

## Publications - Benedikt Grothe, Professor of Neurobiology

May 2019

Peer-reviewed publications: 110

Review articles, book chapters etc.: 30

Additional original publications from the Grothe-Lab (without BG as author): 74

### Peer-reviewed papers and reviews:

1. Rajaram E, Kaltenbach C, Fischl MJ, Mrowka L, Alexandrova O, **Grothe B**, Hennig MH, Kopp-Scheinflug C (2019) Slow excitation accelerates offset-response latencies generated via a post-inhibitory rebound mechanism. *eNeuro* (accepted May 3<sup>rd</sup> 2019)
2. Siveke I, Lingner A, Ammer JJ, Gleiss SA, **Grothe B**, Felmy F (2019) A Temporal Filter for Binaural Hearing is Dynamically Adjusted by Sound Pressure Level. *Front Neural Circuits* 13:8, doi: 10.3389/fncir.2019.00008
3. Bednárová V, **Grothe B**, Myoga MH (2018) Complex and spatially segregated auditory inputs of the mouse superior colliculus. *J Physiol* 596(21): 5281–5298, doi: 10.1113/JP276370<sup>1</sup>
4. Lingner A, Pecka M, Leibold C, **Grothe B** (2018) A novel concept for dynamic adjustment of auditory space. *Scientific Reports* 8:8335 DOI:10.1038/s41598-018-26690-0
5. **Grothe B** (2018) How the Barn Owl Computes Auditory Space. *Trends Neurosci* 41(3):115-117
6. Keplinger S, Beiderbeck B, Michalakis S, Biel M, **Grothe B**, Kunz L (2018) Optogenetic Control of Neural Circuits in the Mongolian Gerbil. *Front Cell Neurosci* 12,111 doi: 10.3389/fncel.2018.00111
7. Petrik D, Myoga MH, Grade S, Gerkau NJ, Pusch M, Rose CR\*, **Grothe B\***, Götz M\* (2018) Epithelial sodium Channel Regulates Adult Neural Stem Cell Proliferation in a Flow-Dependent Manner. *Cell Stem Cell* 22(6):865-878.e8.
8. Beiderbeck B, Myoga MH, Müller NIC, Friauf F\*, **Grothe B\***, Pecka M\* (2018) Precise inhibition in the auditory brainstem fine-tunes and facilitates action potential firing. *Nature Commun* 9:1771 (BD and MHM shared first, FF, GB and MP shared senior authors)
9. Siveke I, Ammer JJ, Gleiss SA, **Grothe B**, Leibold C, Felmy F (2018) Electrogenic N-methyl-D-aspartate receptor signaling enhances binaural responses in the adult brainstem. *Eur J Neurosci* 47:858-865 doi: 10.1111/ejn.13859
10. Brosel S, **Grothe B\***, Kunz L\* (2018) An auditory brainstem nucleus as a model system for neuronal metabolic demands. *Eur J Neurosci* 47:222-235 doi: 10.1111/ejn.13789
11. Porres C, **Grothe B**, Felmy F (2017) Breakdown of excitability by attenuated PRV-152 infection in auditory brainstem neurons of Mongolian gerbils. *Neuroscience* 367:1-9. doi: 10.1016/j.neuroscience.2017.10.020
12. Sinclair JL, Fischl MJ, Alexandrova O, **Grothe B**, Leibold C, Kopp-Scheinflug C (2017) Sound-evoked activity influences myelination of brainstem axons in the trapezoid body. *J Neurosci* 37(34):8239-8255. doi: 10.1523/JNEUROSCI.3728-16.2017
13. Stange-Marten A, Sinclair JL, Fischl MJ, Kopp-Scheinflug C, Pecka M, **Grothe B** (2017) Structural and functional adaptations for fast and precise inhibition: constant synaptic delays and accelerated action potential conductance velocity related to sound localization of low frequency sounds. *Proc Nat Acad Sci USA* 114(24): E4851–E4858 doi:10.1073/pnas.1702290114
14. Ueberfuhr MA, Braun A, Wiegrebe L, **Grothe B**, Drexl M (2017) Modulation of auditory percepts by transcutaneous electrical stimulation. *Hear Res* 350:235-243. doi: 10.1016/j.heares.2017.03.008
15. Biechl D, Tietje K, Ryu S, **Grothe B**, Gerlach G, Wullimann MF (2017) Identification of accessory olfactory system and medial amygdala in the zebrafish. *Nature Sci Rep* 7:44295. DOI: 10.1038/srep44295
16. Fischl JM, Burger RM, Schmidt-Pauly M, Alexandrova O, Sinclair JL, **Grothe B**, Forsythe ID, Kopp-Scheinflug C (2016) Physiology and Anatomy of Neurons in the Medial Superior Olive (MSO) of the Mouse. *J Neurophysiol* 116(6):2676-2688 DOI: 10.1152/jn.00523.2016

