

Curriculum Vitae – August 2017

Jonathan A. Michaels

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Education: Dr. rer. nat. Systems Neuroscience (summa cum laude), GGNB, Georg-August-Universität Göttingen (2017). Dissertation: *“Towards population coding principles in the primate premotor and parietal grasping network”*

Bachelor of Science (Honours), Queen’s University (2011), Kingston, Canada. Dissertation: *“Influence of water maze learning on low-frequency-induced synaptic potentiation in the rat hippocampus”*

Positions:

- 5/2017 – Present Postdoctoral Fellow, Laboratory of Krishna V Shenoy, Howard Hughes Medical Institute at Stanford University, California, United States.
- 1/2017 – 5/2017 Transitional Postdoctoral Fellow, Neurobiology Lab of Hansjörg Scherberger, German Primate Center, Göttingen, Germany.
- 9/2011 – 1/2017 Graduate Student, Neurobiology Lab of Hansjörg Scherberger, German Primate Center, Göttingen, Germany.
- 9/2010 – 5/2011 Bachelor Student, Neuroplasticity Lab of Hans C. Dringenberg, Queen’s University, Kingston, Canada.
- 5/2009 – 8/2011 Undergraduate Researcher, Integrative Motor Behaviour Lab of Stephen H. Scott, Queen’s University, Kingston, Canada.
- 9/2008 – 5/2009 Research Assistant, Language and Cognition Lab of Stanka A. Fitneva, Queen’s University, Kingston, Canada.

Research:

Doctoral Research: Neural population dynamics of reaching and grasping movements in primary motor, premotor, and parietal cortex of monkeys using single-electrode and multi-electrode array electrophysiology. Recurrent neural network modelling and training. Dimensionality reduction methods.

Skills: Animal care, training, and surgery (monkey and rat). Neural data acquisition and processing (experimental design, recording, spike sorting, etc.). EMG recording. Kinematic tracking (video-based and magnetic-based) and musculoskeletal modeling.

Awards and Honours:

Sloan-Swartz Scholarship (2016).

Neural Control of Movement Scholarship (2016).

Doctoral Thesis awarded “summa cum laude” (2016).

Dean’s Honour List, Queen’s University, Kingston, Canada (2009 – 2011).

Peer-reviewed publications:

- Michaels JA**, Dann B, Scherberger H (2016). Neural population dynamics during reaching are better explained by a dynamical system than representational tuning. *PLOS Computational Biology*, 12(11), e1005175. doi:10.1371/journal.pcbi.1005175.
- Michaels JA**, Scherberger H (2016). hebbRNN: A reward-modulated Hebbian learning rule for recurrent neural networks. *The Journal of Open Source Software*. doi:10.21105/joss.00060.
- Dann B, **Michaels JA**, Schaffelhofer S, Scherberger H (2016). Uniting functional network topology and oscillations in the fronto-parietal single unit network of behaving primates. *eLife*. doi:10.7554/eLife.15719.
- Michaels JA**, Dann B, Intveld RW, Scherberger H (2015). Predicting reaction time from the neural state space of the premotor and parietal grasping network. *Journal of Neuroscience*, 35(32), 11415–11432. doi:10.1523/JNEUROSCI.1714-15.2015.
- Yang L, **Michaels JA**, Pruszynski JA, Scott SH (2011). Rapid motor responses quickly integrate visuospatial task constraints. *Experimental Brain Research*, 211(2): 231-242. doi:10.1007/s00221-011-2674-3.

In-progress publications:

- Michaels JA***, Dann B*, Intveld RW, Scherberger H (2017). Neural dynamics of variable grasp movement preparation in the macaque fronto-parietal network. *bioRxiv*. doi:10.1101/179143
- Michaels JA**, Scherberger H (2017). Population coding of grasp and laterality-related information in the macaque fronto-parietal network. *bioRxiv*. doi:10.1101/179184
- Michaels JA**, Schaffelhofer S, Agudelo-Toro A, Scherberger H (in prep). A modular neural network model of the primate grasping circuit.
- Dann B*, **Michaels JA***, Scherberger H (in prep). Three information subspaces explain the category-free population dynamics in the macaque fronto-parietal network.
- Intveld RW, Dann B, **Michaels JA**, Scherberger H (in prep). Strong coding of grasp force planning and execution in macaque areas F5, M1, and AIP.

Conference Proceedings:

- Dann B, **Michaels JA**, Scherberger H (2016). Separable decoding of cue, intention, and movement information from the fronto-parietal grasping-network. *Proceedings of the Sixth International Brain-Computer Interface Meeting: BCI Past, Present, and Future*, 218. doi:10.3217/978-3-85125-467-9.

Talks:

- A modular neural network model of the primate grasping circuit (nanosymposium). *46th Annual Meeting of the Society for Neuroscience*. Washington, November 14th, 2017.
- A recurrent neural network model of the visuomotor grasp generation circuit (nanosymposium). *45th Annual Meeting of the Society for Neuroscience*. San Diego, November 16th, 2016.

