

Personal Information

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Research Experience

- Since 10/2021 **Assistant Professor (Tenure Track to Full Professor), Biomedical Signals and Systems, Faculty of Electrical Engineering, Mathematics and Computer Science, University of Twente, The Netherlands (NL)**
In close collaboration with University Medical Center Hamburg-Eppendorf (UKE), GER
- 09/2020–02/2021 Fellow, College for Life Sciences,
Wissenschaftskolleg zu Berlin (Institute for Advanced Study), GER
- 05/2016–08/2020 **Postdoctoral Fellow, Department of Neurophysiology and Pathophysiology,**
03–09/2021 **University Medical Center Hamburg-Eppendorf (UKE), GER**
Non-invasive modulation of functional brain connectivity.
Group of Prof. Andreas K. Engel
- 09–11/2014 & **Visiting Scholar, Department of Mathematics,**
08–09/2016 **Systems Neuroscience Institute, University of Pittsburgh, PA, USA**
Downstream effects of basal ganglia activity.
Hosts: Prof. Jonathan E. Rubin, Prof. Robert S. Turner
- 01/2010–02/2011 Research Assistant, Institute of Biomedical Engineering, Karlsruhe Institute of Technology, GER
Image processing for reconstruction of cardiac anatomy.
- 09–10/2009 Internship, Athinoula A. Martinos Center for Biomedical Imaging,
Massachusetts General Hospital, Harvard Medical School, Boston, MA, USA
Numeric estimation of electromagnetic fields during high field MRI.
- 09–10/2007 Internship, Medical Physics, St. Vincentius Hospitals Karlsruhe, GER: *Radiation therapy*

Education

- 05/2012–04/2016 **PhD Student, Applied Analysis / Biomedical Signals and Systems, Faculty of Electrical Engineering, Mathematics and Computer Science, University of Twente (NL)**
Do gap junctions regulate synchrony in the parkinsonian basal ganglia?
Supervisors: Prof. Stephan A. van Gils, Prof. Richard J. A. van Wezel
- 03/2011–03/2012 **Diploma (M.Sc.) thesis, Karlsruhe Institute of Technology (KIT), GER, and Cardiovascular Research and Training Institute (CVRTI), University of Utah, UT, USA**
Towards a quantitative understanding of the electrophysiological role of cardiac fibroblasts.
Supervisors: Dr. Frank B. Sachse, Dr. Gunnar Seemann; Prof. Margarete Mühlleitner

- 10/2007–03/2012 **Physics Diploma (B.Sc. and M.Sc.), Karlsruhe Institute of Technology (KIT), GER**
Minors: Biophysics, Biomedical Engineering
- 06/2007 High school graduation (Abitur), Gymnasium Karlsbad, GER

Third Party Funding

- 2022–2025 **Individual Research Grant, German Research Foundation:**
Multi-modal network modulation in Parkinson's disease,
sum: €361,350

Main collaboration partners: Dr. Andrew Sharott, Prof. Timothy Denison, Prof. Charlotte Stagg (MRC Brain Network Dynamics Unit, University of Oxford), Dr. Christian K. E. Moll (Department of Neurophysiology, UKE), Prof. Wolfgang Hamel (Department of Neurosurgery, UKE), Dr. Monika Pötter-Nerger (Department of Neurology, UKE)

- 2021–2022 **Tandemförderung der Medizinischen Fakultät, UKE (external review process)**
& SFB 936 Integrated Junior Project, German Research Foundation:
The relevance of theta-gamma coupling for motor skill acquisition in stroke patients,
sum: €70,500 + €69,900 = €140,400

Joint with Dr. Fanny Quandt (Department of Neurology, UKE)

Main collaboration partners: Prof. Charlotte Stagg (MRC Brain Network Dynamics Unit, University of Oxford), Dr. Robert Schulz (Department of Neurology, UKE), Dr. Till R. Schneider (Department of Neurophysiology, UKE)

- 06/2022–05/2023 Medical Sciences Internal Fund: Pump-Priming (University of Oxford):
Modulation of functional connectivity and bimanual coordination by dual-site transcranial alternating current stimulation; sum: £9,400
- Role: External Co-PI. PI: Dr. Andrew Sharott, Co-PIs: Prof. Charlotte Stagg, Dr. Catharina Zich

