

Erasmus University Rotterdam, the Netherlands
CSC PhD 2015 Project Description

School/Department:	Department of Neuroscience, Erasmus MC, University Medical Center Rotterdam, the Netherlands.
Project Title:	Neuronal activity in the colliculus inferior in a tinnitus mouse model
Abstract:	Tinnitus is a disabling disorder, which is characterized by the perception of a sound in the absence of an acoustic source in the environment. What causes tinnitus is still largely unclear, but a potential role for the dorsal cortex of the inferior colliculus has been indicated in several studies. The aim of this project is to identify the underlying mechanisms of changes in the firing behavior of neurons in the dorsal cortex of the inferior colliculus that occur when a mouse experiences tinnitus. Recent developments in genetically encoded calcium indicators have made it possible to monitor the <i>in vivo</i> firing activity of a population of neurons using a two-photon microscope, allowing for the first time to correlate changes in the activity of identified neurons with tinnitus behavior.
Requirements of candidate:	Background: Strong interest in Neuroscience Master degree: Yes, Biology, Medicine or Physics. IELTS Grade: 6.5 (<i>minimal 6.0 per component</i>)
Supervisor information:	<p>Prof. Dr. J. Gerard G. Borst (g.borst@erasmusmc.nl)</p> <p><u>Links:</u> http://www.neuro.nl (Department of Neuroscience) http://beta.neuro.nl/research/borst (personal research page) http://www.onwar.nl (Graduate school)</p> <p><u>Publications 2010-2014:</u> Borst, J.G.G. (2010) The low synaptic release probability <i>in vivo</i>. <i>Trends Neurosci</i> 33: 259-266. Groffen A.J., Martens S., Arazola R.D., Cornelisse L.N., Lozovaya N., de Jong A.P.H., Goriounova N.A., Habets R.L.P., Takai Y., Borst J.G.G., Brose N., McMahon H.T., Verhage M. (2010) Doc2b is a high-affinity Ca²⁺ sensor for spontaneous neurotransmitter release. <i>Science</i> 327: 1614-1618. Nagtegaal, A.P. and Borst, J.G.G. (2010) An <i>in vivo</i> dynamic clamp study of <i>I_h</i> in the mouse inferior colliculus. <i>J. Neurophysiol.</i> 104:940-948.</p>

	<p>*Tritsch, N.X., *Rodríguez-Contreras, A., Crins, T.T.H., Wang, H.C., Borst, J.G.G. and Bergles, D.E. (2010) Calcium action potentials in hair cells pattern auditory neuron activity before hearing onset. <i>Nature Neurosci.</i> 13: 1050-1052.</p> <p>van Hoeve J.S. and Borst, J.G.G. (2010) Delayed appearance of the scaffolding proteins PSD-95 and Homer-1 at the developing rat calyx of Held synapse. <i>J. Comp. Neurol.</i> 518: 4581-90.</p> <p>Lorteije, J.A.M. and Borst, J.G.G. (2011) Contribution of the mouse calyx of Held synapse to tone adaptation. <i>Eur. J. Neurosci.</i> 33: 251-8.</p> <p>Rusu, S.I. and Borst, J.G.G. (2011) Developmental changes in intrinsic excitability of principal neurons in the rat medial nucleus of the trapezoid body. <i>Dev. Neurobiol.</i> 71: 284-95.</p> <p>Kuenzel, T., Borst, J.G.G. and van der Heijden, M. (2011) Factors controlling the input-output relation of spherical bushy cells in the gerbil cochlear nucleus. <i>J. Neurosci.</i> 31: 4260-73.</p> <p>Geis, H.-R., van der Heijden, M. and Borst, J.G.G. (2011) Subcortical input heterogeneity in the mouse inferior colliculus. <i>J. Physiol.</i> 589.16: 3955-67.</p> <p>Crins, T.T.H., Rusu, S.I., Rodríguez-Contreras, A. and Borst, J.G.G. (2011) Developmental changes in short-term plasticity at the rat calyx of Held synapse. <i>J. Neurosci.</i> 31: 11706-17.</p> <p>Borst, J.G.G. and van Hoeve, J.S. (2012) The calyx of Held synapse: from model synapse to auditory relay. <i>Ann Rev Physiol.</i> 74:199-224.</p> <p>Spoor M., Nagtegaal A.P., Ridwan Y., Borgesius N.Z., van Alphen B., van der Pluijm I., Hoeijmakers J.H.J., Frens M.A. and Borst J.G.G. (2012) Accelerated loss of hearing and vision in the DNA-repair deficient <i>Ercc1</i>^{δ/-} mouse. <i>Mech Ageing Dev.</i> 133: 59-67.</p> <p>Nagtegaal, A.P., Spijker, S., Crins, T.T., Neuro-Bsik Mouse Phenomics consortium, Borst, J.G.G. (2012) A novel QTL underlying early-onset, low frequency hearing loss in BXD recombinant inbred strains. <i>Genes Brain Behav.</i> 11: 911-20.</p> <p>Klug, A., Borst, J.G.G., Carlson, B.A., Kopp-Scheinpflug, C., Klyachko, V.A. and Xu-Friedman, M.A. (2012) How do short-term changes at synapses fine-tune information processing? <i>J. Neurosci.</i> 32: 14058-14063.</p> <p>Geis, H.-R.A.P. and Borst, J.G.G. (2013) Large GABAergic neurons form a distinct subclass within the mouse dorsal cortex of the inferior colliculus with respect to intrinsic properties, synaptic inputs, sound responses, and projections. <i>J Comp Neurol.</i> 521: 189-202.</p>
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	<p>Geis, H.-R.A.P. and Borst, J.G.G. (2013) Intracellular responses to frequency modulated tones in the dorsal cortex of the mouse inferior colliculus. <i>Front. Neural Circuits</i> 7: 7. doi:10.3389/fncir.2013.00007.</p> <p>van der Heijden, M.*, Lorteije, J.A.M.*, Plauška, A., Roberts, M.T., Golding, N.L. and Borst, J.G.G. (2013) Directional hearing by linear summation of binaural inputs at the Medial Superior Olive. <i>Neuron</i> 78: 936-948.</p> <p>Wang, T., Rusu, S.I., Hruskova, B., Turecek, R. and Borst, J.G.G. (2013) Modulation of synaptic depression of the calyx of Held synapse by GABA_B receptors and spontaneous activity. <i>J. Physiol.</i> 591: 4877-4894.</p> <p>Di Guilmi M.N., Wang, T., Gonzalez Inchauspe, C., Forsythe, I.D., Ferrari, M.D., van den Maagdenberg, A.M.J.M., Borst, J.G.G. and Uchitel, O.D. (2014) Synaptic gain-of-function effects of mutant Ca_v2.1 channels in a mouse model of familial hemiplegic migraine are due to increased basal [Ca²⁺]_i. <i>J. Neurosci.</i> 34: 7047-7058.</p> <p>*equal contribution</p>
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