

PERSONAL INFORMATION

Neumann, Wolf-Julian

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Date of birth: 16th December 1985

Nationality: German

Disability: Severe hearing impairment

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• EDUCATION

2011 – 2015 Doctoral dissertation – Dr. med. (summa cum laude), Department of Neurology, Charité – Universitätsmedizin Berlin, Berlin, Germany; Supervisor: Andrea A. Kühn

2006 – 2013 Medical School, Charité – Universitätsmedizin Berlin, Berlin, Germany

• CURRENT POSITION

2020 – 2023 Assistant Professor for Interventional and Cognitive Neuromodulation
Department of Neurology, Charité – Universitätsmedizin Berlin; Director: Matthias Endres

• LEADERSHIP

Since 2023 Executive Board of Directors, *Einstein Center for Neurosciences* (<https://www.ecn-berlin.de/>); Overall budget 9 mio. €, ~1.5 mio € per year),
Funded through: Einstein Foundation

Since 2023 Steering committee, Transregional Collaborative Research Consortium TRR295
ReTune: Retuning dynamic motor network disorders using neuromodulation
(<https://sfb-retune.de>); Overall budget ~12 mio. €, ~3 mio. € per year),
Funded through: Deutsche Forschungsgemeinschaft

• PREVIOUS POSITIONS

2018 – 2020 Clinical resident in neuroradiology, Department of Neuroradiology, Charité – Universitätsmedizin Berlin; Director: Georg Bohner.

2017 – 2018 Post-doctoral research fellow, Department of Neurological Surgery, University of Pittsburgh, Pittsburgh, PA, USA; Director: R. Mark Richardson

2015 – 2018 Resident and post-doctoral research fellow in neurology, Department of Neurology, Charité – Universitätsmedizin Berlin. Director: Matthias Endres

2015 Post-doctoral research fellow, Functional Imaging Laboratory, Institute of Neurology, University College London, London, United Kingdom

• FELLOWSHIPS AND AWARDS

2023 – 2028 ERC Starting Grant, ERC-2022-STG ReinforceBG 101077060 - Interrogating basal ganglia reinforcement with deep brain stimulation in Parkinson's disease.

2020 – 2023 Fellow at Hertie Network of Excellence in Clinical Neuroscience, Hertie Foundation

2020 – 2022 SPOKES Wellcome Trust Funded Translational Partnership Fellowship

2019 Niels A. Lassen Prize, German Society for Clinical Neurophysiology and Functional Imaging (DGKN)

2017 – 2022 Top Reviewer of the Year Award, four consecutive years, *Brain: A Journal of Neurology*

2016 Ernst Reuter Prize 2016, best biomedical doctoral dissertation, FU Berlin

2014 International Research Award, German Society for Clinical Neurophysiology and Functional Imaging (DGKN)

2008 – 2009 Scholarship, Neurobiology Research Unit, Rigshospitalet, Copenhagen, Denmark

• SUPERVISION OF GRADUATE STUDENTS AND POSTDOCTORAL FELLOWS

2020 – 2023 Primary supervisor of PhD: 9, MSc: 5; Charité – Berlin

- **TEACHING ACTIVITIES**

- 2015 – 2023 Programme organization and instructor, Clinical Neuroscience for basal ganglia & movement disorders, Medical Neuroscience, Berlin
- 2021 Seminar instructor, Virtual Reality for Neuroscience, Erfurt University, Germany
- 2018 – 2023 eLearning online instructor, gait disorders, Charité – Universitätsmedizin Berlin
- 2016 – 2017 Seminar instructor, Cognitive Neuroscience, NYU New York University, Berlin, Germany
- 2016 – 2017 Seminar instructor, Motor System & Movement Disorders, School of Mind and Brain, Berlin
- 2015 – 2017 Seminar instructor, Dopamine and Parkinson's disease, Charité – Universitätsmedizin Berlin

- **ORGANIZATION OF SCIENTIFIC MEETINGS**

- 2023 International Basal Ganglia Society (IBAGS) Stockholm: Conference Organization
- 2022 Neural Control of Movement Dublin: Symposium organization
- 2022 DBS Expert Summit Würzburg: Conference Organization
- 2021 IEEE EMBS Conference on Neural Engineering: Symposium Organization
- 2020 Neural Control of Movement: Symposium organization
- 2018 OX-BER Motorneuroscience Berlin: Conference Organization.

- **REVIEW ACTIVITIES**

- 2020 - 2023 Grant reviews for Swiss National Science Foundation (SNF), European Research Council (ERC), U.S. National Science Foundation (NSF), French National Research Agency (ANR), Netherlands Organisation for Health Research and Development (ZonMw), German Ministry of Research and Education (BMBF), German Research Foundation (DFG).
- 2015 – 2023 More than 90 invited peer reviews for Nature biomedical engineering, Nature Communications, Brain, JAMA Neurology, eLife, Annals of Neurology, and more.
- 2021 - 2023 PhD Reviewer for University of Oxford UK, University of Queensland AU, University of Maastricht NL and Charité – University Medicine Berlin.

