

**Jörn Simon Wiegert, Ph. D.****Curriculum Vitae**

**Name:** Jörn Simon Wiegert  
**Date of birth:** 18.08.1979  
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**ACADEMIC POSITIONS**

**from 10/2022** **Chair of Neurophysiology (W3)** at the Medical Faculty Mannheim of the University Heidelberg (offers for W3 at KIT Karlsruhe and TU Kaiserslautern declined)

**09/2018-09/2022** **Professor (W2) for Neurophysiology and Optogenetics** at the University Medical Center Hamburg Eppendorf, ZMNH Hamburg, Germany  
 RG Synaptic Wiring and Information Processing

**04/2017-08/2018** **Independent group leader** at the ZMNH Hamburg, Germany  
 RG Synaptic Wiring and Information Processing

**03/2012-03/2017** **Senior postdoctoral fellow** at the ZMNH Hamburg, Germany  
 Institute for Synaptic Physiology, laboratory of Prof. Thomas Oertner

**09/2009-02/2012** **Marie-Curie postdoctoral fellow** at the Friedrich-Miescher Institute Basel, Switzerland  
 Department of Neurobiology, laboratory of Dr. Thomas Oertner

**04/2009-08/2009** **Postdoctoral fellow** at the University Heidelberg, Germany  
 Interdisciplinary Center for Neurosciences, laboratory of Prof. Hilmar Bading

**EDUCATION**

**11/2005-03/2009** **PhD thesis** at the University of Heidelberg, Germany  
 Interdisciplinary Center for Neurosciences, laboratory of Prof. Hilmar Bading  
 Grade: 1.0 (magna cum laude)

**08/2003-02/2004** **Internship** at the Monash University, Melbourne, Australia  
 Monash Institute for Medical Research, laboratory of Prof. Ban-Hock Toh

**2001-2005** **Research assistant** at MPI for Medical Research, Heidelberg, Germany, laboratory of Prof. Bert Sakmann

**10/2000-11/2005** **Diploma in Biology** at the University of Heidelberg, Germany  
 Grade: 1.0 (with distinction)

## GRANTS / FELLOWSHIPS / AWARDS

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- 2022** Hamburg Innovations, Calls for Transfer „Glasfaserbasiertes Auslesen und Steuerung der Aktivität erregbarer Organsysteme“ (No. C4T734)
- 2019** DFG grant: “Dopaminergic control of dorsal hippocampal networks during behavior” (part of SFB 936)
- 2019** DFG grant: “Optogenetic silencing tools for precise, all-optical analysis of synaptic circuits” (No. WI 4485/3-2, part of SPP1926)
- 2018** DFG grant: “Synaptic plasticity and stability in the context of hippocampal information processing” (No. WI 4485/2-2, part of research unit FOR2419)
- 2017** ERC starting grant: “LIFE synapses” (No. 714762)
- 2016** DFG grant: “Development of next-generation light-gated inhibitory ion channels to probe somatosensory integration in the Drosophila nociceptive circuit in vivo” (No. WI 4485/3-1, part of SPP1926)
- 2015 - 2018** DFG grant: “Dynamic rewiring of hippocampal circuits following synaptic plasticity” (No. WI 4485/2-1, part of research unit FOR2419)
- 2013, 2014** 2x ‘Paper of the month’ selected by the University Medical Center Hamburg-Eppendorf
- 2010 - 2012** Marie-Curie Postdoctoral Fellowship (within EU/FP7 framework)
- 2008 - 2014** Travel grants awarded by the German Academic Exchange Service (DAAD), German Neuroscience Society (NWG) & “Deutsche Forschungsgemeinschaft” (DFG)
- 2005** Diploma in Biology with distinction

## TRAINING & ADDITIONAL QUALIFICATIONS

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- 11/2018** EMBO leadership course
- 03/2018** Biological safety training for group leaders
- 04/2017** Didactic training for high school teachers organized by the vice deanery for student affairs of the University Medical Center Hamburg-Eppendorf
- 03/2007** FELASA B course

## OTHER ACTIVITIES

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- 2021** Co-director of the CAJAL Advanced Neuroscience Training Programme “Optogenetics, chemogenetics and biosensors for cellular and circuit neuroscience” in Bordeaux, France
- since 2019** Editor for Scientific Reports
- since 2018** Reviewing activities for Nature Communications, PNAS, Cell Reports, eNeuro, PloS, Scientific Reports
- March 2019** Organization of Symposium at the bi-annual meeting of the German Neuroscience Society