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<sup>1</sup>"Editor's Choice" and journal cover picture

\* shared senior/corresponding authorship

17. Lingner A, **Grothe B**, Wiegrebe L, Ewert SD (2016) Binaural Glimpses at the Cocktail Party? *J Assoc Res Otolaryngol* 17(5):461-73 DOI: 10.1007/s10162-016-0575-7
18. Biechl D, Dorigo A, Koester RW, **Grothe B**, Wullimann MF (2016) Sonic hedgehog expressing eurydendroid cells and PH3 positive proliferative subpial cells in the larval zebrafish cerebellum support existence of an external granular layer in teleosts. *Front Neuroanat* 10:49 doi: 10.3389/fnana.2016.00049
19. Ford MC, Alexandrova O, Cossell L, Stange-Marten A, Sinclair J, Kopp-Scheinflug C, Pecka M, Attwell D, **Grothe B** (2015) Tuning of Ranvier node and internode properties in myelinated axons to adjust action potential timing. *Nature Commun* 25,6:8073 doi: 10.1038/ncomms9073
20. Kulesza RJ, **Grothe B** (2015) Yes, there is a Medial Nucleus of the Trapezoid Body in Humans. *Front Neuroanat* 9:35. doi: 10.3389/fnana.2015.00035
21. Leibold C, **Grothe B** (2015) Sound localization with microsecond precision in mammals: what is it we do not understand? *E-Neuroforum* March 2015
22. Danek AH, Öllinger M, Fraps T, **Grothe B**, Flanagan VL (2015) An fMRI investigation of expectation violation in magic tricks. *Front Psychology* 4,6:84 doi: 10.3389/fpsyg.2015.00084
23. Radtke-Schuller S, Seeler S, **Grothe B** (2015) Restricted loss of olivocochlear but not vestibular efferent neurons in the senescent gerbil (*Meriones unguiculatus*). *Front Aging Neurosci* 7:4, doi: 10.3389/fnagi.2015.00004
24. Danek AH, Fraps T, von Müller A, **Grothe B**, Öllinger M (2014) It's a kind of magic – what self-reports can reveal about the phenomenology of insight problem solving. *Front Psychol* 6:84 doi: 10.3389/fpsyg.2014.01408
25. Kugler K, Wiegrebe L, **Grothe B**, Kössl M, Gürkov R, Krause E, Drexler M (2014) Low-frequency sound affects active micromechanics in the human inner ear. *R Soc Open Sci* 1:140166
26. **Grothe B**, Pecka M (2014), The natural history of sound localization in mammals – a story of neuronal inhibition. *Front Neural Circuits* 8:116 doi: 10.3389/fncir.2014.00116
27. Yassin L, Radtke-Schuller S, Asraf H, **Grothe B**, Hershinkel M, Forsythe ID, Kopp-Scheinflug C (2014): Nitric oxide signalling modulates synaptic inhibition in the superiorparaolivary nucleus (SPN) via cGMP-dependent suppression of KCC2. *Front Neural Circuits* 8:65 doi: 10.3389/fncir.2014.00065
28. Yuan C-W, Khouri L, **Grothe B**, Leibold C (2014) Neuronal Adaptation Translates Stimulus Gaps Into A Population Code. *PLoS ONE* 9(4): e95705.
29. Myoga MH, Lehnert S, Leibold C, Felmy F, **Grothe B** (2014) Glycinergic Inhibition Controls Coincidence Detection in the Auditory Brainstem. *Nature Commun* 5:3790 DOI: 10.1038/ncomms4790
30. Lehnert S, Ford MC, Alexandrova O, Hellmundt F, Felmy F, **Grothe B**, Leibold C (2014) Action Potential Generation in an Anatomically Constrained Model of Medial Superior Olive Axons. *J Neurosci* 34(15):5370–5384
31. Thurley K, Henke J, Hermann J, Ludwig B, Tatarau C, Wätzig A, Herz AVM, **Grothe B**, Leibold C (2014) Mongolian gerbils learn to navigate in complex virtual spaces. *Behav Brain Res* 266:161-168
32. Dietz M, Marquardt T, Stange A, Pecka M, **Grothe B**, McAlpine D (2014) Emphasis of spatial cues 1 in the temporal fine-structure during the rising segments of amplitude modulated sounds II: Single neuron recordings. *J Neurophysiol* 111:1973-1985, DOI: 10.1152/jn.00681.2013
33. Danek AH, Fraps T, von Müller A, **Grothe B**, Öllinger M (2013) Working Wonders? Investigating Insight with Magic Tricks. *Cognition* 130(2):174-185, doi:10.1016/j.cognition.2013.11.003
34. Stange A, Myoga MH, Lingner A, Ford MC, Alexandrova O, Felmy F, Pecka M, Siveke I, **Grothe B** (2013) Adaptation in sound localization: from GABAB receptor-mediated synaptic modulation to perception. *Nature Neurosci* 16:1840-1847, DOI:10.1038/NN.3548