- **MEMBERSHIPS OF SCIENTIFIC SOCIETIES**

- 2021 – 2022 Council member, International Basal Ganglia Society (IBAGS)
- 2021 – 2022 Member, diversity research network ALBA NETWORK, <https://www.alba.network/>

- **MAJOR COLLABORATIONS**

R. Mark Richardson, Director of functional neurosurgery, Massachusetts General Hospital, Harvard Medical School, Boston, MA, USA. Topics: Brain computer interfaces for epilepsy and Parkinson.

Timothy Denison, Royal Academy of Engineering Chair in Emerging Technologies, University of Oxford, Oxford, UK. Topics: Hardware development and artifact management for brain implants.

Philip Starr, Director of functional neurosurgery, University of California San Francisco (UCSF), San Francisco, USA. Topics: Symptom decoding from home monitored brain implants.

Jian-guo Zhang, Director of functional neurosurgery, Tiantan Hospital, Capital Medical University, Beijing, China. Topics: Sleep stage decoding for invasive brain implants for Parkinson disease.

Andreas Horn, Director of DBS Research, Department of Neurology, Brigham and Women's Hospital, Harvard Medical School, Boston, MA, USA. Topics: BCI connectomics.

Andrea A. Kühn, Director of Movement Disorders and Neuromodulation, Charité – Universitätsmedizin Berlin, Berlin, Germany. Topics: Neurophysiology, Clinical Neurology.

- **CURRENT AND PREVIOUS FUNDING AS PRINCIPAL INVESTIGATOR**

<i>Project Title</i>	<i>Funding source</i>	<i>Amount (Euros)</i>	<i>Period</i>
ERC Starting Grant ReinforceBG 101077060 - Interrogating basal ganglia reinforcement with deep brain stimulation in Parkinson's disease.	Horizon Europe	1,499,000.00 €	01.03.2022-28.02.2028
Deep Neural Network Approaches for Closed-Loop Deep Brain Stimulation Using Cortical and Subcortical Sensing	BMBF & NSF/NINDS	1,022,491.40 €	01.03.2019 – 30.08.2024
Developing standards for data quality, reproducibility, and accessibility	DFG	690,300.00 €	01.06.2020 – 30.06.2024
Decoding therapy-related inhibition/disinhibition signaling through M1 ECoG and subthalamic LFP real-time classification in patients with Parkinson's disease	DFG	429,900.00 €	01.06.2020 - 30.06.2024
Hertie Network of Excellence in Clinical Neurosciences – Modulation of synaptic plasticity as a fundamental mechanism of basal ganglia function	Hertie Foundation	245,000.00 €	01.06.2020 – 31.05.2023
From experiment to open metadata repository: Computational reproducibility for FAIR translational neuromodulation research in clinical neuroscience	BIH & Wellcome Trust	25,000.00 €	01.06.2020 – 01.06.2022
		3,911,691.40 € in 4 years	

- **PUBLICATION METRICS**

(Source: <https://scholar.google.com/citations?user=Xxmc-bQAAAAAJ&hl=de>; accessed: 13.01.2022)

Number of PubMed listed publications: 69 with cumulative impact factor of ~550

Number of citations: 3704 ; H-index: 32

Number of publications as first/last author: 24 with cumulative impact factor of ~250

Publications under review: 4 (2 last authorships)

- **SELECTED PUBLICATIONS**

Neumann WJ, Horn A, Kühn AA. Insights and opportunities for deep brain stimulation as a brain circuit intervention. Trends Neurosci. 2023 Jun;46(6):472-487. doi: 10.1016/j.tins.2023.03.009. Epub 2023 Apr 25. PMID: 37105806. [IF: 15.9]

Neumann WJ, Steiner LA, Milosevic L. Neurophysiological mechanisms of deep brain stimulation across spatiotemporal resolutions. Brain. 2023 Jul 14;awad239. doi: 10.1093/brain/awad239. Epub ahead of print. PMID: 37450573. [IF: 14.5]

Yin Z, Ma R, An Q, Xu Y, Gan Y, Zhu G, Jiang Y, Zhang N, Yang A, Meng F, Kühn AA, Bergman H, Neumann WJ*, Zhang J*. Pathological pallidal beta activity in Parkinson's disease is sustained during sleep and associated with sleep disturbance. Nat Commun. 2023 Sep 5;14(1):5434. doi: 10.1038/s41467-023-41128-6. *equal contribution [IF: 16.6]

De Almeida Marcelino AL, Horn A, Krause P, Kühn AA, Neumann WJ. Subthalamic neuromodulation improves short-term motor learning in Parkinson's disease. Brain. 2019;142(8):2198-2206. [IF: 13.5]

