Bernstein Preis
Computational Neuroscience
Hermann Cuntz

Ernst Strüngmann Institute
in Cooperation with Max Planck Society

FIAS Frankfurt Institute
for Advanced Studies

Work address:
Ernst Strüngmann Institut (ESI)
Deutschordenstraße 46
D-60528 Frankfurt/Main, Germany
Tel: +49-(0)-69-96769-540

Home address:
Ginnheimer Landstr 3
D-60847 Frankfurt/Main, Germany
Cell phone +49-(0)-176-72-198-196

hermann.neuro@gmail.com www.treestoolbox.org/hermann/

Research interest

Computational neuroscience
General goal: To understand the biophysics of neural processing as a function of single cells and circuits.

Positions

Ernst Strüngmann Institute (ESI) for Neuroscience in cooperation with Max Planck Society and Frankfurt Institute for Advanced Studies (FIAS) — Frankfurt (Germany)
Since 2014: Group leader and Research fellow.

Ernst Strüngmann Institute (ESI) for Neuroscience in cooperation with Max Planck Society — Frankfurt (Germany)
2011 – 2014: Guest scientist, affiliated independent group leader at the Institute of Clinical Neuroanatomy of the Goethe University.

University College London — London (UK)
2006 – 2011: Post-doc with Prof. Michael Häusser.
Research topic: Devising a theory of neuronal branching and modeling the network dynamics in the Purkinje cell layer of the Cerebellum.

Hebrew University — Jerusalem (Israel)
2004 – 2005: Post-doc with Prof. Idan Segev.
Research topic: Optimisation principles of dendritic structure with topographically arranged input.

Education

University of California at Berkeley (2000 - 2002) — Berkeley (US)
Max Planck Institute of Neurobiology (2002 - 2004) — Munich (Germany)
2000 – 2004: Ph.D. with Prof. Alexander Borst.
Thesis title: “Input organization of motion-sensitive interneurons in the fly” (magna cum laude).

Eberhard Karls Universität Tübingen — Tübingen (Germany)
Friedrich Miescher Laboratory (Max Planck Society)
1994 – 2000: Diploma degree in biology with Prof. Alexander Borst. Thesis: “Spatial distribution of membrane parameters in fly neurons: a modeling study”.

Publications

**equal first*
***equal last*

In preparation (selected):

1. Ebner C, Clopath C, Jedlicka P**, Cuntz H**. A novel rule of long-term synaptic plasticity in detailed neuron models (SFN 2015, in prep).

2. Cuntz H, Bird DA, Beining M, Hoffmann F, Platschek S, Deller T, Jedlicka P. A general principle of dendritic constancy – a neuron's size-invariant excitability (in prep).

3. Tatarnikova A, Mueller J, Schaffran B, Stuerner T, Cuntz H, Zhang Y, Nemethova M, Bogdan S, Small V, Tavosanis G. The Arp2/3 complex is required for *de novo* formation of dendritic branches (in prep).

4. Baltruschat L, Tavosanis G, Cuntz H. A developmental stretch-and-fill process that optimises dendritic space filling (SfN 2012, in prep).

5. Vormberg A, Effenberger F, Muellerleile J, Cuntz H. Universal features of dendrites through centripetal branch ordering (Bernstein Conference 2016, in prep).

6. Anton-Sanchez L, Effenberger F, Bielza C, Larrañaga P, Cuntz H. Local statistics of input space shape dendritic morphology (in prep).

7. Radic T, Jungenitz T, Singer M, Beining M, Cuntz H, Vlachos A, Deller T, Schwarzacher SW. Time-lapse imaging reveals highly dynamic structural maturation of postnatally born dentate granule cells in organotypic entorhino-hippocampal slice cultures (submitted).

8. Beining M, Mongiat LA, Schwarzacher SW, Cuntz H**, Jedlicka P**. A novel comprehensive and consistent electrophysiological model of dentate granule cells (SfN 2015, submitted).

9. Jungenitz T*, Beining M*, Radic T, Deller T, Cuntz H, Jedlicka P, Schwarzacher SW. Synaptic integration of newborn dentate granule cells in the adult rat brain (submitted).

10. Weigand M, Sartori F, Cuntz H. A universal transition from unstructured to structured neural maps (submitted).

Published:

11. Beining M*, Jungenitz T*, Radic T, Deller T, Cuntz H**, Jedlicka P**, Schwarzacher SW** (2016). Structural plasticity in the critical period of adult born dentate granule cell maturation. Brain Structure and Function Epub.