## PUBLICATIONS

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### Peer reviewed original research articles:

- 1) Duerst, C., **Wiegert, J.S.**, Schulze, C., Helassa, N., Török, K., Oertner, T.G. (2020). The vesicular release probability sets the strength of individual Schaffer collateral synapses. In press at **Nat Commun**. Preprint: <https://doi.org/10.1101/2020.08.02.232850>
- 2) Stuedemann, T., Roessinger, J., Manthey, C., Geertz, B., Srikantharajah, R., von Bibra, C.C., Shibamiya, A., Koehne, M., Wiehler, A., **Wiegert, J.S.**, Eschenhagen, T., Weinberger, F. (2021). Contractile force of transplanted cardiomyocytes contributes to heart function after injury. **Circulation**.
- 3) Rodriguez-Rozada, S., Wietek, J., Tenedini, F. M., Sauter, K., Hegemann, P., Soba, P., & **Wiegert, J.S.** (2022). Aion is a bistable anion-conducting channelrhodopsin that provides temporally extended and reversible neuronal silencing. **Commun Biol**, 5, Article number: 687 (2022).
- 4) Wagdi, A., Malan, D., Sathyanarayanan, U., Beauchamp, J., Vogt, M., Zipf, D., Beiert, T., Mansuroglu, B., Dusend, V., Meininghaus, M., Schneider, L., Kalthof, B., **Wiegert, J.S.**, König, G.M., Kostenis, E., Patejdl, R., Sasse, P. Selective optogenetic control of Gq signaling using human Neuropsin (hOPN5). In revision at **Nat Commun** 13, 1765
- 5) Formozov, A., Chini, M., Dieter, A., Yang, W., Pöppel, J., Hanganu-Opatz, I.L., **Wiegert, J.S.** Calcium imaging and electrophysiology of hippocampal activity under anesthesia and natural sleep in mice. **Scientific Data** 9
- 6) Anisimova M., van Bommel B., **Wiegert J.S.**, Mikhaylova M., Oertner T.G., Gee C.E. Spike-timing-dependent plasticity rewards synchrony rather than causality. **Cerebral Cortex**
- 7) Pulin, M., Stockhausen, K.E., Masseck, O.A., Kubitschke, M., Busse, B., **Wiegert, J.S.**, and Oertner, T.G. (2022). Improved two-photon imaging of GPCR-based optogenetic neurotransmitter sensors using orthogonally polarized excitation. **Biomed Opt Express** 13(2): 777-790.
- 8) Imambocus, B.N., Zhou, F., Formozov, A., Wittich, A., Tenedini, F.M., Hu, C., Sauter, K., Varela, E.M., Herédia, F., Casimiro, A.P., Schlegel, P., Yang, C.H., Miguel-Aliaga, I., **Wiegert, J.S.**, Pankratz, M.J., Gontijo, A.M., Cardona, A., Soba, P. (2022) Discrete escape responses are generated by neuropeptide-mediated circuit logic. **Curr Biol** 32 (1), 149-163.e8
- 9) \*Vierock, J., \*Rodriguez-Rozada, S., Dieter, A., Pieper, F., Sims, R., Tenedini, F., Bergs, A.C.F., Bendifallah, I., Zhou, F., Zeitzschel, N., Ahlbeck, J., Augustin S., Sauter, K., Papagiakoumou, E., Gottschalk, A., Soba, P., Emiliani, V., Engel, A.K., Hegemann, P., **Wiegert, J.S.** (2021). BiPOLES is an optogenetic tool developed for bidirectional dual-color control of neurons. **Nat Commun**, 12, 4527. DOI: 10.1038/s41467-021-24759-5. \* equal contributions
- 10) \*Yang, W., \*Chini, M., Poeppel, J.A., Formozov, A., Piechocinski, P., Rais, C., Morellini, F., Sporns, O., Hanganu-Opatz, I.L., **Wiegert, J.S.** (2021). Anesthetics fragment hippocampal network activity, alter spine dynamics, and affect memory consolidation. **PLOS Biol** 19(4): e3001146. DOI: 10.1371/journal.pbio.3001146, \* equal contributions
- 11) \*Mahn, M., \*Saraf-Sinik, I., \*Patil, P., \*Pulin, M., Bitton, E., Karalis, N., Bruentgens, F., Palgi, S., Gat, A., Dine, J., Wietek, J., Davidi, I., Levy, R., Litvin, A., Zhou, F., Sauter, K., Soba, P., Schmitz, D., Lüthi, A., Rost, B.R., **Wiegert, J.S.**, Yizhar, O. (2021). Optogenetic

