Moritz Helmstaedter

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Education, Professional Experience

08/2014-present	Director at the Max Planck Institute for Brain Research, Frankfurt, Germany and Scientific Member of the Max Planck Society.
2011-2014	Group leader and Principal Investigator at the Max Planck Institute of Neurobiology, Munich, Germany.
2006-2011	Scientist (Postdoctoral fellow) at the Max Planck Institute for Medical Research, Heidelberg, Germany, Laboratory of Dr. Winfried Denk.
05-08/2006	Associate intern, McKinsey & Co., Stuttgart, Germany.
2001-2007	Doctoral thesis at the Max Planck Institute for Medical Research, Heidelberg, Germany, Laboratory of Dr. Bert Sakmann *(summa cum laude, issued 01/2010).*
1998-2007	Medical school, Ruprecht-Karls-University Heidelberg, Germany. *Approbation* (Medical license) 01/2008. Specialization during the practical year: Neurology
1998-2006	*Diplom* (M.Sc.) in Physics, Ruprecht-Karls-University Heidelberg, Germany

Scholarships, Awards

2013	Bernard Katz Lecture
2009	Otto Hahn Medal awarded by the Max Planck Society
1998-2006	German National Academic Merit Foundation (*Studienstiftung des Deutschen Volkes*), full scholarship

Professional Activities

Peer reviewer:
Biophysical Journal, Cerebral Cortex, The Journal of Neuroscience, Molecular Psychiatry, Nature, Nature Communications, Nature Methods, Nature Neuroscience, Neuroinformatics, PLoS Computational Biology, PLoS One, The Wellcome Trust.

Member of selection committees:
Max Planck Director, MPI for Biophysics, Frankfurt (2014); *Max Planck Research Group Leader*, Krakow, Poland (2014); *Max Planck Research Group Leader*, caesar, Bonn (2014); *German National Academic Merit Foundation* (since 2008).

Member: The Society for Neuroscience (since 2002).

Publications

Research Articles

Helmstaedter M, Briggman KL, Turaga S, Jain V, Seung HS, Denk W (2013) Connectomic reconstruction of the inner plexiform layer in the mouse retina. *Nature* 500: 168-174

Egger R, Narayanan RT, Helmstaedter M, de Kock CP, Oberlaender M (2012) 3D Reconstruction and Standardization of the Rat Vibrissal Cortex for Precise Registration of Single Neuron Morphology. *PLoS Comput Biol* 8(12):e1002837.

Andres B, Koethe U, Kroeger T, Helmstaedter M, Briggman KL, Denk W, Hamprecht FA (2012) 3D segmentation of SBFSEM images of neuropil by a graphical model over supervoxel boundaries. *Medical Image Analysis* 16:796-805.

Oberlaender M, de Kock CP, Bruno RM, Ramirez A, Meyer HS, Dercksen VJ, Helmstaedter M, Sakmann B (2012) Cell Type-Specific Three-Dimensional Structure of Thalamocortical Circuits in a Column of Rat Vibrissal Cortex. *Cerebral Cortex* 22(10):2375-91.

Meyer HS, Schwarz D, Wimmer VC, Schmitt AC, Kerr JN, Sakmann B, Helmstaedter M (2011) Inhibitory interneurons in a cortical column form hot zones of inhibition in layers 2 and 5A. *Proceedings of the National Academy of Sciences (PNAS)* 108:16807-16812

Helmstaedter M, Briggman KL, Denk W (2011) High-accuracy neurite reconstruction for high-throughput neuroanatomy. *Nature Neuroscience* 14:1081-1088 featured in “High-throughput anatomy: Charting the brain's networks” *Nature* 490:293–298

Briggman KL, Helmstaedter M, Denk W (2011) Wiring specificity in the direction-selectivity circuit of the mammalian retina. *Nature* 471:183-188

Meyer HS, Wimmer VC, Hemberger M, Bruno RM, de Kock CP, Frick A, Sakmann B, Helmstaedter M (2010) Cell Type-Specific Thalamic Innervation in a Column of Rat Vibrissal Cortex. *Cerebral Cortex* 20:2287-2303 *(Cover article).*

Meyer HS, Wimmer VC, Oberlaender M, de Kock CP, Sakmann B, Helmstaedter M (2010) Number and Laminar Distribution of Neurons in a Thalamocortical Projection Column of Rat Vibrissal Cortex. *Cerebral Cortex* 20:2277-2286.

