinsic signals as a tool to visualize the functional architecture of adult and developing visual cortex. *Arzneimittel-Forschung/Drug Research* 45:351-356.
- Kisvárdy ZF, D-S Kim, UT Eysel, T Bonhoeffer (1994) Relationship between lateral inhibitory connections and the topography of orientation map in cat visual cortex. *Europ. J. Neurosci.* 6:1619-1632.
- Kim D-S, T Bonhoeffer (1994) Reverse occlusion leads to a precise restoration of orientation preference maps in visual cortex. *Nature* 370:370-372.
- Bonhoeffer T, A Grinvald (1993) The layout of iso-orientation domains in area 18 of cat visual cortex. Optical imaging reveals a pinwheel-like organization. *J. Neurosci.* 13:4157-4180.

**Book Chapters
(17)**

- Bonhoeffer T, A Grinvald (1991) Iso-orientation domains in cat visual cortex are arranged in pinwheel-like patterns. *Nature* 353:429–431
- Kossel A, T Bonhoeffer, J Bolz (1990) Non-hebbian synapses in rat visual cortex. *NeuroReport* 1:115–118.
- Bolz J, N Novak, M Götz, T Bonhoeffer (1990) Formation of target-specific neuronal projections in organotypic slice cultures from rat visual cortex. *Nature* 346:359–362.
- Caeser M, T Bonhoeffer, J Bolz (1989) Cellular organization and development of slice cultures from rat visual cortex. *Exp. Brain Res* 77:234–244.
- Bonhoeffer T, V Staiger, A Aertsen (1989) Synaptic plasticity in rat hippocampal slice cultures: Local 'Hebbian' conjunction of pre- and postsynaptic stimulation leads to distributed synaptic enhancement. *Proc. Natl. Acad. Sci. USA* 86:8113–8117.
- Bonhoeffer T, V Staiger (1988) Optical recording with single cell resolution from monolayered slice cultures of rat hippocampus. *Neurosci. Lett.* 92:259–264.
- Palm G, T Bonhoeffer (1984) Parallel processing for associative and neuronal networks. *Biol. Cybern.* 51:201–204.
- Bonhoeffer, T M Hübener (2005) A practical guide: Intrinsic optical imaging of functional map development in mammalian visual cortex. In *Imaging in Neuroscience and Development: A Laboratory Manual*, R. Yuste and A. Konnerth, Cold Spring Harbor Laboratory Press, Cold Spring Harbor.
- Hübener M, T Bonhoeffer (2002) Optical imaging of functional architecture in cat primary visual cortex. In *The cat primary visual cortex*, B.R. Payne and A. Peters, eds., pp. 131–165, Academic Press, San Diego.
- Bonhoeffer, T (1999) Intrinsic signal optical imaging as a tool to visualize the development of functional maps in the mammalian visual cortex. In *Imaging: A Laboratory Manual*, R. Yuste, F. Lanni and A. Konnerth, Cold Spring Harbor Laboratory Press, Cold Spring Harbor.
- Bonhoeffer T, CJ Shatz (1997) Neurotrophins and visual system plasticity. In *Mechanistic relationships between development and learning: Beyond metaphor*. Dahlem Konferenzen.
- Bonhoeffer T, A Grinvald (1996) Optical imaging based on intrinsic signals: The Methodology. In *Brain Mapping: The Methods*, A.W. Toga and J.C. Mazziotta, eds., pp. 57–97, Academic Press, San

Diego.

