Personal Information

Name	**Shiqiang Gao**
Current position	Group Leader
Work address	Institute of Physiology, University of Würzburg
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Research topics

Photobiology and photoreceptor fucntions, Protein engineering and synthetic biology, Development and application of optogenetic tools, Ion channels and ion signaling, cAMP/cGMP signaling

Scientific Degrees and Qualifications

Habilitation	2022-2025, requirements fulfilled (thesis reviewed, teaching qualified, and all documents accepted); formal conferral pending. Medicine Faculty, University of Würzburg, Würzburg, Germany. (Mentor: Prof. Dr. Manfred Heckmann)
Dr. rer. nat.	2015, Biology Faculty, University of Würzburg, Würzburg, Germany. (Mentor: Prof. Dr. Georg Nagel)

Academic education

2010-2015	University of Würzburg, Würzburg, Germany. Dr. rer. nat.
2004-2007	Chinese Academy of Agricultural Science, Beijing, China. Master.
2000-2004	School of Life Science, Shandong University, Jinan, China. Bachelor.

Working experience

since 2022	Group leader, Principal Investigator, Physiology Institute - Neurophysiology, University of Würzburg, Germany
since 2023	PhD supervisor of Graduate School of Life Science, University of Würzburg, Germany
2019-2021	Postdoc, Physiology Institute, University of Würzburg, Germany
2016-2019	Postdoc, Julius-von-Sachs-Institute of Biosciences, University of Würzburg, Germany
2008-2010	Assistant research officer in Temasek life sciences laboratory, National University of Singapore, Singapore
2007-2008	Research assistant in Chinese academy of agricultural science, Beijing, China

Awards and scholarships

2018	Poster award, Gordon Research Conference on Photosensory Receptors and Signal Transduction, Lucca, Italy.
2016	Chinese government award for outstanding self-financed students abroad, Berlin
2012	Optoelectronics Committee Prize for Best Contributed Paper, The Rank Prize Funds Symposium “Optogenetics”, Windermere, UK.
2004-2007	Award for Academic Excellence, Sanyi Scholarship. Chinese Academy of Agricultural Sciences, Beijing, China
2000-2004	Outstanding Graduate of Shandong University, Outstanding Graduate of Shandong Province, Academic Scholarship, Excellent Student Leader, Guanghua

Scholarship. Shandong University, Jinan, China

Current Projects and Grants (as Grant Holder)

1. DFG Project number 525167920, “Optogenetic approaches to study platelet production and function”. 02.2024 – 01.2027. Euro 232 349
2. DFG Project number 538090107, “The cell-specific role of cGMP in striatum and hippocampus“. 03.2024 – 02.2027. Euro 240 523
3. Stiftung Innovation in der Hochschullehre, Freiraum 2026, “Globale KI Peer-Plattform für Medizinstudierende“. 04.2026 - 03.2028. Euro 399 444

Completed Projects and Grants (as Grant Holder)

1. Homeworld Garden Grants: Protein Engineering for Climate. “Improve the CO2 Uptake and H2O Retention under High Light and Temperature Conditions“. 01.2024 – 12.2024. Euro 18 514
2. DFG (German Research Foundation, Deutsche Forschungsgemeinschaft) Project number 374031971, TR240 A04 “Optogenetic approaches to study platelet production and function (CRC/Transregios)”. 07.2022 – 06.2023. Euro 148 100

Participated projects

1. Natural Environment Research Council (NERC) funding. **Einreichungsfrist:** Jan 2024. “The role of light-driven proton pumps in sustaining oceanic primary production (RHOPP)”. Thomas Mock (PI) and Vincent Moulton (Co-I), University of East Anglia, Norwich, UK. as collaborator.
2. 2019-2022, Analyzing PKA-dependent synaptic plasticity in the hippocampal mossy fiber synapse using novel optogenetic tools. Deutsche Forschungsgemeinschaft (DFG) - Project number 417451587
3. 2015-2020, Optogenetic control of ionotropic receptor function by cyclic nucleotides (A03). Deutsche Forschungsgemeinschaft (DFG) - Project number 258780946
4. 2013-2016, Optophysiological analysis of the clock network of D. melanogaster: Manipulating neuronal excitability and cAMP levels of individual clock neurons (A03). Deutsche Forschungsgemeinschaft (DFG) - Project number 208233609
5. 2010-2014, Analysis and engineering of natural photoreceptors to Light-manipulate cyclic nucleotides, Ca^{2+} and membrane voltage in animal cells. Deutsche Forschungsgemeinschaft (DFG) - Project number 119438981

10 Representative Publications

#co-first author. *corresponding author.

