

# Benjamin Torben-Nielsen

Born: May 21, 1982 – Bilzen, Belgium  
Nationality: Belgian

Computational Neuroscience Unit  
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## Current position

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*Group leader* in the Computational Neuroscience Unit headed by Erik De Schutter.

## Areas of specialization

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Computational neuroscience, Neuroinformatics, Single-neuron computation, Dendritic morphology Conductance-based network models, Data mining & analysis, Machine learning.

## Previous positions

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- 2012-2013 Post-doctoral fellow at the Blue Brain Project, École Polytechnique Fédérale de Lausanne (EPFL), Switzerland. (Continued as external collaborator)
- 2010-2012 Post-doctoral fellow with Idan Segev and Yosi Yarom at the Interdisciplinary Center for Neural Computation and the Department of Neurobiology, Hebrew University Jerusalem. Position funded by a Marie Curie Initial Training Network grant
- 2008-2010 Post-doctoral fellow at the Theoretical and Experimental Neurobiology Unit, Okinawa Institute of Science and Technology, Japan
- 2007 Visiting researcher at the Okinawa Institute of Science and Technology, Japan
- 2004 Freelance IT consultant
- 2003 Research assistant at the McLuhan Institute, Maastricht University, the Netherlands
- 2001-2002 Research assistant at the Computer science department, Maastricht University, the Netherlands

## Education

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- 2004-2008 **PhD in Artificial Intelligence & Neuroscience**, University of Tilburg  
Thesis title: “Dendritic Morphology: function shapes structure”  
Supervisors: Prof.dr. H.J. van den Herik and Prof.dr. E.O. Postma
- 2000-2004 **MSc in Computer science, specialization: Artificial Intelligence**, Maastricht University  
Thesis title: “New ears for a robot cricket”

Supervisors: Prof.dr. H.J. van den Herik and Prof.dr. E.O. Postma (research performed under supervision of Prof.dr. B. Webb, see internship)

2004 Internship at the Institute of Action, Perception and Behaviour, Edinburgh University.

#### Grants, honors & awards

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- 2012 MARCS institute grant for Visiting fellows at the University of Western Sydney (declined)  
2010 Marie Curie Fellowship  
2009 INCF collaboration grant  
2006 Selected as participant for the 2006 Okinawa Computational Neuroscience Course (fully funded)  
2005-2008 Awarded travel grants to present at the following meetings: ICJNN, ECAL, AISB, CNS

#### Publications & Presentations

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##### BOOK

- 2013 *The computing dendrite: from structure to function*, Eds Cuntz, H., Remme, M., Torben-Nielsen, B., Springer, New York, US.

##### JOURNAL ARTICLES

- 2014 Torben-Nielsen, B., De Schutter, E., *Context-aware modeling of neuronal morphologies*. *Frontiers in neuroanatomy*, 8:92.  
2014 Laudanski, J.\*, Torben-Nielsen, B.\*, Segev, I., Shamma, S., *Spatially distributed dendritic resonance selectively filters synaptic input*. *PLoS Computational Biology*, 10(8): e1003775  
2014 Torben-Nielsen, B., *An efficient and extendable Python library to analyze neuronal morphologies*. *Neuroinformatics* 12:619-622  
2014 Torben-Nielsen, B., *Synthetic neuronal morphology*. *Encyclopedia of Computational neuroscience*, Springer (invited entry)  
2013 Stiefel K.M., Torben-Nielsen, B., Coggan, J.S., *Proposed evolutionary changes in the role of myelin*. *Frontiers in Neuroscience* 7:202  
2013 Wybo, W., Stiefel, K.M., Torben-Nielsen, B., *The Green's function formalism as a bridge between single and multi-compartmental modeling*. *Biological Cybernetics* 107(6):685-694  
2013 Lefler Y., Torben-Nielsen B., Yarom Y, *Oscillatory activity, phase differences and phase resetting in the inferior olivary nucleus*. *Front in Systems Neuroscience*. 7:22  
2013 Memelli H.\*, Torben-Nielsen B.\*, Kozloski J., *Self-referential forces are sufficient to explain different dendritic morphologies*. *Frontiers in Neuroinformatics* 7:1. (with commentary)  
2012 Torben-Nielsen B., Segev I., Yarom, Y., *The generation of phase differences and frequency changes in a network model of Inferior Olive subthreshold oscillations*. *PLoS Computational Biology* 8(7): e1002580  
2010a Torben-Nielsen B., Stiefel K.M., *An inverse approach for elucidating dendritic function*. *Frontiers in Computational Neuroscience* 4:128.  
2010b Torben-Nielsen B., Stiefel K.M., *Wide-field motion integration in fly VS cells: insights from an inverse approach*. *PLoS Computational Biology* 6(9): e1000932.