12. Bird AD, Cuntz H (2016). Optimal current transfer in dendrites. PLoS Computational Biology 12(5):e1004897.

13. Platschek S*, Cuntz H*, Vuksic M, Deller T, Jedlicka P (2016). A general homeostatic principle following lesion induced dendritic remodeling. Acta Neuropathol Commun 4(1):19.

14. Mazzoni A, Lindén H, Cuntz H, Lansner A, Panzeri S, Einevoll GT (2015). Computing the Local Field Potential (LFP) from Integrate-and-Fire Network Models. PLoS Computational Biology 11(12):e1004584.

15. Budd J, Cuntz H, Eglen S, Krieger P (2015). Editorial: Quantitative Analysis of Neuroanatomy. Frontiers in Neuroanatomy 9:143.

16. Schneider C, Cuntz H, Soltesz I (2014). A three-dimensional model of the rat dentate gyrus. PLoS Computational Biology 10(10):e1003921. (Featured image in October 2014 issue)

17. Cuntz H, Forstner F, Schnell B, Raghu SV, Borst A (2013). Preserving dendrite function under extreme scaling. PLoS One 8 (8): e71540.

18. Cuntz H, Mathy A, Häusser M (2012). A scaling law derived from optimal dendritic wiring. PNAS 109 (27): 11014–11018. (Press release and covered by medicalxpress and others)

19. Cuntz H (2012). The dendritic density field of a cortical pyramidal cell. Perspective article, invited submission for special issue in Frontiers in Neuroanatomy 6:2.

20. Cuntz H, Forstner F, Borst A, Häusser M (2011). The TREES toolbox – probing the basis of neuronal branching. Neuroinformatics 9(1): 91-96. News Item, invited submission, most popular download.

21. Cuntz H, Forstner F, Borst A, Häusser M (2010). One rule to grow them all: A general theory of neuronal branching and its practical application. PLoS Computational Biology 6(8): e1000877. (Featured image in August 2010 issue; selected by PLoS and kikim media for a prototype documentary film for the US Public Broadcasting Service; reviewed in Faculty 1000 by Prof. Olaf Sporns, ~20,000 downloads)

22. Phoka E*, Cuntz H*, Roth A, Häusser M (2010) A new approach for determining phase response curves reveals that Purkinje cells can act as perfect integrators. PLoS Computational Biology 6(4): e1000768.

23. Watt AJ, Cuntz H, Mori M, Nusser Z, Sjöström PJ, Häusser M (2009) Traveling waves in developing cerebellar cortex mediated by asymmetrical Purkinje cell connectivity. Nature Neuroscience 12:463-473. (Cover in April 2009 issue; reviewed as “exceptional” in Faculty 1000 by Prof. Marla Feller)

24. Cuntz H*, Forstner F*, Haag J, Borst A (2008) The morphological identity of insect dendrites. PLoS Computational Biology 4(12):e1000251. (Featured image in December 2008 issue; reviewed in Faculty 1000 by Prof. Eve Marder)

25. Weber F, Eichner H, Cuntz H, Borst A (2008) Eigenanalysis of a neural network for optic flow processing. New Journal of Physics 10:015013.

26. Cuntz H, Borst A, Segev I (2007) Optimization principles of dendritic structure. Theoretical Biology and Medical Modelling 4(1):21.

27. Cuntz H, Haag J, Forstner F, Segev I, Borst A (2007) Robust coding of flow-field parameters by axo-axonal gap junctions between fly visual interneurons. PNAS 104(24):10229–10233. (Press release)

28. Cuntz H, Haag J, Borst A (2003) Neural image processing by dendritic networks. PNAS 100 (19): 11082–11085. (Press release and covered by National geographics and others)

Book

Cuntz H, Remme M, Torben-Nielsen B, (Eds). The computing dendrite: from structure to function (2014). Springer Series in Computational Neuroscience, Vol 11, Springer.

Book chapters
***equal last*

1. Platschek S, Cuntz H**, Deller T**, Jedlicka P** (in press). Lesion-induced dendritic remodeling as a new mechanism of homeostatic structural plasticity in the adult brain. In: *Rewiring the brain: a computational approach to structural plasticity in the adult brain*, (Eds) van Ooyen A, Butz M, Elsevier.

2. Cuntz H (2016) Modelling dendrite shape. In: *Dendrites, 3rd edition*, (Eds) Stuart G, Spruston N, Häusser M, Oxford University Press.

3. Torben-Nielsen B, Cuntz H (2014) Dendrite morphology and quantitative analysis. In: *Dendritic computations through morphology and connectivity,* (Eds) Cuntz H, Remme M, Torben-Nielsen B, Springer.