1. Duan X, Zhang C, Ott S, Zhang Z, Ruse C, Dannhäuser S, Jacobi R, Ehmann N, Sachidanandan D, Nagel G, Heckmann M, Kittel RJ, Gottschalk A, Claridge-Chang A*, **Gao S***. 2025. Stabilized Ion Selectivity Corrects Activation Drift in Kalium Channelrhodopsins. **Advanced Science** 2025, e09180 doi: 10.1002/advs.202509180
2. Duan X#, Zhang C#, Wu Y#, ... Nagel G, Hou S*, **Gao S***, Song K*. 2025. Suppression of epileptic seizures by transcranial activation of K^+-selective channelrhodopsin. **Nat Commun** 16, 559. doi.org/10.1038/s41467-025-55818-w
3. Zhang Y, Yu-Strzelczyk J, Sisario D, Holzapfel R, Nagy Z, Xu C, Shen C, Nagel G, **Gao S***, Bender M*. 2025. Optogenetic induction of subcellular Ca2+ events in megakaryocytes and platelets using a highly Ca2+-conductive channelrhodopsin. **Commun Biol** 8 (1), 1433, doi.org/10.1038/s42003-025-08924-w.
4. Ding M#, Zhou Y#, Becker D#, Yang S#, … Hedrich R*, Nagel G*, **Gao S***, Konrad R*. 2024. Probing plant signal processing optogenetically by two channelrhodopsins. **Nature** 633: 872–877. doi: 10.1038/s41586-024-07884-1.

5. Lin, F, Tang, R, Zhang, C, Scholz N, Nagel G, **Gao S***. 2023. Combining different ion-selective channelrhodopsins to control water flux by light. **European Journal of Physiology** 10.1007/s00424-023-02853-5.
6. Zhou Y#, Ding M#, **Gao S#***, Yu-Strzelczyk J#, Krischke M, Duan X, Leide J, Riederer M, Mueller MJ, Hedrich R, Konrad KR*, Nagel G*. 2021. Optogenetic control of plant growth by a microbial rhodopsin. **Nature Plants** 7(2): 144-151.
7. Yang S, Constantin OM, Sachidanandan D, Hofmann H, Kunz TC, Kozjak-Pavlovic V, Oertner TG, Nagel G, Kittel RJ*, Gee CE*, **Gao S***. 2021. PACmn for improved optogenetic control of intracellular cAMP. **BMC Biology** 19: 227.
8. Tian Y, Nagel G*, **Gao S***. 2021. An engineered membrane-bound guanylyl cyclase with light-switchable activity. **BMC Biology** 19: 54.
9. Tian Y#, **Gao S#***, Yang S, Nagel G*. 2018. A novel rhodopsin phosphodiesterase from Salpingoeca rosetta shows light-enhanced substrate affinity. **Biochem J** 455: 359-65.
10. **Gao S#**, Nagpal J#, Schneider M, Kozjak-Pavlovic V, Nagel G, Gottschalk A. 2015. Optogenetic manipulation of cGMP in cells and animals by the tightly light-regulated guanylyl-cyclase opsin CyclOp. **Nat Commun** 6: 8046.

Patents

Ye J, Chua NH, Qu J, Gao S. Control of pests in plants. (world-wide; No. PCT/SG2010/000339, WO2011040880A1, US10017774B2).

Membership and Reviewer for Journals:

Member of German Physiological Society (DPG). Board Member of Society of Chinese Meidical and Biological Scholars of Medicine in Germany (GCM).
Reviewer: Nat Microbiol, Nat. Commun, PLOS Biology, Proc. Natl. Acad. Sci. U.S.A., iScience, Trends in Plant Science, International Journal of Biological Macromolecules, Neuroscience, Cell Reports Methods, European Journal of Physiology, Frontiers in Molecular Biosciences, Frontiers in Environmental Science, Frontiers In Molecular Neuroscience, Frontiers in Plant Science, Bioscience Reports, Methods and Protocols, International Journal of Molecular Sciences, Plants, Applied Sciences, Biomolecules, Biosensors, Biomedicines, Current Issues in Molecular Biology