- silencing of neurotransmitter release with a naturally occurring invertebrate rhodopsin. **Neuron** 109 (10). DOI: 10.1016/j.neuron.2021.03.013 \* equal contributions
- 12) Westermann, L. M., Fleischhauer, L., Vogel, J., Jenei-Lanzl, Z., Floriano Ludwig, N., Schau, L., Morellini, F., Baranowsky, A., Yorgan, T. A., Di Lorenzo, G., Schweizer, M., de Souza Pinheiro, B., Guarany, N. R., Sperb-Ludwig, F., Visioli, F., Oliveira Silva, T., Soul, J., Hendrickx, G., **Wiegert, J. S.**, Schwartz, I. V. D., Clausen-Schaumann, H., Zaucke, F., Schinke, T., Pohl, S. and Danyukova, T., (2020). Imbalanced cellular metabolism compromises cartilage homeostasis and joint function in a mouse model of mucopolidosis type III gamma. **Dis Model Mech**, DOI: 10.1242/dmm.04642
  - 13) Perez-Alvarez, A., Fearey, B., Schulze, C., O'Toole, R.J., Moeyaert, B., Mohr, M.A., Arganda-Carreras, I., Yang, W., **Wiegert, J.S.**, Schreiter, E.R., Gee, C.E., Hoppa, M.B., Oertner, T.G., (2020). Freeze-frame imaging of synaptic activity using SynTagMA. **Nat Commun**, 11(1): 2464, DOI: 10.1038/s41467-020-16315-4
  - 14) Oppermann, J., Fischer, P., Silapetere, A., Liepe, B., Rodriguez-Rozada, S., Flores-Urbe, J., Peter, E., Keidel, A., Vierock, J., Kaufmann, J., Broser, M., Luck, M., Bartl, F., Hildebrandt, P., **Wiegert, J. S.**, Béjà, O., Hegemann, P., and Wietek, J., (2019). MerMAIDs: A novel family of metagenomically discovered, marine, anion-conducting and intensely desensitizing Channelrhodopsins. **Nat Commun** 10(1):3315, DOI: 10.1038/s41467-019-11322-6
  - 15) Binder, S., Molle, M., Lippert, M., Bruder, R., Aksamaz, S., Ohl, F., **Wiegert, J.S.**, and Marshall, L. (2019). Monosynaptic hippocampal-prefrontal projections contribute to spatial memory consolidation in mice. **J Neurosci** DOI:10.1523/JNEUROSCI.2158-18.2019
  - 16) Dürst, C., **Wiegert, J.S.**, Helassa, N. Kerruth, S., Coates, C., Schulze, C., Geeves, M., Török, K., Oertner, T. G. (2019). High-speed imaging of glutamate release with genetically encoded sensors. **Nat Prot** 14(5):1401-1424 DOI:10.1038/s41596-019-0143-9
  - 17) **Wiegert, J.S.**, Pulin, M., Gee, C.E., Oertner, T. G. (2018). The fate of hippocampal synapses depends on the sequence of plasticity-inducing events. **eLife** e39151 DOI: 10.7554/eLife.39151
  - 18) Oda, K., Vierock, J., Oishi, S., Rodriguez-Rozada, S., Taniguchi, R., Yamashita, K., **Wiegert, J.S.**, Nishizawa, T., Hegemann, P., Nureki, O. (2018). Crystal structure of the red light-activated channelrhodopsin Chrimson. **Nat Commun** 9(1):3949 DOI: 10.1038/s41467-018-06421-9
  - 19) Helassa, N., Dürst, C.D., Coates, C., Arif, U., Schulze, C., **Wiegert, J.S.**, Geeves, M., Oertner, T.G., Török, K. (2018). Ultrafast glutamate sensors resolve high-frequency release at Schaffer collateral synapses, **Proc Natl Acad Sci USA** 115(21), 5594-5599 DOI: 10.1073/pnas.1720648115
  - 20) Wietek, J., Rodriguez-Rozada, S., Tutas, J., Tenedini, F., Grimm, C., Oertner, T.G., Soba, P., Hegemann, P., **Wiegert, J.S.** (2017). Anion-conducting channelrhodopsins with tuned spectra and modified kinetics engineered for optogenetic manipulation of behavior. **Sci Rep** 7:14957 DOI: 10.1038/s41598-017-14330-y
  - 21) Bitzenhofer, S.H., Ahlbeck, J., Wolff, A. **Wiegert, J.S.**, Gee, C.E., Oertner, T.G., Hanganu-Opatz, I.L. (2017). Layer-specific optogenetic activation of pyramidal neurons causes beta-gamma entrainment of neonatal networks. **Nat Commun** 8:14563 DOI: 10.1038/ncomms14563
  - 22) Wietek, J., Beltramo, R., Scanziani, M., Hegemann, P., Oertner, T.G., **Wiegert, J.S.** (2015). An improved chloride-conducting channelrhodopsin for light-induced inhibition of neuronal activity in vivo. **Sci Rep** 5:14807 DOI: 10.1038/srep14807

