

# Vanguardia de la Neurociencia

DEPARTAMENTO DE ANATOMÍA, HISTOLOGÍA Y NEUROCIENCIA  
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Máster en  
Neurociencia  
UAM

## The role of higher-order thalamocortical input in cortical synaptic plasticity



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**Viernes, 18 de enero de 2019**  
**13 h, Seminario IV**

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## (G) BIOGRAPHICAL SKETCH

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NAME Holtmaat, Anthony	POSITION TITLE Professor of Neuroscience

### EDUCATION/TRAINING

INSTITUTION AND LOCATION	DEGREE	MM/YY	FIELD OF STUDY
University of Utrecht, The Netherlands	B.S.	04/92	Medical Biology
University of Utrecht, The Netherlands	Ph.D.	12/96	Neurobiology
Netherlands Institute for Brain Research	Postdoctoral	01/01	Neurobiology
Cold Spring Harbor laboratory, NY, USA	Postdoctoral	04/05	Neurobiology

### A. Personal Statement

The goal of my research is to understand the mechanisms of experience-dependent structural and functional plasticity in cortical neuronal circuits. My lab is embedded in the department of Basic Neurosciences at the Faculty of Medicine of the University of Geneva. We are supported by various facilities such as transgenic mice, sequencing, imaging and behavior platform facilities. My lab uses in vivo gene transfer techniques combined with long term in vivo 2-photon laser scanning microscopy, in vivo electrophysiology, intrinsic optical imaging, and optogenetics to image and manipulate the structure and function of individual synapses, dendrites and axons.

### B. Positions and Honors

#### Positions and Employment

- 2001-2003 Research Investigator, Netherlands Institute for Brain Research, Amsterdam, The Netherlands
- 2002-2003 Visiting Scientist, Svoboda-lab, Cold Spring Harbor Laboratories, NY, USA
- 2005-2007 Research Investigator, Cold Spring Harbor Laboratories, NY, USA
- 2007-2015 Associate Professor, Faculty of Medicine, University of Geneva, Switzerland
- 2016 Full Professor, Faculty of Medicine, University of Geneva, Switzerland

#### Other Experience, Professional Memberships, and Distinctions

- 1995-pres Member of the Society for Neuroscience, USA
- 1995-pres Member of the European Society for Neuroscience
- 1997, 2001 Co-organizer, International Summer School of Brain Research, Amsterdam, Netherlands
- 2001 Recipient of a Visiting Scientist travel stipend from the Netherlands Science Organization
- 2005-pres Reviewer for National Science Foundations and Funding Organizations (National Institute of Health [USA], Swiss National Science Foundation, Netherlands Organization for Scientific Research, Wellcome Trust, Medical Research Council [UK], French National Research Agency, Foundation for Polish Science, Vienna Science and Technology Fund, Austrian Science Fund)
- 2007-pres Reviewer for Scientific Journals (Nature, Science, Nature Neurosci, Neuron, EMBO Journal, eLife, J Neurosci, Cerebral Cortex, Eur J Neurosci, PLoS ONE, Learning and Memory, Brain Res, Nature Prot, J Neurosci Meth, Learning and Memory, Biol

- Rev, JoVE)
- 2007 Appointed at Alain Rossier Chair in the department of Basic Neuroscience Geneva, funded by the International Foundation for Research in Paraplegia,
- 2007-pres Member of the Swiss Society for Neuroscience
- 2008-pres Teaching in Neuroscience Masters program and 3<sup>rd</sup> year Medical Students (Neurology)
- 2008-pres Thesis committee member/examiner for more than 30 PhD students
- 2008-pres Thesis advisor of 7 PhD students
- 2008-pres Scientific advisor of 12 postdocs
- 2008-pres Annual Research Prizes committee, Faculty of Medicine, University of Geneva, Switzerland
- 2008-pres Appointed member of the Young Investigators Network of European Neuroscience Institutes
- 2009 Co-organizer, ENI-net meeting, Geneva, Switzerland
- 2010, '12 Co-organizer, IBRO/FENS Lemanic Neuroscience Summer School, Geneva/Lausanne, Switzerland
- 2010, '13, '17 Recipient of IRP Foundation Research Funding on behalf of a private donor
- 2011-pres Co-Director, Lemanic Neuroscience Doctoral School, Geneva, Switzerland
- 2011-pres Board member of the Geneva Neuroscience Center
- 2011-pres Medical center building logistics committee, Faculty of Medicine, University of Geneva, Switzerland
- 2016 Research prize 2016 of the Swiss Brain League