Conference talks

10/2025 the 37th Annual Conference of Chinese-German Society of Medicine and German-Chinese Society of Medicine, Taiyuan, China: “The discovery of Channelrhodopsin and its application in Neuroscience” (Invited talk)

10/2025 hLife Café (Beijing, China): “Development and applications of Optogenetic tools for manipulation of cyclic nucleotides and beyond” (Invited talk)

03/2025 DFG Roundtable Discussion: “Photoreceptors – Structure, Function and Application”, Castle Ringberg. “Rhodopsin-based Optogenetics: From Neuroscience to Plant Research” (Invited talk)

03/2025 Jan IngenHousz Institute, Wageningen, Netherlands. “Rhodopsin-based optogenetics for plant physiology research” (Invited talk)

02/2025 University of Copenhagen, Copenhagen Plant Science Centre (CPSC, Copenhagen, Denmark): “Rhodopsin-based optogenetics: from neuroscience to plant research” (Invited talk)

10/2024 Chinese Academy of Sciences, Institute of Botany (Beijing, China): “Optogenetic tools for biomedical research” (Invited talk)

10/2024 International Symposium on Plant Interaction and Crop Improvements (ISPICI, ShanXi, China): “Rhodopsin-based Optogenetics for Plant Physiological Research“ (Invited talk)

09/2024 EPSO (European Plant Science Organisation) Plant Science Seminar (#35, online): “Rhodopsin-based Optogenetics for Plant Physiological Research” (Invited talk)

08/2024 33RD NEUROBIOLOGY DOCTORAL STUDENTS WORKSHOP (Leipzig): “Optogenetic tools for research and clinical trials: recent progress and considerations” (Invited talk)

08/2024 Summer Symposium, Brain Dynamics Graduate School (Institute of Biology, Leipzig): “Optogenetic tools for research and clinical trials: recent progress and considerations” (Invited talk)

07/2024, Gordon Research Conference - Optogenetic Approaches to Understanding Neural Circuits and Behavior (Renaissance Tuscany Il Ciocco in Lucca, Italy): “Chromophore-Independent Channel Activity of Channelrhodopsins.” (Selected talk)

06/2024, 11th International Conference on cGMP - cGMP: Generators, Effectors and (Lübeck/Germany): “Development and applications of Optogenetic tools for manipulation of cyclic nucleotides” (Selected talk)

04/2024 Seminar for Research Training Group (RTG) - "MoNN&Di" - Monoaminergic Neuronal Networks & Disease (Ruhr-University in Bochum): “Optogenetic tools for research and clinical trials: recent progress and considerations” (Invited talk)

01/2022 School of Life Sciences seminar series, University of Nottingham Medical School (Virtuelles Seminar): “From Photoreceptors to Optogenetics: A Brief Introduction” (Invited talk)

10/2021 100th Meeting of the German Physiological Society / Joint Meeting with the Austrian Physiological Society (APS) and Life Sciences Switzerland (LS^2) Physiology (Frankfurt, Germany): “Development and Applications of Optogenetic Tools for Manipulation of Cyclic Nucleotides” (Selected talk)

10/2021 Plantae Webinar Highlighting Plant Physiology Focus Issue - Sensors and Controllers, for and from Plants (Virtuelles Seminar): “Functional expression of microbial rhodopsins for plant physiological research” (Invited talk)

10/2019 DFG Roundtable Discussion Meeting - Conformational Dynamics of Photoreceptors at Different Time Scales (Schloss Ringberg, Germany): “Green optogenetics for plant physiology study” (Invited talk)

10/2017 DFG Roundtable Discussion Meeting – Photoreceptors, from activation to interaction (Schloss Ringberg, Germany): “Expanding the optogenetic toolbox: from lightsensitive ion channels to light-sensitive enzymes” (Invited talk)

12/2016 OPTOGEN 2016, 3rd International Workshop on Technologies for Optogenetics (Freriburg, Germany): “The Cyclop (Cyclase opsin) as a new optogenetic tools for light-gated nucleotide production” (Selected talk)

09/2012 The Rank Prize Funds, Symposium on Optogenetics (Windermere, UK): “Searching for and characterization of new algal rhodopsins.” (Selected talk)