- 23) Blumer, C., Vivien, C., Genoud, C., Perez-Alvarez, A., **Wiegert, J.S.**, Vetter, T., Oertner, T.G. (2015). Automated analysis of spine dynamics on live CA1 pyramidal cells. **Med Image Anal** 19(1), 87-97 DOI: 10.1016/j.media.2014.09.004
- 24) Wietek, J.\*, **Wiegert, J.S.\***, Adeishvili, N., Schneider, F., Watanabe, H., Tsunoda, S., Vogt, A., Elstner, M., Oertner, T.G., Hegemann, P. (2014). Conversion of Channelrhodopsin into a light-gated chloride channel. **Science** 344 (6182): 409-412, **\*first 2 authors equally contributing** DOI: 10.1126/science.1249375, *Highlighted in Science, Science Signaling & Nature Methods*
- 25) Biermann, B., Sokoll, S., Klyueva, J., Missler, M., **Wiegert, J.S.**, Sibarita, J.-B., Heine, M. (2014). Imaging of molecular surface dynamic in brain slices using single particle tracking. **Nat Commun** 5:3024 DOI: 10.1038/ncomms4024
- 26) **Wiegert, J.S.** and Oertner, T. G. (2013). Long-term depression selectively eliminates weakly integrated synapses. **Proc Natl Acad Sci USA** 110(47), E4510-E4519. DOI: 10.1073/pnas.1315926110
- 27) Huber, D., Gutnisky, D.A., Peron, S., O'Connor, D.H., **Wiegert, J.S.**, Tian, L., Oertner, T.G., Looger, L.L., and Svoboda, K. (2012). Multiple dynamic representations in the motor cortex during sensorimotor learning. **Nature** 484, 473-478. DOI: 10.1038/nature11039
- 28) Holbro, N., Grunditz, A., **Wiegert, J.S.**, and Oertner, T.G. (2010). AMPA receptors gate spine Ca<sup>2+</sup> transients and spike-timing-dependent potentiation. **Proc Natl Acad Sci USA** 107(36), 15975-15980. DOI: 10.1073/pnas.1004562107
- 29) Wittmann, M. \*, Queisser, G. \*, Eder, A. \*, **Wiegert, J.S. \***, Bengtson, C.P. \*, Hellwig, A. \*, Wittum, G., and Bading, H. (2009). Synaptic activity induces dramatic changes in the geometry of the cell nucleus: interplay between nuclear structure, histone H3 phosphorylation, and nuclear calcium signaling. **J Neurosci** 29, 14687-14700. **\*first 6 authors equally contributing** DOI: 10.1523/jneurosci.1160-09.2009
- 30) **Wiegert, J.S.**, Hofmann, F., Bading, H., and Bengtson, C.P. (2009). A transcription-dependent increase in miniature EPSC frequency accompanies late-phase plasticity in cultured hippocampal neurons. **BMC Neurosci** 10, 124. DOI: 10.1186/1471-2202-10-124
- 31) **Wiegert, J.S.**, Bengtson, C.P., and Bading, H. (2007). Diffusion and not active transport underlies and limits ERK1/2 synapse-to-nucleus signaling in hippocampal neurons. **J Biol Chem** 282, 29621-29633. DOI: 10.1074/jbc.m701448200y

#### **Peer reviewed review articles:**

- 32) **Wiegert, J. S.**, Mahn, M., Prigge, M. Prinz, Y., Yizhar, O. (2017). Silencing Neurons: Tools, Applications, and Experimental Constraints. **Neuron** 95 (3), 504-529 DOI: 10.1016/j.neuron.2017.06.050
- 33) **Wiegert, J.S.** and Bading, H. (2011). Activity-dependent calcium signaling and ERK-MAP kinases in neurons: a link to structural plasticity of the nucleus and gene transcription regulation. **Cell Calcium** 49, 296-305. DOI: 10.1016/j.ceca.2010.11.009
- 34) Queisser, G., **Wiegert, J.S.**, Bading, H. (2011). Structural dynamics of the cell nucleus: basis for morphology modulation of nuclear calcium signaling and gene transcription. **Nucleus** 2(2), 1-7. DOI: 10.4161/nucl.2.2.15116