Awards and Scholarships

- 2021–2023 Associated Young Academy Fellow, Academy of Sciences and Humanities in Hamburg
- 2020 Poster Award, 7th International Conference on Non-Invasive Brain Stimulation
- 2020–2022 Rahel Liebeschütz-Plaut Mentoringprogramm, UKE
- 2020–2021 **Young Academy Fellow, Academy of Sciences and Humanities in Hamburg**
(<https://www.awhamburg.de/akademie/young-academy-fellows>)
- 2020–2021 **Fellowship, College for Life Sciences, Institute for Advanced Study Berlin**
(<http://wiko-berlin.de/cfls>)
- 2019–2021 DynaMENT advanced (mentoring program, <https://www.dynament.de/e16290/e86774/>)
- 2018 DAAD Scholarship (“Kongressreisenprogramm”)
- 2018 Poster Award, Basal Ganglia Gordon Research Conference
- 2015 Poster Award, NDNS+ Workshop, Nonlinear Dynamics in Natural Sciences (NDNS+), Netherlands Organization for Scientific Research (NWO)
- 2014 NDNS+ Travel Award, NWO

- 2014 Computational Neuroscience (CNS*2014) Travel Award
- 2014 International Brain Organization (IBRO) International Travel Grant
- 05/2013–04/2016 **PhD Scholarship, German National Scholarship Foundation** (Studienstiftung des deutschen Volkes; <https://www.studienstiftung.de/en/>)
- 2013 Travel Fellowship Award, International Basal Ganglia Society
- 2013 Netherlands Brain Bank Project (grant for human brain tissue)
- 06–09/2011 Travel Scholarship, German National Scholarship Foundation
- 2009 **Student Award “Stiftung Familie Klee”** for research at the interface of medicine and technology (<http://s-fk.de>)
- 11/2007–03/2012 **Scholarship, German National Scholarship Foundation**
 - until 2007 Awards for best high school graduation in Karlsbad, Bundeswettbewerb Mathematik (awardee 1st round), Auswahlverfahren Int. Physikolympiade (awardee 1st & 2nd round)

Invited Talks

- 12/01/2021 European School of Network Neuroscience (online): *Connectivity modulation by dual-site tACS*
- 11/25/2021 University of Twente, TechMed Center (online): *Network stimulation in the human brain*
- 09/03/2021 University of Oxford, UK (online): *Modulation of functional connectivity by dual-site tACS*
- 18/02/2021 University of Twente, NL (online): *Effects of spike-timing dependent plasticity during tACS*
- 11/24/2020 Wissenschaftskolleg zu Berlin, GER (online): *Network Modulation in the Human Brain*
- 10/22/2020 Department of Neurology, Charité, Berlin, GER (online): *Neural activity in macaques is counter to gating and rebound in basal ganglia-thalamic communication*
- 10/12/2020 Department of Psychology, University of Wisconsin-Madison, USA (online): *Neural activity during a simple reaching task in macaques is counter to gating and rebound in basal ganglia-thalamic communication*
- 09/22/2020 Brainbox Initiative Conference, London, UK (online): *Modulation of functional connectivity by dual-site tACS*
- 05/27/2020 Computational Modeling in Non-Invasive Brain Stimulation (NIBS) Workshop, University of Minnesota, USA (online): *Estimating dual-site tACS after-effects based on spike-timing dependent plasticity*
- 04/25/2019 **MRC Brain Network Dynamics Unit, University of Oxford, UK:** *Weak modulation of thalamic discharge by basal ganglia output in association with a reaching task*
- 12/20/2016 tACS Artifact Correction Workshop, UKE: *Weak tACS to validate artifact correction protocols*
- 07/10/2015 IBRO World Congress, Rio de Janeiro, Brazil: *Pallidal gap junctions – Triggers of synchrony in Parkinson’s disease?*
- 05/08/2015 Department of Neurophysiology and Pathophysiology, UKE, GER: *Synchrony and oscillations in the basal ganglia.*
- 02/04/2015 Neurophysics Colloquium, Donders Institute, Radboud University, Nijmegen, NL: *Synchrony and oscillations in the basal ganglia.*