Turaga S, Murray J, Jain V, Roth F, Helmstaedter M, Briggman KL, Denk W, Seung HS (2010) Convolutional networks can learn to generate affinity graphs for image segmentation. *Neural Computation* 22:511-538.

Helmstaedter M, Sakmann B, Feldmeyer D (2009) L2/3 interneuron groups defined by multiparameter analysis of axonal projection, dendritic geometry, and electrical excitability. *Cerebral Cortex* 19:951-962.

Helmstaedter M, Sakmann B, Feldmeyer D (2009) The relation between dendritic geometry, electrical excitability, and axonal projections of L2/3 Interneurons in rat barrel cortex. *Cerebral Cortex* 19:938-950.

Helmstaedter M, Sakmann B, Feldmeyer D (2009) Neuronal correlates of local, lateral, and translaminar inhibition with reference to cortical columns. *Cerebral Cortex* 19:926-937. (*Cover article*)

Helmstaedter M, Staiger JF, Sakmann B, Feldmeyer D (2008) Efficient recruitment of layer 2/3 interneurons by layer 4 input in single columns of rat somatosensory cortex. *Journal of Neuroscience* 28:8273-8284.

Frick A, Feldmeyer D, Helmstaedter M, Sakmann B (2008) Monosynaptic connections between pairs of L5A pyramidal neurons in columns of juvenile rat somatosensory cortex. *Cerebral Cortex* 18:397-406.

Schaefer AT*, Helmstaedter M*, Schmitt AC, Bar-Yehuda D, Almog M, Ben-Porat H, Sakmann B, Korngreen A (2007) Dendritic voltage-gated K+ conductance gradient in pyramidal neurones of neocortical layer 5B from rats. *Journal of Physiology* 579:737-752. ***equally contributing***

Schaefer AT, Helmstaedter M, Sakmann B, Korngreen A (2003) Correction of conductance measurements in non-space-clamped structures: 1. Voltage-gated K+ channels. *Biophysical Journal* 84:3508-3528.

Review Articles

Helmstaedter M (2013) Cellular-resolution connectomics: challenges of dense neural circuit reconstruction. *Nature Methods* 10:501-507 in Feature on Brain Mapping

Denk W, Briggman KL, Helmstaedter M (2012) Structural neurobiology: missing link to a mechanistic understanding of neural computation. *Nature Reviews Neuroscience* 13:351-358.

Helmstaedter M, Mitra PP (2012) Computational methods and challenges for large-scale circuit mapping. *Current Opinion in Neurobiology* 22:162-169.

Kleinfeld D, Bharioke A, Blinder P, Bock DD, Briggman KL, Chklovskii DB, Denk W, Helmstaedter M, Kaufhold JP, Lee WC, Meyer HS, Micheva KD, Oberlaender M, Prohaska S, Reid RC, Smith SJ, Takemura S, Tsai PS, Sakmann B (2011) Large-scale automated histology in the pursuit of connectomes *Journal of Neuroscience* 31:16125-16138.

Helmstaedter M, Briggman KL, Denk W (2008) 3D structural imaging of the brain with photons and electrons. *Current Opinion in Neurobiology* 18:633-641.

Ascoli GA, Alonso-Nanclares L, Anderson SA, Barrionuevo G, Benavides-Piccione R, Burkhalter A, Buzsaki G, Cauli B, Defelipe J, Fairen A, Feldmeyer D, Fishell G, Fregnac Y, Freund TF, Gardner D, Gardner EP, Goldberg JH, Helmstaedter M, Hestrin S, Karube F, Kisvarday ZF, Lambolez B, Lewis DA, Marin O, Markram H, Munoz A, Packer A, Petersen CC, Rockland KS, Rossier J, Rudy B, Somogyi P, Staiger JF, Tamas G, Thomson AM, Toledo-Rodriguez M, Wang Y, West DC, Yuste R (2008) Petilla terminology: nomenclature of features of GABAergic interneurons of the cerebral cortex. *Nature Reviews Neuroscience* 9:557-568.