- Bonhoeffer T, D-S Kim (1995) Development of the functional architecture in cat visual cortex. In *Challenges and perspectives in neuroscience*, D. Ottoson et al., eds., pp. 117–138, Stockholm.
- Kisvárdy ZF, T Bonhoeffer, D-S Kim, UT Eysel (1995) Functional topography of horizontal neuronal networks in cat visual cortex (area 18). In *Brain Theory: Biological Basis and Computational Theory of Vision*, A. Aertsen and V. Braitenberg, eds, Springer.
- Bonhoeffer T, A Grinvald (1993) Optical imaging of the functional architecture in cat visual cortex: The layout of direction and orientation domains. In *Advances in experimental medicine and biology. Optical imaging of brain function and metabolism*, U. Dirnagl, A. Villringer and K. Einhüpl, eds., pp. 57–69, Plenum Press, New York and London.
- Edwards FA, P Andersen, A Artola, J Bockaert, T Bonhoeffer, GL Collingridge, MB Kennedy, RC Malenka, BL McNaughton, H Monyer, RA Nicoll, CF Stevens (1993) Group report: How adequate are current explanations of long-term potentiation/depression? In *Cellular and molecular mechanisms underlying higher neural functions*, A.I. Selverston and P. Ascher, eds, pp 223–246. Wiley and Son, Chichester.
- Bonhoeffer T, BH Gähwiler (1992) Electrophysiological and optical recordings in organotypic slice cultures. In *Slices of Life: State of the Art Recording and Imaging Techniques in Slice Preparations*, LC Katz, ed., Society for Neuroscience, Anaheim.
- Bonhoeffer T, A Grinvald (1992) Imaging the functional architecture of cat area 18 in vivo. In *Information processing in the cortex. Experiments and theory*, A Aertsen, V Braitenberg, eds., pp. 421–440, Springer, Berlin.
- Grinvald A, T Bonhoeffer, D Maloney, D Shoham, E Bartfeld, A Arieli, R Hildesheim, E Ratzlaff (1991) Optical imaging of architecture and function in the living brain. In *Memory: organization and locus of change*, LR Squire, NM Weinberger, G Lynch, JL McGaugh, eds., pp. 49–85, Oxford University Press, New York.
- Bonhoeffer T, A Kossel, J Bolz, and A Aertsen (1990) A modified Hebbian rule for synaptic enhancement in the hippocampus and the visual cortex. In *Cold Spring Harbor Symposia on Quantitative Biology. Vol. LV. The Brain*, JD Watson, ER Kandel TJ Sejnowski, CF Stevens, eds., pp. 137–145, Cold Spring Harbor Laboratory Press, Cold Spring Harbor.

Aertsen A, T Bonhoeffer, J Krüger (1989) Actividad coherente en poblaciones neuronales: analisis e interpretacion. In *Cerebro humano y tecnologia inteligente*, J Arana, ed., pp. 49–98, Fundacion instituto de ciencias del hombre, Madrid.

Bonhoeffer T, V Staiger, A Aertsen (1988) Optical recording from hippocampal slice cultures with single cell resolution. In *Optical Methods in Neurobiology*. Proceedings of the Technical Workshop I. 11th Annual meeting of the ENA (Lüscher HR, Rioult M eds), pp 117–125. Bern: ENA.

Aertsen A, T Bonhoeffer, J Krüger (1987) Coherent activity in neuronal populations: Analysis and interpretation. In *Physics of Cognitive Processes*, ER Caianiello, ed., pp. 1–34, World Scientific Publishing, Singapore.

Bonhoeffer T (1985) Nobel prize winners meet in Lindau: physics and its future. *Lufthansa's Germany* 4: 12–13.

Theses (3)

Bonhoeffer T (1994) *Organisation und Entwicklung corticaler Karten in sensorischen Arealen bei Säugern. Zelluläre und systemphysiologische Untersuchungen*. Habilitation Thesis, University of Darmstadt.

Bonhoeffer T (1988) *Synaptische Plastizität in Hippocampus-Slice-Kulturen. Untersuchungen mit Hilfe von spannungsempfindlichen Fluoreszenzfarbstoffen*, Thesis, University of Tübingen.

Bonhoeffer T (1984) Ein paralleles Prozessornetz zur Realisation eines assoziativen Speichers, Diplom-thesis, University of Tübingen.