**C. Selected Peer-Reviewed Publications** (Selected from 60 publications; from newest to oldest)

- Williams L, **Holtmaat A.** (2018) Higher-order thalamocortical inputs gate synaptic long-term potentiation via disinhibition. *bioRxiv*. <https://doi.org/10.1101/281477>
- Niquille M\*, Limoni G\*, Markopoulos F\*, Cadilhac C, Prados J, **Holtmaat A**, Dayer A. (2018) Neurogliaform cortical interneurons expressing the serotonin receptor 3A originate from the preoptic area. *Elife*, pii: e32017. doi: 10.7554/eLife.32017
- Roelfsema PR, **Holtmaat A** (2018) Control of synaptic plasticity in deep cortical networks. *Nat. Rev. Neurosci.* 19: 166-180. Review
- Frangeul L, Kehayas V, Sanchez-Mut JV, Fièvre S, Krishna-K K, Pouchelon G, Telley L, Bellone C, **Holtmaat A**, Gräff J, Macklis JD, Jabaudon D. (2017) Input-dependent regulation of excitability controls dendritic maturation in somatosensory thalamocortical neurons. *Nat. Commun.* 8:2015
- Gala R\*, Lebrecht D\*, Sahlender DA, Jorstad A, Knott G, **Holtmaat A**, Stepanyants A. (2017) Computer assisted detection of axonal bouton structural plasticity in in vivo time-lapse images. *Elife* 6. pii: e29315. doi: 10.7554/eLife.29315
- Frazer S, Prados J, Niquille M, Cadilhac C, Markopoulos F, Gomez L, Tomasello U, Telley L, **Holtmaat A**, Jabaudon D, Dayer A. (2017) Transcriptomic and anatomic parcellation of 5-HT3AR expressing cortical interneuron subtypes revealed by single-cell RNA sequencing. *Nat. Commun.* 8: 14219
- Holtmaat A**, Caroni P. (2016) Functional and structural underpinnings of neuronal assembly formation in learning. *Nat. Neurosci.* 19: 1553-1562. Review
- Yau KW, Schätzle P, Tortosa E, Pagès S, **Holtmaat A**, Kapitein LC, Hoogenraad CC. (2016) Dendrites In Vitro and In Vivo Contain Microtubules of Opposite Polarity and Axon Formation Correlates with Uniform Plus-End-Out Microtubule Orientation. *J Neurosci.* 36:1071-85.
- Pagès S, Cane M, Randall J, Capello L, **Holtmaat A.** (2015) Single cell electroporation for

longitudinal imaging of synaptic structure and function in the adult mouse neocortex in vivo. *Front Neuroanat.* 9, 36.

10. Gambino F, Pagès S, Kehayas V, Baptista D, Tatti R, Carleton A, **Holtmaat A** (2014) Sensory-evoked LTP driven by dendritic plateau potentials in vivo. *Nature* 515, 116-119.
11. Bernardinelli Y, Randall J, Janett E, Nikonenko I, König S, Jones EV, Flores CE, Murai KK, Bochet CG, **Holtmaat A**, Muller D (2014) Activity-dependent structural plasticity of perisynaptic astrocytic domains promotes excitatory synapse stability. *Curr Biol* 24: 1679-1688.
12. Maco B, Cantoni M, **Holtmaat A**, Kreshuk A, Hamprecht FA, Knott GW (2014) Semiautomated correlative 3D electron microscopy of in vivo-imaged axons and dendrites. *Nat Protoc* 9:1356-1366.
13. Pouchelon G, Gambino F, Bellone C, Telley L, Vitali I, Lüscher C, **Holtmaat A**, Jabaudon D (2014) Modality-specific thalamocortical inputs instruct the identity of postsynaptic L4 neurons. *Nature* 511: 471-474.
14. Cane M, Maco B, Knott G, **Holtmaat A** (2014) The relationship between PSD-95 clustering and spine stability in vivo. *J Neurosci* 34: 2075-2086.
15. Murmu RP, Li W, **Holtmaat A**, Li JY (2013) Dendritic spine instability leads to progressive neocortical spine loss in a mouse model of Huntington's disease. *J Neurosci* 33: 12997-3009.
16. Schubert V, Lebrecht D, **Holtmaat A** (2013) Peripheral deafferentation-driven functional somatosensory map shifts are associated with local, not large-scale dendritic structural plasticity. *J Neurosci* 33: 9474-9487.
17. Gambino F, **Holtmaat A** (2012) Spike-timing-dependent potentiation of sensory surround in the somatosensory cortex is facilitated by deprivation-mediated disinhibition. *Neuron* 75: 490-502.
18. Wilbrecht L, **Holtmaat A**, Wright N, Fox K, Svoboda K (2010) Structural plasticity underlies experience-dependent functional plasticity of cortical circuits. *J. Neurosci* 30: 4927-4932.
19. **Holtmaat A**, Svoboda K (2009) Experience-dependent structural synaptic plasticity in the mammalian brain. *Nature Rev Neurosci* 10: 647-658. Review.
20. **Holtmaat A** et al. (2009) Long-term, high resolution imaging in the mouse neocortex through a chronic cranial window. *Nature Protoc* 4: 1128-144.
21. Knott G\*, **Holtmaat A\***, Wilbrecht L, Welker E, Svoboda K (2006) Spine growth precedes synapse formation in the adult neocortex in vivo. *Nature Neurosci* 9: 1117-1124.
22. **Holtmaat A\***, Wilbrecht L\*, Knott G, Welker E, Svoboda K (2006) Experience-dependent and cell-type specific spine growth in the neocortex. *Nature* 441: 979-983.
23. De Paola V, **Holtmaat A**, Knott G, Song S, Wilbrecht L, Caroni P, Svoboda K (2006) Cell type-specific structural plasticity of axonal branches and boutons in the adult neocortex. *Neuron* 49:861-875. 979-983.
24. **Holtmaat A**, Trachtenberg JT, Wilbrecht L, Shepherd GM, Zhang X, Knott GW, Svoboda K (2005) Transient and persistent dendritic spines in the neocortex in vivo. *Neuron* 45:279-291.