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36. Trattner B, Gravot CM, **Grothe B**, Kunz L (2013) Metabolic Maturation of Auditory Neurones in the Superior Olivary Complex. *PLoS ONE* 8(6):e67351
37. Lingner A, Kugler K, **Grothe B**, Wiegrebe L (2013) Amplitude-modulation detection of Gerbils in reverberant sound fields. *Hear Res* 302:207-112
38. Danek AH, Fraps T, von Müller A, **Grothe B**, Öllinger M (2012) Aha! experiences leave a mark: Facilitated recall of insight solutions. *Psychol Res* 77:659–669
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40. Lingner A, Wiegrebe L, **Grothe B** (2012) Sound localization in noise by gerbils and humans. *J Assoc Res Otolaryngol* 13:237-248
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43. Siveke I, Leibold C, Schiller E, **Grothe B** (2012) Adaptation of binaural processing in the adult brainstem induced by ambient noise. *J Neurosci* 32:462-473
44. Walcher J, Hassfurth B, **Grothe B**, Koch U (2011) Comparative post-hearing development of inhibitory inputs to the lateral superior olive in gerbils and mice. *J Neurophysiol* 106:1443-1453
45. Khouri L, Lesica NA, **Grothe B** (2011) Impaired Auditory Temporal Selectivity in the Inferior Colliculus of Aged Mongolian Gerbils. *J Neurosci* 31:9958-9970
46. Wullimann MF, Mueller T, Distel M, Babaryka A, **Grothe B**, Köster RW (2011) The long adventurous journey of rhombic lip cells in jawed vertebrates: a comparative developmental analysis. *Front Neuroanat* DOI: 10.3389/fnana.2011.00027
47. **Grothe B**, Koch U (2011) Dynamics of binaural processing in the mammalian sound localization pathway - the role of GABA<sub>B</sub> receptors. *Hear Res* 279:43-50
48. Kaiser A, Alexandrova O, **Grothe B** (2011) Urocortin-expressing olivocochlear neurons exhibit tonotopic and developmental changes in the auditory brainstem and in the innervation of the cochlea. *J Comp Neurol* 519:2758-78
49. Lüling H., Siveke I, **Grothe B**, Leibold C (2011) Frequency-Invariant Representation of Interaural Time Differences in Mammals. *PLoS Comp Biol* 10.1371/journal.pcbi.1002013
50. Porres C, Meyer E, **Grothe B**, Felmy F (2011) NMDA currents modulate the synaptic input-output functions of neurons in the dorsal nucleus of the lateral lemniscus in Mongolian gerbils. *J Neurosci* 31: 4511– 4523
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53. Lesica NA, Lingner A, **Grothe B** (2010) Population coding of interaural time differences in gerbils and barn owls. *J Neurosci* 30: 11696-11702
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56. Schebesch G, Lingner A, Firzlaff U, Wiegrebe L, **Grothe B** (2010) Perception and neural representation of size-variant human vowels in the Mongolian gerbil (*Meriones unguiculatus*). *Hear Res* 261: 1-8
57. Pecka M, Siveke I, **Grothe B**, Lesica NA (2010) Enhancement of ITD coding within the initial stages of the auditory pathway. *J Neurophysiol* 102: 38-46
58. Hassfurth B, Magnusson AK, **Grothe B**, Koch U (2009) Sensory deprivation regulates the development of the hyperpolarization-activated current in auditory brainstem neurons. *Eur J Neurosci* 30: 1227-1238
59. Rautenberg PL, **Grothe B**, Felmy F (2009) Quantification of the three dimensional morphology of coincidence detector neurons in the medial superior olive of gerbils during late postnatal development. *J Comp Neurol* 517: 385-396
60. Meffin H., **Grothe B** (2009) Selective Filtering by Spurious Localization Cues in the Mammalian Auditory Brainstem. *J Acoust Soc Am* 126: 2437-2454
61. Ford MC, **Grothe B**, Klug A (2009) Fenestration of the calyx of Held during development occurs sequentially along the tonotopic axis and is influenced by afferent activity. *J Comp Neurol* 514: 92-106
62. Hermann J, **Grothe B**, Klug A (2009) Modeling short-term synaptic plasticity at the calyx of Held using in vivo like stimulation patterns. *J Neurophysiol* 101: 20-30
63. Park TJ, Brand A, Koch U, Ikebuchi M, **Grothe B** (2008) Dynamic changes in level influence spatial coding in the lateral superior olive. *Hear Res* 238:58-67, DOI:10.1016/j.heares.2007.10.009