4. Cuntz H (2014) Modelling dendrite shape from wiring principles. In: *Dendritic computations through morphology and connectivity,* (Eds) Cuntz H, Remme M, Torben-Nielsen B, Springer.

5. Cuntz H, Haag J, Borst A (2014) Modelling the cellular mechanisms of fly optic flow. In: *Dendritic computations through morphology and connectivity,* (Eds) Cuntz H, Remme M, Torben-Nielsen B, Springer.

6. Cuntz H, (2013) Models of fly lobula plate tangential cells (LPTCs). In: *Encyclopedia of Computational Neuroscience*, (Ed) Jaeger D, Jung R; invited by Gabbiani F, Springer.

7. Cuntz H, (2013) TREES toolbox. In: *Encyclopedia of Computational Neuroscience*, (Ed) Jaeger D, Jung R; invited by Gleeson P, Springer.

Other editorial work

Cuntz H, Eglen S, Krieger P (Eds). Quantitative analysis of neuronal anatomy. Frontiers in Neuroscience Research Topic and eBook (2016).

Other publications

Cuntz H, (2015) Computational Cajal – modelling the formation of neural circuits. Yearbook of the Max Planck Society 2015.

Cuntz H, (2013) Geburtshilfe für den Computer; Die neurowissenschaftlichen Wurzeln der Kybernetik. Gehirn und Geist (Spektrum der Wissenschaft) 3/2013: 86-87. Invited book review in German.

Fellowships and awards

Sept 2013:	Bernstein Award 2013 (€1,351,662.00)
June 2013:	DFG grant (rededicated, €257,315.00)
Feb 2011:	Wellcome Image Award 2011 (£200)
May 2010:	Guarantors of Brain, travel grant award
April 2010:	1st prize poster, UCL Neuroscience (£500)
April 2008 – April 2011:	Max Planck Fellowship
April 2006 – March 2008:	Alexander von Humboldt, Feodor Lynen Fellowship
June 2004 – June 2005:	Minerva Fellowship

Selected media outreach

Oct 2015:	Invited contribution to the Biennale entitled „Globale" at the Zentrum für Kunst und Medientechnologie (ZKM) in Karlsruhe
Jan 2015	Video installation at Open Day of the Zentrum für Kunst und Medientechnologie (ZKM) in Karlsruhe
Nov 2012:	Exhibition at Zentrum für Kunst und Medientechnologie (ZKM) Karlsruhe; video installation on panoramic screen 2.1m x 18.4m. Reviewed in Frieze Magazine
Aug 2012:	Video interview (15 min) about my work by Arvid Leyh for dasgehirn.info (title „Die Schönheit wachsender Dendriten")
June 2012:	Interview by Stuart Mason Dambrot for medicalxpress (title „Branching out: A mathematical law of dendritic connectivity")
May 2012:	Coverage of my work in Wired magazine (June issue)
Dec 2011:	Full article (5-pages) „the dendrite code" about my work in Gehirn und Geist (Spektrum der Wissenschaft)
May 2011:	Full documentary about my work by kikim media funded by the Alfred P. Sloan foundation and available at Public Broadcasting Service (PBS) and Sciencebytes.org
March 2011:	Contribution to University College London video sequence
March 2011:	Interview for BioTechniques
Feb 2011:	Wellcome Image Award 2011, exhibition at the Wellcome Collection (24. February – 10. July)
April 2005:	Interview for Israel21c
Oct 2003:	Short interview for National Geographic