**Other publications:**

- 35) Yizhar, O. & **Wiegert, J. S.** Designer Drugs for Designer Receptors: Unlocking the Translational Potential of Chemogenetics. (2019). **Trends Pharmacol Sci** 40(6):362-364 DOI:10.1016/j.tips.2019.04.010
- 36) **Wiegert, J.S.**, Gee, C.E., and Oertner, T. G. (2017). Stimulating Neurons with Heterologously Expressed Light-Gated Ion Channels. **Cold Spring Harb Protoc** 2017 (2) DOI: 10.1101/pdb.top089714
- 37) Gee, C.E., Ohmert, I., **Wiegert, J. S.**, and Oertner, T. G. (2017). Preparation of Slice Cultures from Rodent Hippocampus. **Cold Spring Harb Protoc** 2017 (2) DOI: 10.1101/pdb.prot094888
- 38) **Wiegert, J.S.**, Gee, C.E., and Oertner, T. G. (2017). Single-Cell Electroporation of Neurons. **Cold Spring Harb Protoc** 2017 (2) DOI: 10.1101/pdb.prot094904
- 39) **Wiegert, J.S.**, Gee, C.E., and Oertner, T. G. (2017). Viral Vector-Based Transduction of Slice Cultures. **Cold Spring Harb Protoc** 2017 (2) DOI: 10.1101/pdb.prot094896
- 40) **Wiegert, J.S.** and Oertner, T.G. (2016). How (not) to silence long-range projections with light. **Nat Neurosci** 19, 527-528. DOI: 10.1038/nn.4270
- 41) **Wiegert, J.S.** and Oertner, T.G. (2015). Neighborly synapses help each other out. **Nat Neurosci** 18, 326-327. DOI: 10.1038/nn.3955
- 42) **Wiegert, J.S.** and Oertner, T. G. (2011). Shapeshifting for memory. **e-Neuroforum** 2(1), 6-12. [REVIEW ARTICLE] DOI: 10.1007/s13295-011-0014-5

**Preprints and submitted manuscripts:**

- 43) Bergs, A., Liewald, J., Liu, Q., Zeitzschel, N., Durmaz, H., Vierock, J., Bargmann, C., Hegemann, P., **Wiegert, J.S.**, Gottschalk, A. All-optical closed-loop voltage clamp for precise control of muscles and neurons in live animals. In revision at **Nat Biotech**. **Preprint:** <https://doi.org/10.1101/2022.06.03.494532>
- 44) Nicolas, C., Ju, A., Wu, Y., Delcasso, S., Eldirdiri, H., Supiot, L., Fornari, C., Jacky, D., Vérité, A., Masson, M., Rodriguez-Rozada, S., **Wiegert, J.S.**, Beyeler, A. Linking valence and anxiety in a mouse insula-amygdala circuit. In revision at **Nat Neurosci**. **Preprint:** <https://doi.org/10.21203/rs.3.rs-964107/v1>
- 45) Wissing, C., Maheu, M., **Wiegert, J.S.**, and Dieter, A. (2022). Targeting Noradrenergic Neurons of the Locus Coeruleus: A Comparison of Model Systems and Strategies. **Preprint:** <https://doi.org/10.1101/2022.01.22.477348>
- 46) Kubitschke, M., Mueller, M., Wallhorn, L., Pulin, M., Mittag, M., Pollok, S., Ziebarth, T., Bremshey, S., Gerdey, J., Claussen, K.C., Renken, K., Gross, J., Meyer, N., **Wiegert, J.S.**, Reiner, A., Fuhrmann, M., Masseck, O.A. (2022) sDarken: Next generation genetically encoded fluorescent sensors for serotonin. In revision at **Nat Commun** **Preprint:** <https://doi.org/10.1101/2022.03.10.483799>
- 47) Formozov, A., Dieter, A., & **Wiegert, J. S.** (2022). A flexible and versatile system for multicolor fiber photometry and optogenetic manipulation. In revision at **Cell Rep Meth** **Preprint:** <https://doi.org/10.1101/2022.03.16.484590>