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65. Krebs B, Lesica NA, **Grothe B** (2008) The representation of amplitude modulations in the mammalian auditory midbrain. *J Neurophysiol* 100:1602-1609
66. Magnusson AK, Park TJ, Pecka M, **Grothe B\***, Koch U (2008) Retrograde GABA signaling adjusts sound localization by balancing excitation and inhibition in the brainstem. *Neuron* 59:125–137<sup>2,3</sup>
67. Pecka M, Brand A, Behrend O, **Grothe B** (2008) Interaural time difference processing in the mammalian medial superior olive: the role of glycinergic inhibition. *J Neurosci* 28: 6914-6925
68. Lesica NA, **Grothe B** (2008) Dynamic spectrotemporal feature selectivity in the auditory midbrain. *J Neurosci* 28: 5412-5421
69. Lesica NA, Grothe B (2008) Efficient temporal processing of naturalistic sounds. *PLoS ONE*. 3 (2):e1655
70. Siveke I, Ewert SD, **Grothe B**, Wiegrebe L (2008) Psychophysical and physiological evidence for fast binaural processing. *J Neurosci* 28: 2043-2052
71. Maier JK, Kinderman T, **Grothe B**, Klump G (2008) Effects of omni-directional noise exposure during hearing onset and age on auditory spatial resolution in the Mongolian gerbil (*Meriones unguiculatus*) - a behavioral approach. *Brain Res* 1220: 47-57
72. Siveke I, Leibold C, **Grothe B** (2007) Spectral Composition of Concurrent Noise Affects Neuronal Sensitivity to Interaural Time Differences of Tones in the Dorsal Nucleus of the Lateral Lemniscus. *J Neurophysiol* 98: 2705-2715
73. Berninger B, Costa MR, Koch U, Schroeder T, Sutor B, **Grothe B**, Götz M (2007) Functional properties of neurons derived from in-vitro reprogrammed postnatal astroglia. *J Neurosci* 27: 8654-8664
74. Hermann J, Pecka M, Gersdorff H von, **Grothe B**, Klug A (2007) Synaptic transmission at the calyx of Held under in vivo like activity levels. *J Neurophysiol* 98: 807-820
75. Pecka M, Zahn TP, Saunier-Rebori B, Siveke I, Felmy F, Wiegrebe L, Klug A, Pollak GD, **Grothe B** (2007) Inhibiting the inhibition: a neuronal network for sound localization in reverberant environments. *J Neurosci* 27: 1782-1790
76. Siveke I, Pecka M, Seidl AH, Baudoux S, **Grothe B** (2006) Binaural Response Properties of Low Frequency Neurons in the Gerbil Dorsal Nucleus of the Lateral Lemniscus. *J Neurophysiol* 96: 1425-1440
77. Magnusson AK, Kapfer C, **Grothe B**, Koch U (2005) Maturation of Glycinergic Inhibition in the Gerbil Medial Superior Olive after Hearing Onset. *J Physiol* 568: 497-512
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81. Koch U, **Grothe B** (2003) Hyperpolarization-activated current (I<sub>h</sub>) in the inferior colliculus: distribution and contribution to temporal processing. *J Neurophysiol* 90: 3679-3687
82. Grothe B (2003) New roles for synaptic inhibition in sound localization. *Nature Rev Neurosci* 4: 540-550
83. McAlpine D, **Grothe B** (2003) Sound Localisation and Delay Lines - Do Mammals fit the Model? *TINS* 26: 347-350
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86. Behrend O, Brand A, Kapfer C, **Grothe B** (2002) Auditory response properties in the superior paraolivary nucleus of the gerbil. *J Neurophysiol* 87: 2915-2928