Neumann WJ, Schroll H, de Almeida Marcelino AL, et al. (2018) Functional segregation of basal ganglia pathways in Parkinson's disease. Brain. 2018 Aug 6. doi: 10.1093/brain/awy206. [IF: 13.5]

Neumann WJ, Huebl J, Brücke C, et al. (2018) Pallidal and thalamic neural oscillatory patterns in Tourette syndrome. Annals of Neurology. 2018 Aug 15. doi: 10.1002/ana.25311. [IF: 10.2]

Neumann WJ, Jha A, Bock A, et al. (2015) Cortico-pallidal oscillatory connectivity in patients with dystonia. Brain. doi:10.1093/brain/awv109 [IF: 13.5]

Neumann WJ, Huebl J, Brücke C, et al. (2014) Different patterns of local field potentials from limbic DBS targets in patients with major depressive and obsessive compulsive disorder. Molecular Psychiatry, | doi:10.1038/mp.2014.2 [IF: 15.9]

Barow E*, Neumann WJ*, Brücke C, et al. (2014) Deep brain stimulation suppresses pallidal low frequency activity in patients with phasic dystonic movements. Brain. doi:10.1093/brain/awu258 [IF: 13.5]

- **MISSION STATEMENT & NARRATIVE BIOSKETCH**

The primary aim of my research is to translate invasive brain data from human patients with neurological and psychiatric disorders into neurotechnological brain circuit interventions. As a medical doctor, I integrate clinical, technical and computational expertise for invasive brain implants and brain computer interfaces (BCI). My group combines human invasive neurophysiology, invasive brain stimulation, MRI connectomics and machine learning for circuit discovery and neurotherapeutic development. During my career I have characterized invasively recorded brain activity in hundreds of patients suffering from Parkinson's disease (PD), Major Depressive Disorder, Tourette's Syndrome, Obsessive Compulsive Disorder and Dystonia. I am currently the only PI in Europe who has established and performs electrocorticography (ECoG) recordings for invasive BCI research in patients undergoing deep brain stimulation surgery. My research combines causal brain stimulation experiments, with MRI based connectomics and machine learning to understand how to a) optimally decode symptoms and behavior for BCI, b) discover pathophysiological changes in brain networks and c) develop the most spatiotemporally precise treatment strategies possible. I am convinced that success and progress in neurotechnology and BCI will depend on continuous research on the fundamental principles of human brain function and precise knowledge on pathophysiological circuit changes and their interaction. I believe that understanding neural learning and reinforcement mechanisms in the human brain will be key to advance neurotechnology. They are arguably the most powerful feature of the brain and if understood, could dramatically improve our access to novel treatment strategies that counteract loss of brain function. My and others research suggest that the neurotransmitter dopamine plays a critical role in neural learning, which is why I have made the circuit changes in dopaminergic brain disorders my primary clinical research interest. Specifically, I have recently acquired an ERC Starting Grant (3/2023-02/2028) to elucidate the function of dopamine through causal brain stimulation experiments in Parkinson's disease, the most prominent dopaminergic disorder. Building on subthalamic deep brain stimulation, I aim to develop an invasive neuroprosthetic that can mimic the effect of dopamine release in the human brain and counteract the development of symptoms of Parkinson's disease. If successful, this could open new horizons for the support of neural learning in context of neuroprosthetics. Beyond Parkinson's disease, augmenting neural learning could accelerate the adaptation of brain circuits to sensory and motor prosthetics, e.g. by reinforcing learned input-output relationships for a) brain spine interfaces after spinal cord injury b) auditory brainstem implants or c) artificial retinas. Ultimately, it could pave the way for a precision medicine approach to restore the intrinsic reinforcement capacity of cortex – basal ganglia pathways: Towards closed-loop brain circuit therapeutics that can restore healthy brain function.

- **ENGAGEMENT IN OPEN-SCIENCE**

Given the scarcity and importance of invasive neurophysiology data, I have actively engaged in community work to make these data more accessible. I have been awarded a SPOKES fellowship for research data strategy development and am PI in the informatics project of a large international research consortium. I am developing an extension to the Brain Imaging Data Structure (BIDS) for invasive neurostimulation research. The research in my group is powered through major clinical collaborations with high-profile and high-volume neurosurgery departments (MGH Harvard, UCSF, Charité Berlin, Tiantan Beijing) that have already provided me with thousands of hours of invasive brain data.

- **ENGAGEMENT FOR INCLUSIVITY AND DIVERSITY**

I take efforts towards inclusivity and diversity very seriously, as I suffer from severe hearing impairment myself and am at times dependent on the support of the community. However, as a white cis-male I am still overprivileged, and therefore I regard it as my duty to work twice as hard to implement equal opportunities. I actively recruit female and intersectionally disadvantaged researchers and maintain a strict gender quota of at least 50% female scientists. I am part of the equal opportunities committee of the transregional research consortium ReTune (<https://retune.science>) and am a member of the ALBA network (<https://alba.network>). My lab members are actively engaged in diversity initiatives, such as the Queer Network of Charité.