- Continuous decoding of hand grips with a high dimensional brain computer interface (nanosymposium, presenting in place of Andres Agudelo-Toro). *45th Annual Meeting of the Society for Neuroscience*. San Diego, November 16th, 2016.
- A recurrent neural network model of the visuomotor grasp generation circuit. *Sloan-Swartz Centers for Theoretical Neurobiology Annual Meeting*. Pasadena, August 3rd, 2016. Travel grant awarded.
- Probing and modeling the continuum of immediate to withheld grasping movements in the macaque fronto-parietal network (invited talk). *Neural-Prosthetic Systems Laboratory*. Stanford, May 24th, 2016.
- Probing the continuum of immediate to withheld grasping movements in the macaque fronto-parietal network. *26th Neural Control of Movement Conference*. Montego Bay, Jamaica. April 26th, 2016.
- Grasping with and without motor preparation (nanosymposium). *45th Annual Meeting of the Society for Neuroscience*. Chicago, October 20th, 2015. Travel grant awarded.
- Laterality of grasp-related activity in macaque areas AIP and F5. *8th Primate Neurobiology Meeting*. Göttingen, March 18th, 2015.
- Single trial neural correlates of grasping movement preparation in macaque areas AIP and F5. *24th Neural Control of Movement Conference*. Amsterdam, April 24th, 2014.

Abstracts:

- Michaels JA, Schaffelhofer S, Agudelo-Toro A, Scherberger H (2017). A modular neural network model of the primate grasping circuit. *27th Neural Control of Movement Conference*. Dublin, Ireland.
- Agudelo-Toro A, Michaels JA, Sheng W, Phillipow A, Scherberger H (2017). Continuous decoding of hand grips with a high dimensional brain computer interface. *10th Primate Neurobiology Meeting*. Göttingen, Germany.
- Dann B, Michaels JA, Scherberger H (2016). Disentangling cue, intention, and movement information from the fronto-parietal network. *9th Primate Neurobiology Meeting*. Tübingen, Germany.
- Michaels JA, Dann B, Scherberger H (2016). Emergent properties in a dynamical model of movement generation. *9th Primate Neurobiology Meeting*. Tübingen, Germany.
- Dann B, Michaels JA, Schaffelhofer S, Scherberger H (2015). The single unit network for hand grasping has a small-world and rich-club topology with oscillators as hubs. *Neurizons*. Göttingen, Germany.
- Michaels JA, Scherberger H. Laterality of grasp-related activity in macaque areas AIP and F5 (2015). *11th Göttingen Meeting of the German Neuroscience Society*. Göttingen, Germany.
- Michaels JA, Scherberger H. Laterality of grasp-related activity in macaque areas AIP and F5 (2014). *44th Annual Meeting of the Society for Neuroscience*. Washington, DC, USA. Travel grant awarded.
- Dann B, Michaels JA, Schaffelhofer S, Scherberger H (2014). Role of beta and low frequency oscillations in functional network connectivity of single units in the primate motor system. *10th Bernstein Conference*. Göttingen, Germany.

Michaels JA, Wellner B, Scherberger H (2014). Single trial neural correlates of grasping movement preparation in macaque areas AIP and F5. *7th Primate Neurobiology Meeting*. Tübingen, Germany.

Michaels JA, Wellner B, Scherberger H (2013). Single trial neural correlates of grasping movement preparation in macaque areas AIP and F5. *43rd Annual Meeting of the Society for Neuroscience*. San Diego, CA, USA. Travel grant awarded.

Michaels JA, Wellner B, Scherberger H (2013). Single trial neural correlates of grasping movement preparation in macaque areas AIP and F5. *EPFL Life Science Symposium (LSS)*. Lausanne, Switzerland.

Wellner B, Michaels JA, Wellner AW, Scherberger H (2013). Single trial neuronal correlates of decision-making for hand grasping in macaque area F5 and AIP. *10th Göttingen Meeting of the German Neuroscience Society*. Göttingen, Germany.

Teaching experience, skills, and professional membership:

Supervision:

- Master Thesis of Luis Ángel Pardo Sánchez, *Title: A recurrent neural network model of bimanual coordination and interference* (2017).
- Bachelor Thesis of Roman Eppinger, *Title: State space analysis and visualization of neuronal data in a delayed grasping task* (2015).

Teaching assistant, Motor Systems Lecture & Seminar of Hansjörg Scherberger (2013). University of Göttingen, Germany.

Programming: Matlab, Labview, Simulink, Java, Haskell, Prolog, html/css, Python, C/C++

Software: Plexon Spike Sorting Tool, Wave_Clus, SPSS (IBM), Adobe Photoshop/Illustrator, Microsoft Office

Journals reviewed for: *J Neuroscience*.

Member of: Bernstein Association for Computational Neuroscience (2014-2016), Society for Neural Control of Movement (2014-), Society for Neuroscience (2013-).

Languages: English (Native), German (Fluent), Hebrew (Advanced).

Workshop participation:

FieldTrip Workshop (2014). Göttingen, Germany.

Tübingen International Summer School for Neuroenhancement (2013). Cloister Heiligkreuztal, Germany

NWG Practical Course – Transcranial Magnetic and Electrical Stimulation (2013). Göttingen, Germany.

BBCI Summer School: Brain-Computer Interfacing and Neurotechnology (2012). Berlin, Germany.

Nerve Cell Culture and Patch-Clamp Recording (2012). Göttingen, Germany.

Bernstein R&D Workshop Cellular Electrophysiology (2012). Heidelberg, Germany.