Helmstaedter M, de Kock CP, Feldmeyer D, Bruno RM, Sakmann B (2007) Reconstruction of an average cortical column in silico. *Brain Research Reviews* 55:193-203.

Invited presentations

2016 113th International Titisee Conference, Titisee, Germany **2015** | Seminar TUD Dresden | Chinese-German Meeting "Brain Development: Basic mechanisms and diseases", Beijing | 5th Neuroscience Symposium, Cambridge | *Kolloquim*, Universität Ulm | Vollum Institute Portland, USA | *CapoCaccia Workshop*, Alghero, Italien | Annual winter conference, Soelden, Austria | Forschungszentrum Jülich | Annual Meeting German Physical Society | Lecture at Pasteur Institute, Paris | Plenary lecture, Annual Meeting Swiss Society for Neuroscience, Fribourg, Switzerland **2014** BMFZ Heine University Düsseldorf, Germany | Brain Mind Institute, EPFL, Lausanne, Switzerland | Plenary lecture, Meeting of the Italian Physiological Society - Isle of Capri, Italy | Harvard University, Boston | HHMI/Max Planck connectomics conference, Berlin (co-organizer) | Gordon Research Conference Synaptic Transmission, New Hampshire | Microscience and Microscopy Congress, Manchester | Jacques-Monod-Conference, Roscoff, France | CNCR Institute, VU University, Amsterdam | Workshop Physical, Engineering, and Biological Limits to Brain Measurements, Arlington | Microscopy club, Laser Laboratory, Göttingen | Collaborations in Neuroscience Symposium, Max Planck Florida Institute for Neuroscience, Jupiter | Max Planck Institute of Psychiatry, Munich | Annual Meeting Pro-Retina Foundation, Potsdam, Germany | Workshop Analyzing neural circuits and control theory, Cold Spring Harbor Laboratory | Department of Diagnostic Radiology, University Freiburg, Germany | Institute seminar, Max Planck Florida Institute for Neuroscience, Jupiter | Max Planck Meeting, Valparaiso, Chile **2013** MPI for Biological Cybernetics, Tübingen, Germany | NERF Neurotechnology Symposium, Leuven, Belgium | Workshop *Physical and Mathematical Principles of Brain Structure and Function*, NSF, Arlington | Workshop *Visualization in Medicine and Life Sciences*, Leipzig | Gatsby Unit, UCL, London | Microscopy & Microanalysis Conference, Indianapolis | Max Planck Institute for Brain Research, Frankfurt | caesar Conference, Bonn | Institut de la vision, Paris | International Society for Magnetic Resonance in Medicine workshop, Split, Croatia | Biology and Medicine Section of the Max Planck Society Symposium, Berlin | Bernard Katz Lecture, Israel Society for Neuroscience, Eilat **2012** Bernstein Center for Computational Neuroscience, Berlin | Ecole Superieure de la Physique et Chimie, Paris | Visual Computing Workshop, German Informatics Society, Berlin | FENS Symposium, Barcelona (Symposium Co-chair and speaker) | Conference *Next Generation Medical Imaging* Carnegie Mellon University, Pittsburgh | Bernstein Conference, Bernstein Center Munich | European Microscopy Conference, Royal Microscopical Society, Manchester | Workshop *Scaling up connectomics*, Janelia Farm Research Campus, HHMI | Institute of Neuroinformatics, ETH Zurich | Allen Institute for Brain Science, Seattle | Neural Information Processing Systems (NIPS) Meeting (Workshop co-organizer), Lake Tahoe **2011** PANOS conference, Dortmund, Germany | Microscopy conference, Kiel | Connectomics conference, Janelia Farm Research Campus, HHMI | NIMR, London | MPG/Tokyo University meeting, Tokyo | MRC, Cambridge **2010** Symposium *Cortical Column in silico*, Max Planck Florida Institute | Conference *Neuronal Circuits*, Cold Spring Harbor Laboratory | Conference *The Neural Basis of Vibrissa-Based Tactile Sensation*, Janelia Farm Research Campus, HHMI | Berlin Colloquium on Scientific Visualization, Konrad Zuse Institute, Berlin | Monday Seminar of the Institute for Brain Research, University of Zürich, Switzerland | HHMI Janelia Farm Research Campus | Center for Molecular and Behavioral Neuroscience, Rutgers University | Princeton Neuroscience Institute **2009** Berlin Circuit Conference HHMI/Max Planck Society | NINDS, National Institute of Health, Bethesda **2008** Barrels Meeting, Johns Hopkins University, Baltimore