Teaching	Since June 2015: Faculty member for the Bachelor program in Biology, course *Neurobiology I*	Frankfurt (Germany)
	Since August 2014: Faculty member for the Master of Interdisciplinary Neuroscience program, module *Computational Neuroanatomy*	Frankfurt (Germany)
	Since March 2014: Faculty member of the International Max-Planck Research School (IMPRS) for Neural Circuits (PhD program)	Frankfurt (Germany)
Other teaching	**EU advanced course in computational neuroscience (ACCN)**	
	Local organizer (with Jochen Triesch at the FIAS): Aug 2014	Frankfurt (Germany)
	Course lecturer: Aug 2013	Bedlewo (Poland)
	Course tutor: *supervision of individual projects of five students for four weeks each (total ~640 hours):*	
	Aug 2008	Freiburg (Germany)
	Aug 2005 and 2007	Arcachon (France)
	Aug 2004	Obidos (Portugal)
	Other	
	Oct 2013: Guest lecturer, Computational Neuroscience	Basel (Switzerland)
	Summer Semester 2011: Lecturer, Human Anatomy	Frankfurt (Germany)
	Dec 2006: Course tutor, “Dendritic patching workshop”	London (UK)
	May 2006: Guest lecturer, “Theoretical Neuroscience II”, at the Gatsby Computational Neuroscience Unit	London (UK)
Selected invited talks *(*shortlisted for faculty position)*	Apr 2016: Invited talk at “Digital representation of neuronal morphologies / tissue”	Okinawa (Japan)
	Apr 2016: Gutenberg Universität Mainz, invited by Prof. Carsten Duch	Mainz (Germany)
	Mar 2016: Invited talk at EITN “Dendritic Sophistication: From Structure to Function”	Paris (France)
	Sept 2015: Invited talk at workshop “Connectomic workbench”	Cambridge (UK)
	Mar 2015: Invited talk at workshop “Power laws and multiple scales in neural systems”	Paris (France)
	Feb 2015: Invited hacking at “Connectomics Analysis Workshop and Hackathon”	Janelia Farm (US)
	Nov 2014: Invited talk at Symposium “Principles of Brain Wiring”	Bochum (Germany)
	Sept 2013: Bernstein Award Lecture at the Bernstein Conference 2013	Tübingen (Germany)
	Sept 2013: Centre de Regulació Genòmica; invited by Prof. Mara Dierssen	Barcelona (Spain)
	June 2013: Philipps Universität Marburg; invited by Prof. Uwe Homberg	Marburg (Germany)
	May 2013: Invited talk at Dutch INCF meeting on “predictive modeling”	Nijmegen (Netherlands)

April 2013: Donders Institute Nijmegen, invited by Prof. Paul Tiesinga	Nijmegen (Netherlands)
*Feb 2013: Philipps Universität Marburg; invited by Prof. Anna Schubö	Marburg (Germany)
Dec 2012: Frankfurt Institute for Advanced Studies (FIAS); invited by Prof. Jochen Triesch	Frankfurt (Germany)
April 2012: Max Planck Institute (MPI) for Brain Research; invited by Prof. Gilles Laurent	Frankfurt (Germany)
*Dec 2011: Imperial College London; invited by Prof. Ross Ethier	London (UK)
July 2011: Helmholtz Research Center; invited by Prof. Markus Diesmann	Jülich (Germany)
July 2011: MRC Laboratory of Molecular Biology (LMB); invited by Dr. Gregory Jefferis	Cambridge (UK)
July 2011: Microsoft Research; invited by Prof. Stephen Emmott	Cambridge (UK)
July 2011: Friedrich Miescher Institute (FMI); invited by Dr. Karl Farrow and Dr. Botond Roska	Basel (Switzerland)
May 2011: Hertie-Institut für klinische Hirnforschung; invited by Dr. Fahad Sultan	Tübingen (Germany)
March 2011: Invited talk at 2nd NeuroML workshop by Padraig Gleeson	London (UK)
Nov 2010: Brain Corporation, Qualcomm; invited by Dr. Eugene Izhikevich	San Diego (US)
July 2010: Invited talk at FENS 2010 satellite meeting “Morphology and computations of single neurons”	Amsterdam (Holland)
March 2010: Massachusetts Institute of Technology (MIT); invited by Prof. Sebastian Seung	Boston (US)
Jan 2010: Ernst Strüngmann Institute (ESI) for Neuroscience; invited by Prof. Pascal Fries & Prof. Wolf Singer	Frankfurt (Germany)
*Jan 2010: Neurosciences Institute; invited by Prof. Gerald Edelman	San Diego (US)
*July 2009: Goethe Center for Scientific Computing; invited by Prof. Gabriel Wittum	Frankfurt (Germany)
June 2009: Goethe University, Clinical Neuroanatomy; invited by Prof. Thomas Deller	Frankfurt (Germany)
March 2009: Okinawa Institute of Science and Technology; invited stay for three weeks with Prof. Erik de Schutter, incl. invited talk	Okinawa (Japan)
May 2008: Invited talk at 47th Tutzing Symposion "Modelling and engineering of complex systems - from molecular assemblies to biological networks"	Tutzing (Germany)
Feb 2008: Invited talk at Joint meeting of Gatsby Computational Neuroscience Unit and Columbia University Center for Theoretical Neuroscience	New York (US)
Jan 2004: Max Planck Institute for Mathematics in the Sciences "neural networks and cognitive systems" seminar series; invited by Prof. Jürgen Jost	Leipzig (Germany)