- 11/24/2014 Society for Neuroscience Annual Meeting (SfN), Washington DC, USA: *Gap junctions as modulators of synchrony in Parkinson's disease.*
- 10/27/2014 Department of Biological Sciences, Carnegie Mellon University, Pittsburgh, USA: *Pallidal gap junctions – Triggers of synchrony in Parkinson's disease?*
- 10/13/2014 Department of Neurology, Emory University, Atlanta, USA: *Pallidal gap junctions – Triggers of synchrony in Parkinson's disease?*
- 09/11/2014 Mathematical Biology Colloquium, University of Pittsburgh, USA: *Pallidal gap junctions – Triggers of synchrony in Parkinson's disease?*
- 07/30/2014 CNS Workshop Dynamics of Disease, 2014, Québec City, Canada (CAN): *Basal ganglia dynamics assuming pallidal gap junctions.*
- 07/29/2014 **Computational Neuroscience Meeting 2014 (CNS*2014), Québec City, CAN (plenary talk):** *Synchronization of the Parkinsonian globus pallidus by gap junctions.*
- 01/24/2013 Dutch Biomedical Engineering Conference, Egmond aan Zee, NL: *Possible roles of neural gap junctions in Parkinson's disease pathology.*
- 10/24/2012 Translational Neuroscience Colloquium, Radboud University, NL: *A possible role of neural gap junctions in Parkinson's disease pathology.*
- 10/23/2012 Parkinson's Disease Symposium, University of Twente, NL: *Possible roles of neuronal gap junctions for network activity change in Parkinson's disease.*

Organization of Symposia & Workshops

- 08/2021 *Workshop on Inter- and Multidisciplinarity*, Academy of Sciences and Humanities in Hamburg, Hamburg Institute for Advanced Study
- 03/2018 *Science and Gender Equality (SAGE 2.0)*, Symposium, UKE, Hamburg, SFB 936
- 12/2016 *Artifact Correction for combined tACS & M/EEG*, Workshop, UKE, Hamburg
- 04/2016 *Parkinson's disease, computational neuroscience, & synchrony*, Symposium, University of Twente

Service to the Profession & Administrative Tasks

- since 2022 Examination Board, Electrical Engineering & Embedded Systems, University of Twente
- 2019–2021 PostDoc representative, large-scale collaboration center (SFB) 936
- Reviewer for Nature Communications, IEEE Transactions on Neural Networks & Learning Systems, IEEE Transactions on Neural Systems & Rehabilitation Engineering, IEEE Journal of Biomedical and Health Informatics, NeuroImage, Brain Stimulation, Journal of Physiology, Experimental Neurology, European Journal of Neuroscience, Frontiers in Human Neuroscience, Cognitive Neuroscience, Neuro-modulation: Technology at the Neural Interface

Supervision

- starting 08/2022 Mareike Gann, UKE, GER (Postdoc, Neuroscience),
Multi-modal network stimulation for Parkinson's disease
- since 05/2022 Lina Sophie Grigutsch, UKE, GER (MD student, joint with F. Quandt),
Non-invasive brain stimulation to increase motor learning after stroke
- since 04/2022 Hakan Ceylan, UKE, GER (MD student, joint with F. Quandt),
Non-invasive brain stimulation to increase motor learning after stroke
- since 03/2022 Silvana Huertas Penen, University of Twente, NL (PhD student, Biomedical Engineering),
Model-based optimization of dual-site tACS
- since 04/2021 Benjamin Haverland, UKE, GER (MD student, joint with F. Quandt),
Cross-frequency coupling related to motor learning
- since 04/2021 Lena Sophie Timmsen, UKE, GER (MD student, joint with F. Quandt),
Motor learning in stroke patients
- 04–11/2021 Sneha Kanithi, UKE, GER (student assistant, Electrical Engineering),
FEM Modeling of tACS
- since 01/2017 Marina Fiene, UKE, GER (Co-supervision of PhD, Neuroscience),
Phase-specificity of transcranial alternating current stimulation
- 10/2016–10/2019 Darius Zokai, UKE, GER (Co-supervision of MD)
Effects of transcranial alternating current stimulation on sensorimotor readout
- 02–07/2015 Laura van de Weerd, University of Twente, NL (Master thesis, Applied Mathematics),
Gap junction coupling in a neural field model