- 2010c Torben-Nielsen B., Uusisaari M., Stiefel K.M., *A comparison of methods to determine neuronal phase-response curves*. *Frontiers in Neuroinformatics* 4:6.
- 2009 Torben-Nielsen B., Stiefel K.M., *Systematic mapping between dendritic function and structure*. *Network: Computation in Neural Systems*, 20(2): 69 - 105.
- 2008a Torben-Nielsen B., Vanderlooy S., Postma E.O., *Non-parametric algorithmic generation of neuronal morphologies*. *Neuroinformatics* 6:257–277.
- 2008b Torben-Nielsen, B., Tuyls, K. , Postma E.O., *EvOL-Neuron: virtual neuron generation*, *Neurocomputing* 71(4-6): 963-972.
- 2006 Reeve R., van Schaik A., Jin C., Hamilton T., Torben-Nielsen B., Webb B., *Directional hearing in a silicon cricket*. *BioSystems* 87(2-3):307–313.

#### BOOK CHAPTERS AND PROCEEDINGS

- 2013 Torben-Nielsen, B., Cuntz, H., *Dendritic morphology*. in “The computing dendrite: from structure to function”, Eds. Cuntz H., Remme M. and Torben-Nielsen B. Springer, New York
- 2013 Remme, M., Torben-Nielsen, B., *Dendritic computation*. in “The computing dendrite: from structure to function”, Eds. Cuntz H., Remme M. and Torben-Nielsen B. Springer, New York
- 2013 Stiefel, K.M., Torben-Nielsen, B., *Optimized Dendritic Morphologies for Noisy Inputs*. in “The computing dendrite: from structure to function”, Eds. Cuntz H., Remme M. and Torben-Nielsen B. Springer
- 2013 Alva, P., de Sousa, G., Torben-Nielsen, B., Maex, R., Davey, N., Adams, R. and Steuber, V., *Evolution of Dendritic Morphologies Using Deterministic and Nondeterministic Genotype to Phenotype Mapping*. ICANN 2013 Proceedings, LNCS 8131, pp 319-326 , Springer-Verlag, Heidelberg
- 2009 Torben-Nielsen B., Stiefel K.M., *Multi-scale modeling of cortical networks*. Multi-scale phenomena in biology workshop proceedings, AIP Conf. Proc. 1167, pp. 15-25.
- 2007a Torben-Nielsen B., *Evolving Virtual Neuronal Morphologies: a case study in Genetic L-Systems Programming*. ECAL Proceedings, LNAI 4648 eds. Almeida e Costa, F. et al., pp. 1089-1099, Springer-Verlag, Heidelberg.
- 2007b Torben-Nielsen B., Tuyls K. , Postma E.O., *On the neuronal morphology-function relationship: a synthetic approach*, LNBI 4366 eds. Tuyls, K. et al, pp. 131-144, Springer-Verlag, Heidelberg.
- 2006a Torben-Nielsen B., Tuyls K. , Postma E.O., *Shaping Realistic Neuronal Morphologies: an Evolutionary Computation Method*, WCCI2006, International Joint Conference on Neural Networks (IJCNN), Vancouver, Canada.
- 2006b Torben-Nielsen B., Tuyls K. , Postma E.O., *Towards Robotic Self-repair by means of Neuronal Remodelling*, Kovacs, T. and Marshall, James A.R. (Eds.): AISB’06, Biologically Inspired Robotics (BIRO-NET), Bristol, UK.
- 2005a Torben-Nielsen B., de Croon G., Postma E.O., *Timing is important: delaying action execution in Plastic Neural Networks*, BNAIC 2005.
- 2005b Torben-Nielsen B., Webb B., Reeve R., *New ears for a robot cricket*, W. Duch et al. (Eds.): ICANN 2005, LNCS 3696, pages 297-304.