	June 2003: FU Berlin Neurobiology department; invited by Prof. Bernd Grünewald and Prof. Randolf Menzel	Berlin (Germany)
Organised scientific events	July 2015: Official workshop of CNS*2015, “Dendrite function and wiring” with Dr. Michiel Remme and Dr. Ben Torben-Nielsen	Prague (Czech Rep)
	July 2013: Official workshop of CNS*2013, “Dendrite function and wiring” with Dr. Michiel Remme and Dr. Ben Torben-Nielsen	Paris (France)
	October 2012: Computational Neuroscience Social at SfN*2012. Invited chairman and organizer, approximate attendance 350.	New Orleans (US)
	July 2011: Official workshop of CNS*2011, “Dendrite function and wiring: experiments and theory” with Dr. Michiel Remme, Dr. Ben Torben-Nielsen and Prof. Jaap van Pelt	Stockholm (Sweden)

Selected conference attendance *(*poster or oral presentation)*

International

SfN: Chicago 2015*, New Orleans 2012*, Washington 2011*, San Diego 2010*, Washington 2008*, New Orleans 2003*, Miami Beach 1999
FENS: Amsterdam 2010, Lisbon 2004*
CNS: Prague 2015*; Paris 2013*; Stockholm 2011*, Berlin 2009, Edinburgh 2006, Chicago 2002*, Bruges 2000*
Cosyne: Salt Lake City 2010*, 2008*
Invertebrate Vision: Lund 2001*

Local

Bernstein Conference: Berlin 2016*, Heidelberg 2015*, Göttingen 2014, Tübingen 2013*
RMN^2 Biennial Meeting in Oberwesel 2014*
Meeting of the Dutch INCF (Neuroinformatics) in Nijmegen 2013*
Annual meeting of the German anatomical society in Frankfurt 2012*
UCL Neuroscience Symposium 2010*
Mathematical Neuroscience Meeting in Warwick 2007
Ein Gedi Meeting in Israel 2004, 2005*
Meeting of the Israel Society of Neuroscience in Eilat 2004*
Meeting of the German Neuroscience Society in Göttingen 1999, 2003*

Summer schools

Otto Loewi International Course in Eilat 2005
School of dendrites in Jerusalem 2005

Supervision

Master thesis
From 2017: Lisa Hilde Deters.

Master thesis
Since 2016: Alexandra Vormberg.

PhD thesis
Since 2015: André Castro.

Master thesis
2015: Christian Ebner. *With Dr. Peter Jedlicka*.

PhD thesis
Since 2014: Marvin Weigand.

MD thesis
Since 2012: Steffen Platschek. *With Dr. Peter Jedlicka and Prof. Thomas Deller.*

PhD thesis
Since 2012: Marcel Beining. *With Dr. Stephan Schwarzacher, Dr. Peter Jedlicka and Prof. Thomas Deller*.

Master thesis
2006 – 2007: Elena Phoka. Title of thesis: “The Phase response curves of cerebellar Purkinje cells”. *With Prof. Michael Häusser.*

Diploma thesis and PhD thesis
2005 – 2011: Friedrich Förstner. Title of Diploma thesis: “Modeling the neuroanatomy of interneurons in the visual system of the fly *calliphora vicina*”. Title of PhD thesis: “The morphological identity of insect dendrites”. *With Prof. Alexander Borst.*

Community work
Since 2016: **Associate editor**, Frontiers in Neuroanatomy
Since 2016: **Director**, Organization for Computational Neurosciences

Review editor for
Neuron, PNAS, Current Biology, eLife, PLoS Computational Biology, PLoS One, Frontiers in Cellular Neuroscience, Frontiers in Neuroanatomy, Biological Cybernetics, Cerebral Cortex, Neuroinformatics, Scientific Reports, Journal of Neurophysiology, Neuroscience, Neuroscience Letters, Journal of Computational Neuroscience, Journal of Neuroscience Methods

ERA-Net of the European Union, Air Force Office of Scientific Research, Dutch Research Council (NWO), German Research Foundation (DFG)

EU advanced course in computational neuroscience, CNS*2012, CNS*2013

Other
Member of Brains for Brains Award selection committee 2014 and 2015

Languages
English, French, German, basic Dutch

Service work
2002: McKinsey award “start social” for a project to build an international house in München. — München (Germany)

1993 – 1994: Terre des Hommes – Civil Service in a children’s home. — Wiesbaden (Germany)

Other activities
Opera singing (student of Cilla Grossmeyer and Zvi Semel), Piano, Painting.

Kids
Sophie (born 2 dec 2013)
Clara (born 2 dec 2013)
Lotte (born 8 feb 2016)