Teaching experience

2015 ACCN, Lissabon, Portugal | Lecturer Donders Summer School on Neural Metrics, Nijmegen **2014** Lecturer, 3rd Latin-American Summer School in Computational Neuroscience, Valparaiso, Chile **2013** Lecturer, INCF sponsored course, University of Antwerp, Belgium **2012** Lecturer, PhD course, Universität Göttingen, Göttingen, Germany | Lecturer, PhD course, Karolinska Institutet, Stockholm, Sweden | Lecturer, PhD course, International Max Planck Research School, Münster, Germany | Lecturer, Barcelona Cognition, Brain and Technology Summer School, Barcelona, Spain | Lecturer, *Neuroinformatics Course*, Marine Biological Laboratory, Woods Hole **2011** Lecturer, *Neuroinformatics Course*, Marine Biological Laboratory, Woods Hole | Lecturer, PhD course *Staromics*, Université de

Fribourg, Switzerland | Lecturer, PhD course, University of Copenhagen, Denmark | Lecturer, *Workshop on Circuit & Molecular Architecture of the Vertebrate Brain,* Cold Spring Harbor Laboratory **2010** Lecturer, *Workshop on Circuit & Molecular Architecture of the Vertebrate Brain,* Cold Spring Harbor Laboratory | Speaker, Horizons in Molecular Biology, Max Planck Graduate School, Göttingen, Germany **2009** Lecturer, Graduate seminar *Introduction to Connectomics*, MIT and Harvard University, Cambridge **2008-2012** Lecturer and Instructor in *General Human Physiology* for the introductory practical courses for 1st and 2nd year medical students at Heidelberg University Medical School

Public media coverage / Public lectures

2015 *Campus Talks*, Bayerisches Fernsehen, München | **2014** Science, *Connectomics at the Cutting Edge* (webinar together with Jeff Lichtman) Link | Gehirn und Geist, *Der Netzwerk-Analysator* Link | Die Welt, *So wird die Hirnforschung zu einem großen Spiel* Link | Frankfurter Allgemeine Zeitung, *Kartograph des Gehirns* | Frankfurter Rundschau, *Die Vermessung des Gehirns - Einem Mysterium auf der Spur* Link | BioTechniques, *Mapping Neural Connections* Link | *Caesarium*, Center of Advanced European Studies and Research, Bonn Link | Bild der Wissenschaft (print), Link | BRα, *Brainflight – Forschung als Spiel,* Link | *Wissenschaft für Jedermann*, Campus Martinsried, Munich | *Science meets music* public lecture, Max Planck Florida Institute for Neuroscience, Jupiter | Hebrew University/Max Planck Brain Forum: Frontiers in Brain Research, Berlin | Laborjournal, *Hirnforschung @ Home*, Link | **2013** Stuttgarter Zeitung, *Das kartierte Gehirn*, Link | Deutschlandfunk, *Nächstes Level Großhinrinde*, Link | Wired, *Zweites Leben: Die Digitalisierung des Gehirns*, Link | Science writers guild New York, panel discussion | Tech open air, Berlin | DasGehirn.info, *Das Labyrinth im Gehirn*, Link | Focus (print), *Freiwillige Forscher* | Rundfunk Berlin-Brandenburg, Radio interview | Economist blog, *Crowdsourced connectomics: Mind games*, Link | Focus online, *Operation Brainflight: Mit dem Flugsimulator durchs Mäusehirn*, Link | DLD Conference, Munich, *Game Based Brain Reconstruction*, Link | **2012** DER SPIEGEL, *Im Flug durch das Gehirn*, Link | **2011** TEDx Vienna, *Brain Mapping*, Link

Science media coverage

2014 BioTechniques, *Mapping Neural Connections* Link, Science, *Investments Boost Neurotechnology Career Prospects* Link **2013** Nature Methods, *Neuroscience waves to the crowd*, Link | Science, *This is your brain: Mapping the connectome*, Link **2012** Nature, *High-throughput anatomy: Charting the brain's networks*, Link