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\* UK and BG share senior authorship

<sup>2</sup> Preview by Xu-Friedman MA and Regehr WG (2008) Retrograde Tuning of Tuning. *Neuron* 59: 3-8

<sup>3</sup> "Research Highlight", *Nature* 454: 371, 2008

<sup>4</sup> -"news and views" by Pollak GD (2002) Model hearing. *Nature* 417: 543

<sup>5</sup> commented on in by Jones R (2002) *Nature Rev Neurosci* 3: 492-493

<sup>6</sup> cover-story by Fitzgerald R (2002) *Physics Today* 55: 13-16

<sup>7</sup> -"news and views" by Sanes DH (2002) Right place at the right time. *Nature Neurosci* 5: 187-188

87. **Grothe B**, Covey E, Casseday JH (2001) Medial superior olive in the big brown bat: neuronal response to pure tones, amplitude modulations, and pulse trains. *J Neurophysiol* 86: 2219-2230
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89. **Grothe B**, Neuweiler G (2000) The function of the medial superior olive in small mammals: temporal receptive fields in auditory analysis. *J Comp Physiol A* 186: 413-423
90. Koch U, **Grothe B** (2000) Interdependence of spatial and temporal coding in the auditory midbrain. *J Neurophysiol* 83: 2300-2314
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93. **Grothe B**, Klump GM (2000) Temporal processing in sensory systems. *Curr Opin Neurobiol* 10: 467-473
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98. Casseday JH, Covey E, **Grothe B** (1997) Neural selectivity and tuning for sinusoidal frequency modulations in the inferior colliculus of the big brown bat, *Eptesicus fuscus*. *J Neurophysiol* 77: 1595-1605
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100. Koch U, **Grothe B** (1997) Azimuthal position affects analysis of complex sounds in the mammalian auditory system. *Naturwissenschaften* 84: 160-162
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110. Vater M, Habbicht H, Kössl M, **Grothe B** (1992) The functional role of GABA and glycine in monaural and binaural processing in the inferior colliculus of horseshoe bats. *J Comp Physiol A* 171: 541-553