## VARIOUS PRESENTATIONS

- 2015 *Probing the consequence of microscopic growth-cone dynamics on adult neuronal morphology.* Lab for genetic control of neuronal architecture, Riken Brain Sciences Institute, Tokyo, Japan, 26-03-2015.
- 2015 *Purkinje cells: does the forest shapes the trees?* Institute for Integrated Cell-Material Sciences, Kyoto University, Kyoto, Japan, 19-02-2014.
- 2015 *Purkinje cells: does the forest shapes the trees?* Presentation at the “Recent Findings on the Cerebellar Microcircuitry” workshop, Okinawa Institute of Science and Technology, Okinawa, Japan, 28-01-2014.
- 2014 *Context-aware modelling of neuronal morphologies and circuits.* Krasnow institute for advanced study, George Mason University, VA, US, 21-11-2014.
- 2014 *Context-aware modelling of neuronal morphologies and circuits.* McGill University, Montreal, Canada, 24-07-2014.
- 2012 *Network phenomena in the Inferior Olive.* Mini-symposium on the Olivo-Cerebellar system, Netherlands Institute for Neuroscience 03-02-2012.
- 2011 *An inverse approach to elucidate dendritic computations.* Presentation at the 12th Otto Loewi conference, Eilat, Israel, 27/30-11-2011.
- 2011 *Generation and maintenance of phase-differences in a network model of the Inferior Olive.* Seminar at the IBM Watson research center, NY, USA, 17-11-2011.
- 2010 *Insights in dendritic function from an inverse approach.* Seminar at the Neuroinformatics Research Group, VU University Amsterdam, 09-01-2010.
- 2009 *VS cells are optimized wide-field motion detectors.* Seminar at the Neural Computation Group, University of Hertfordshire, UK, 29-07-2009.
- 2009 *Function shapes structure: insights from optimizing neuronal morphologies.* Seminar at the Redwood Center for Neuroscience, Berkely, USA, 05-03-2009.
- 2008 *Fake real neurons as next generation robot controller?* Presentation at the Single-neuron modeling workshop, Tilburg University, the Netherlands, 02-12-2008.
- 2008 *Optimizing neuronal morphologies and implications for mobile robotics.* Presentation at Almende, Rotterdam, the Netherlands, 28-11-2008.

## Teaching

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- Main instructor for the course “Situated agents”; I designed the curriculum together with Prof.dr. E.O. Postma. (Msc level, Dept computer science, Maastricht University)
- Instructor for the courses:
  - Data structures and algorithms (BSc level, Dept. Computer science, Maastricht University)
  - Intelligent systems (Msc level, Dept. Computer Science, Maastricht University)
  - Multi-agent systems (Msc level, Dept. Computer Science, Maastricht University)
  - Modeling nature (BA level, University College Maastricht)

- Supervision: BSc student (Hebrew University), MSc students (Maastricht University, Hebrew University), PhD students (EPFL, OIST), and Post-docs (OIST)
- Summer schools:
  - Telluride Neuromorphic engineering workshop: Invited lecturer for the “dendrites” track.
  - Okinawa Computational Neuroscience Course (OCNC): Invited tutor 2010-2014. Head tutor in charge of organizing the tutors and tutorials in 2011-2014. Taught Python and Matlab programming as well as programming in the NEURON simulator.

### Scientific activities

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2015-2017	Elected director of the Organization for Computational Neurosciences.
2013	Organizer of the “Dendrite function and wiring: experiments and theory” meeting, July 27, 2013. Paris, France. (Co-organizer with Hermann Cuntz and Michiel Remme)
2012-2014	Elected program committee member of the Computational Neuroscience Meeting. (3 year mandate)
2012-present	Review editor Frontiers in Computational neuroscience.
2011	Organizer of the “Dendrite function and wiring: experiments and theory” meeting, July 29, 2011. Stockholm, Sweden. (Co-organizer with Hermann Cuntz, Michiel Remme and Jaap van Pelt)
2010	Organizer of the “Single neuron morphology & function” meeting, July 7-8, 2010. Amsterdam, the Netherlands. (Co-organizer with Jaap van Pelt, Arjen van Ooyen en Klaus Stiefel)
2008	Organizer of the “Single neuron modeling workshop”, Tilburg University, the Netherlands.
2006-present	Ad-hoc reviewer for “Scientific reports”, “Frontiers in neuroanatomy”, “Brain, Behaviour and Evolution”, “Neuroinformatics”, “Neurocomputing”, “Biological cybernetics”, “Consciousness and cognition”, Conferences: CNS meeting, ICJNN, BNAIC

### Professional skills

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Informatics skills: Programming (Python, Java, NEURON, Matlab, C, C++, PHP), Parallel computing (MPI, ZeroMQ, multi-agent programming, multi-threading), databases (PostgreSQL, MySQL, SQLite), typesetting ( $\LaTeX$ ,  $X\LaTeX$ ), Operating systems (Linux, MacOSX, Windows)

Language skills: Dutch (native), English (fluent), French (advanced), Japanese (beginner)