

Mager, Thomas (B01)**Personal Data**

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| Title | Dr. phil. nat. |
| First name | Thomas |
| Name | Mager |
| Current position | Group Leader and Optogenetics Application Specialist |
| Current institution(s)/site(s), country | Institut für Auditorische Neurowissenschaften Universitätsmedizin Göttingen Göttingen, Germany |
| Identifiers/ORCID | 0000-0002-9571-7033 / Google Scholar |

Qualifications and Career

| Stages | Periods and Details | |
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| Degree programme | 2003 - 2008 | Diploma studies in Biochemistry, Diploma degree in Biochemistry (Prof. Dr. Klaus Fendler), Faculty of Biochemistry, Chemistry, Pharmacy, Goethe University, Frankfurt am Main, Germany |
| Doctorate | 2012 | Dr. phil. nat., Supervisor: Prof. Dr. Klaus Fendler, Biophysics/Biochemistry, Max Planck Institute of Biophysics and Goethe University, Frankfurt am Main, Germany |
| Stages of academic/ professional career | Since 2021 | Group Leader, Institute for Auditory Neuroscience, University Medical Center Göttingen, Germany |
| | Since 2019 | Optogenetics Application Specialist, Cluster of Excellence EXC 2067 (Multiscale Bioimaging: From Molecular Machines to Networks of Excitable Cells), Germany |
| | 2019 - 2021 | Senior Scientist, Institute for Auditory Neuroscience, University Medical Center Göttingen, Germany |
| | 2019 | Postdoctoral Fellow, Institute for Auditory Neuroscience, University Medical Center Göttingen (Prof. Dr. Tobias Moser), Germany |
| | 2012 - 2019 | Postdoctoral Fellow, Department of Biophysical Chemistry, Max Planck Institute of Biophysics, Frankfurt am Main (Prof. Dr. Ernst Bamberg), Germany |

Engagement in the Research System

- Since 2024 Board member of the Else Kröner Fresenius Center for Optogenetic Therapies, UMG
- Since 2023 Reviewer of Pflügers Archiv
- Since 2022 Reviewer of Scientific Reports
- Since 2019 Co-Organizer of the MBExC (EXC 2076 Multiscale Bioimaging: From Molecular Machines to Networks of Excitable Cells) Optogenetics Club seminar series

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| Since 2019 | Hertha Spöner College (part of MBExC): workshops and seminars |
| Since 2019 | Molecular medicine elective “Auditory Neuroscience”: lecture and practical course |
| 2022/2024 | Electrain 2022 and 2024: workshop and lecture (Extended methods course in electrophysiology by FENS) |
| 2009/2010 & 2014/2015 | Member of the MPI seminar committee, MPI of Biophysics |

Scientific Results

Category A

1. Zerche M*, Wrobel C*, Kusch K, Moser T[#], **Mager T[#]** (2023) Channelrhodopsin fluorescent tag replacement for clinical translation of optogenetic hearing restoration. *Mol Ther Methods Clin Dev* 29:202-212. doi: [10.1016/j.omtm.2023.03.009](https://doi.org/10.1016/j.omtm.2023.03.009) (OA)
Significance: We developed a procedure for Channelrhodopsin fluorescent tag replacement, which minimized the risk for adverse effects and improved the efficacy for future optogenetic hearing restoration.
2. **Mager T** (2022) Electrophysiological characterization of microbial rhodopsins by patch-clamp experiments. *Methods Mol Biol* 2501:277-288. doi: [10.1007/978-1-0716-2329-9_13](https://doi.org/10.1007/978-1-0716-2329-9_13)
Significance: The chapter provides a detailed description of the biophysical characterization of microbial rhodopsins by patch-clamp experiments. The electrophysiological characterization of microbial rhodopsins is of key importance for the discovery of advanced optogenetic actuators.
3. Bali B, Lopez de la Morena D, Mittring A, **Mager T**, Rankovic V, Huet AT, Moser T (2021) Utility of red-light ultrafast optogenetic stimulation of the auditory pathway. *EMBO Mol Med* 13:e13391. doi: [10.15252/emmm.202013391](https://doi.org/10.15252/emmm.202013391) (OA)
Significance: My contribution was the assessment of the plasma membrane localization of the fast-switching and red light-activated ChR variants f-Chrimson and vf-Chrimson based on confocal microscopy images.
4. Zabelskii D, Alekseev A, Kovalev K, Rankovic V, Balandin T, Soloviov D, Bratanov D, Savelyeva E, Podolyak E, Volkov D, Vaganova S, Astashkin R, Chizhov I, Yutin N, Rulev M, Popov A, Eria Oliveira AS, Rokitskaya T, **Mager T**, Antonenko Y, Rosselli R, Armeev G, Shaitan K, Vivaudou M, Buldt G, Rogachev A, Rodriguez Valera F, Kirpichnikov M, Moser T, Offenhausser A, Willbold D, Koonin E, Bamberg E, Gordeliy V (2020) Viral rhodopsins 1 are an unique family of light-gated cation channels. *Nat Commun* 11:5707. doi: [10.1038/s41467-020-19457-7](https://doi.org/10.1038/s41467-020-19457-7) (OA)
Significance: My contribution was the direct supervision of experiments on the photostimulation of rat hippocampal neurons by viral rhodopsin 1.
5. Bratanov D, Kovalev K, Machtens JP, Astashkin R, Chizhov I, Soloviov D, Volkov D, Polovinkin V, Zabelskii D, **Mager T**, Gushchin I, Rokitskaya T, Antonenko Y, Alekseev A, Shevchenko V, Yutin N, Rosselli R, Baeken C, Borshchevskiy V, Bourenkov G, Popov A, Balandin T, Buldt G, Manstein DJ, Rodriguez Valera F, Fahlke C, Bamberg E, Koonin E, Gordeliy V (2019) Unique structure and function of viral rhodopsins. *Nat Commun* 10:4939. doi: [10.1038/s41467-019-12718-0](https://doi.org/10.1038/s41467-019-12718-0) (OA)
Significance: My contribution was the direct supervision of black lipid membrane experiments with a pentameric virus rhodopsin, which for the first time demonstrated light-driven proton pumping activity in virus rhodopsins.