Teaching

| Semester | Title | Format | Program |
|-----------|---|---|--|
| 2022 | Bioelectromagnetics | Lecture [coordination] (English) | Biomedical Engineering (MSc), Electrical Engineering (MSc), University of Twente |
| 2021 | Group mentoring | Mentoring program (German) | Medicine, UKE Hamburg |
| 2016–2021 | Sensory and neurophysiology: <i>Auditory and vestibular system;</i> <i>Multiple sclerosis;</i> <i>Cerebral functional diagnostics:</i> <i>EEG and evoked potentials</i> | Seminars, laboratory courses (German) | Medicine, UKE Hamburg |
| 2014/15 | <i>Advanced Techniques for Signal Analysis</i> | Exercise class (English/Dutch) | Biomedical Engineering (MSc), Technical Medicine (MSc), University of Twente |
| 2013–2016 | <i>Dynamic Behavior of Neural Networks</i> | Exercise class (English/Dutch) | Biomedical Engineering (MSc) University of Twente |
| 2011/12 | <i>Transistor circuits</i> | Laboratory course (German) | Physics (BSc), Karlsruhe Institute of Technology |

Journal Publications

11. M. Fiene, J.-O. Radecke, J. Misselhorn, M. Sengelmann, C. S. Herrmann, T. R. Schneider, **B. C. Schwab**⁺, and A. K. Engel⁺ (+ shared senior authorship): “tACS phase-specifically biases brightness perception of flickering light”, *Brain Stimulation*, 15 (1), January–February 2022.
10. **B. C. Schwab**, P. König and A. K. Engel: “Spike-timing-dependent plasticity can account for aftereffects of dual-site transcranial alternating current stimulation”, *NeuroImage*, 237, August 2021.
9. **B. C. Schwab**, D. Kase, A. Zimnik, R. Rosenbaum, J. E. Rubin and R. S. Turner: “Neural activity during a simple reaching task in macaques is counter to gating and rebound in basal ganglia-thalamic communication”, *PLOS Biology*, 18(10): e3000829, 2020
8. M. Fiene, **B. C. Schwab**, J. Misselhorn, C. S. Herrmann, T. R. Schneider and A. K. Engel: “Phase-specific manipulation of rhythmic brain activity by transcranial alternating current stimulation”, *Brain Stimulation*, 13(5), pp. 1254–1262, 2020
7. J. Misselhorn, **B. C. Schwab**, T. R. Schneider and A. K. Engel: “Synchronization of sensory gamma oscillations promotes multisensory communication”, *eNeuro*, 6(5), 1–14, 2019.
6. **B. C. Schwab**, J. Misselhorn and A. K. Engel: “Modulation of interhemispheric alpha-band connectivity by transcranial alternating current stimulation”, *Brain Stimulation*, 12(5), pp. 1187–1196, 2019.
5. **B. C. Schwab**, R. J. A. van Wezel and S. A. van Gils: “Sparse pallidal connections shape synchrony in a network model of the basal ganglia”, *European Journal of Neuroscience*, 45(8), pp. 1000–1012, 2017.
4. M. A. J. Lourens, **B. C. Schwab**, J. Nirody, H. G. E. Meijer and S. A. van Gils: “Exploiting pallidal plasticity for stimulation in Parkinson’s disease”, *Journal of Neural Engineering*, 12(2), 026005, 2015.
3. **B. C. Schwab**, T. Heida, Y. Zhao, S. A. van Gils and R. J. A. van Wezel: “Pallidal gap junctions – Triggers of synchrony in Parkinson’s disease?”, *Movement Disorders*, 29(12), pp. 1486–1494, 2014.
2. **B. C. Schwab**, T. Heida, Y. Zhao, E. Marani, S. A. van Gils and R. J. A. van Wezel: “Synchrony in Parkinson’s disease: Importance of intrinsic properties of the external globus pallidus”, *Frontiers in Systems Neuroscience*, 7(60), 2013.
1. **B. C. Schwab**, G. Seemann, R. A. Lasher, N. S. Torres, E. M. Wülfers, M. Arp, E. D. Carruth, J. H. B. Bridge and F. B. Sachse: “Quantitative analysis of cardiac tissue including fibroblasts using three-dimensional confocal microscopy and image reconstruction: Towards a basis for electrophysiological modeling”, *IEEE Transactions on Medical Imaging*, 32(5), pp. 862–872, 2013.