## Book Chapters and other Publications:

1. Pecka M, Leibold C, **Grothe B**: Biological aspects of perceptual-space formation. In: *Blauert J, The Technology of Binaural Listening*. Springer
2. **Grothe B**, Leibold, C, Pecka M: The Medial Superior Olivary Nucleus: Meeting the Need for Speed. *Kandler K (Ed.). The Oxford Handbook of the Auditory Brainstem*. Oxford Univ Press. DOI: 10.1093/oxfordhb/9780190849061.013.9
3. **Grothe B** (2018) How the Barn Owl Computes Auditory Space. *Trends Neurosci* 41(3):115-117
4. Wullimann MF, **Grothe B**, Straka H, Behrend O, Ten Donkelaar HJ (2017) Vertebrate Sensory Systems and Brains: From Genes to Behavior. *Brain Behav Evol* 90(2):97. doi: 10.1159/000477652
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6. Wullimann MF, **Grothe B** (2013) The Central Nervous Organization of the Lateral Line System. In: *Coombs S, Bleckmann H, Fay RR, Popper AN (eds): The Lateral Line System. Springer Handbook of Auditory Research*. Springer, New York, ISBN 978-1-4614-8850-7, pp. 195-251, DOI 10.1007/978-1-4614-8851-4
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8. **Grothe B** (2012) Why systemic neurosciences? *Public Service Review: European Science and Technology*
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10. Borst A, **Grothe B** (2011) Die Welt entsteht im Kopf - Das Gehirn und sein Sinne. In: *Bonhoeffer T, Gruss P (eds) Zukunft Gehirn*. Verlag C.H.Beck oHG, München, ISBN-978-3-406-61642 6, pp. 37-58
11. Siemers BM, Wiegrebe L, **Grothe B** (2011) Editorial: Ecology and neuroethology of bat echolocation: a tribute to Gerhard Neuweiler. *J Comp Physiol A* 197:399-402
12. Klug A, **Grothe B** (2010) Ethological stimuli. In: *Rees A, Palmer AR (eds) Oxford Handbook of Auditory Science: The Auditory Brain*. Oxford University Press, ISBN 978-0-19-923328-1, pp. 171-190
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14. **Grothe B** (2009) Nimmt uns die Neurobiologie den freien Willen? Eine kritische Betrachtung der Aussagekraft moderner neurowissenschaftlicher Methoden. In *Vossenkuhl W et al. (eds) Ecce Homo! Menschenbild - Menschenbilder*. Kohlhammer, Stuttgart, ISBN 978-3-17-020368-6, pp. 238-255
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### Original Publications from the Grothe-Group

(it is policy of the Lehrstuhl Neurobiology (Grothe) that advanced postdocs can publish without the group leader if he did not contribute directly to the manuscript, this explicitly includes papers that have been funded partially by grants from B. Grothe, relevant PI from the Grothe lab indicated by italics):

1. Baier AL; Stelzer KJ; Wiegrebe L (2018) Flutter sensitivity in FM bats. Part II: amplitude modulation. *J Comp Physiol A* 204:941-951
2. Baier AL; Wiegrebe L (2018) Flutter sensitivity in FM bats. Part I: delay modulation. *J Comp Physiol* 204:929-939
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5. Fischer L, Leibold C, Felmy F (2018) Resonance Properties of Auditory Brainstem Neurons. *Front Cell Neurosci* 12:8. doi: 10.3389/fncel.2018.00008
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