6. **Mager T***, Lopez de la Morena D*, Senn V, Schlotte J, D'Errico A, Feldbauer K, Wrobel C, Jung S, Bodensiek K, Rankovic V, Browne L, Huet A, Jüttner J, Wood PG, Letzkus JJ, Moser T, Bamberg E (2018) High frequency neural spiking and auditory signaling by ultrafast red-shifted optogenetics. *Nat Commun* 9:1750. doi: [10.1038/s41467-018-04146-3](https://doi.org/10.1038/s41467-018-04146-3) (OA)
Significance: My contribution was the design and the electrophysiological characterization of the fast-switching and red light-activated ChR variants f-Chrimson and vf-Chrimson.
7. Vinayagam D, **Mager T**, Apelbaum A, Bothe A, Merino F, Hofnagel O, Gatsogiannis C, Raunser S (2018) Electron cryo-microscopy structure of the canonical TRPC4 ion channel. *eLife* 7:e36615. doi: [10.7554/eLife.36615](https://doi.org/10.7554/eLife.36615) (OA)
Significance: My contribution was the electrophysiological characterization of the canonical transient receptor channel TRPC4 from the zebrafish Danio rerio.
8. Shevchenko V*, **Mager T***, Kovalev K*, Polovinkin V*, Alekseev A, Juettner J, Chizhov I, Bamann C, Vavourakis C, Ghai R, Gushchin I, Borshchevskiy V, Rogachev A, Melnikov I, Popov A, Balandin T, Rodriguez Valera F, Manstein DJ, Bueldt G, Bamberg E, Gordeliy V (2017) Inward H(+) pump xenorhodopsin: Mechanism and alternative optogenetic approach. *Sci Adv* 3:e1603187. doi: [10.1126/sciadv.1603187](https://doi.org/10.1126/sciadv.1603187) (OA)
Significance: I directly supervised patch-clamp experiments, which proved that xenorhodopsin from the nanohaloarchaeon Nanosalina is a light-driven, inwardly directed proton pump and conducted experiments in order to assess its utility as an optogenetic tool.
9. **Mager T**, Wood PG, Bamberg E (2017) Optogenetic control of Ca²⁺ and voltage dependent large conductance (BK) potassium channels. *J Mol Biol* 429:911-921. doi: [10.1016/j.jmb.2017.02.004](https://doi.org/10.1016/j.jmb.2017.02.004) (OA)
Significance: I inter alia provided a quantitative description of sub-plasma membrane calcium concentration changes due to the optogenetic stimulus.
10. **Mager T**, Rimon A, Padan E, Fendler K (2011) Transport mechanism and pH regulation of the Na⁺/H⁺ antiporter NhaA from *Escherichia coli*: an electrophysiological study. *J Biol Chem* 286:23570-2358. doi: [10.1074/jbc.M111.230235](https://doi.org/10.1074/jbc.M111.230235) (OA)
Significance: Purification and functional reconstitution of a Na⁺/H⁺ antiporter from Escherichia coli and subsequent solid supported membrane measurements for kinetic modelling of Na⁺/H⁺ antiport.

Category B

1. Moser T, **Mager T**, Zerche M (2022) Novel mutant bacteriorhodopsin-like-channelrhodopsin ion channel. University Medical Center Göttingen, OptoGenTech (Application number: EP22155173, Publication number: EP4223768)
2. Bamberg E, **Mager T**, Shevchenko V, Gordeliy V (2018) New optogenetic tool. Max-Planck-Gesellschaft zur Förderung der Wissenschaften e.V. (World patent application number: PCT/EP2018/059297, Publication number: EP3609518)
3. Bamberg E, Wood P, **Mager T**, Moser T, Lopez de la Morena D (2017) Mutant light-inducible ion channel of Chrimson. Max-Planck-Gesellschaft zur Förderung der Wissenschaften e.V., Universitätsmedizin Göttingen (World patent application number: PCT/EP2017/063458, Application number: EP17728811, Publication number: EP3464342)
4. Bamberg E, Wood P, **Mager T** (2017) Mutant light-inducible ion channel of Channelrhodopsin. Max-Planck-Gesellschaft zur Förderung der Wissenschaften e.V. (World patent application number: PCT/EP2017/063425, Application number: EP17728808, Publication number: EP3464341)

5. Zerche M*, Hunniford V*, *int. al*, Macé E, Kusch K, Bruegmann T, Wolf BJ#, **Mager T#**, Moser T# (2023) Efficient and sustained optogenetic control of nervous and cardiac systems. *bioRxiv* 2022.08.03.502284. doi: [10.1101/2022.08.03.502284](https://doi.org/10.1101/2022.08.03.502284) **(OA)**

* Equal contribution, #Shared correspondence.

(OA): Publicly available (e.g. open access, open archive, preprint, free access, etc.).

Academic Distinctions

2012 PhD thesis: Magna cum Laude (Disputation: Summa cum Laude)
2008 Diploma degree with distinction (grade 1.0)