

NICOLAS W. SCHUCK

Research Group Leader
Independent Max Planck Research Group NeuroCode
Max Planck Institute for Human Development
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– Oct 2018 –

EDUCATION

- 2013 – 2017 ***Postdoc in Cognitive Neuroscience*** | *Princeton Neuroscience Institute*
Advisor: Yael Niv
- 2010 – 2013 ***PhD in Psychology*** | *MPI for Human Development/Humboldt-Universität*
Advisors: Shu-Chen Li, P. Frensch; degree: Dr. rer. nat., Summa Cum Laude
- 2007 – 2008 ***Minor in Machine Learning*** | *University of Toronto (Exchange)*
Advisors: Geoff Hinton, Rich Zemel; Student Exchange
- 2004 – 2010 ***Diploma in Psychology*** | *Humboldt-Universität zu Berlin*
Advisor: Peter Frensch, degree: Dipl. Psych.

FACULTY POSITIONS / APPOINTMENTS

- 2017 – 2022 ***Max Planck Institute for Human Development*** | *Principal Investigator*
Independent Max Planck Research Group “NeuroCode”

HONORS & FUNDING

- 2017 – 2022 ***Independent Max Planck Research Group*** | *Principal Investigator*
- 2015 – 2017 ***Humboldt-Princeton grant*** | *co-I, with Y. Niv, J-D. Haynes.*
- 2010 – 2017 ***Travel awards*** | *Support for conference travel*
Cosyne (2017), CSHL (2014), SfN (2013), DAAD (2011), OCNS (2010)
- 2010 – 2013 ***Max Planck PhD fellowship (IMPRS LIFE)*** | *Full stipend for graduate school*
- 2007 – 2010 ***Exchange scholarships*** | *Support for UofT & UCL Exchanges*
European Union (2010), DAAD (2008), Humboldt-Universität (2007)

PUBLICATIONS

JOURNAL ARTICLES

(*equal contribution)

*In Prep./
Submitted*

Sharpe, M.J., Stalnaker, T., **Schuck, N.W.**, Killcross, S., Schoenbaum, G., & Niv, Y. An integrated model of action selection: distinct modes of cortical control of striatal decision making.

Hilliard, D., Passow, S., Thurm, F. **Schuck, N.W.**, Garthe, A., Kempermann, G., & Li, S.C. Noisy galvanic vestibular stimulation modulates spatial memory in young healthy adults.

Cai, M., **Schuck, N.W.**, Pillow, J.W. & Niv, Y. Representational structure or task structure? Bias in neural representational similarity analysis and a Bayesian method for reducing bias.

Gaschler, R., **Schuck, N.W.**, Reverberi C., Frensch, P.A. & Wenke, D. Incidental covariation learning leads to task-set reconfiguration.

2018

Schuck, N.W. & Niv, Y. Replay of task state sequences in the human hippocampus. [bioRxiv. 315978](https://doi.org/10.1101/315978), <https://doi.org/10.1101/315978>

Wu, C.M., Schulz, E., Garvert, M.M., Meder, B. & **Schuck, N.W.** (2018). Connecting conceptual and spatial search via a model of generalization. [Proceedings of CogSci 2018. https://doi.org/10.1101/258665](https://doi.org/10.1101/258665)

2017

Schuck, N.W., Wilson, R. & Niv, Y. The role of orbitofrontal cortex in reinforcement learning and goal-directed decision making. [bioRxiv. 210591](https://doi.org/10.1101/210591). <https://doi.org/10.1101/210591>

Schuck, N.W.*, Simon, J.*, Meeter, M., Schjeide, B.-M., Bisenack, J., Bertram, L., Gluck, M.A. & Li, S.C. (2017). Age-dependent effects of Kibra on probabilistic classification learning. [Neurobiology of Aging](https://doi.org/10.1101/210591)

Kaplan, R.*, **Schuck, N.W.*** & Doeller, C.F. (2017). The role of decision-making processes in memory. [Trends in Neurosciences. 40 \(5\), 256-259](https://doi.org/10.1101/210591).

2016

Cai M., **Schuck, N.W.**, Pillow, J., Niv, Y. (2016). Unbiased estimation of neural representation similarity structure. [Neural Information Processing Systems, 29](https://doi.org/10.1101/210591).

Schuck, N.W., Cai, M., Wilson, RC & Niv, Y. (2016). Human orbitofrontal cortex encodes a cognitive map of state space. [Neuron. 91\(1\), 1402-1412](https://doi.org/10.1101/210591).

Thurm, F., **Schuck, N.W.**, Fauser, M., Doeller, C.F., Stankevich, Y., Evens, R., Riedel, O., Storch, A., Lüken U. & Li, S.-C. (2016). Dopamine modulation of spatial memory performance in parkinson's disease. [Neurobiology of Aging, 38, 93-103](https://doi.org/10.1101/210591).

Buritica, J.M.R., Eppinger, B., **Schuck, N.W.**, Heekeren, H. R. & Li, S.-C. (2016). Electrophysiological correlates of observational learning in children. [Developmental Science. 19\(5\), 699 - 709](https://doi.org/10.1101/210591).

2015

Schuck, N.W., Doeller, C.F., Frensch, P.A., Polk, T.A., Lindenberger, U. & Li, S.-C. (2015). Human aging alters neural computation and representations during spatial navigation. [NeuroImage. 117, 141-150](https://doi.org/10.1101/210591).

Schuck, N.W., Gaschler, R., Wenke, D., Heinze, J., Haynes, J.-D. & Reverberi, C. (2015). Medial prefrontal cortex predicts internally driven strategy shifts. [Neuron. 86\(1\), 331-340](https://doi.org/10.1101/210591).

[Commentary] Daniel, R., **Schuck, N.W.** & Niv, Y. (2015). How to divide and conquer the world, one step at a time. [Proceedings of the National Academy of Sciences, 112\(10\), 2929-2930](https://doi.org/10.1101/210591).

2013

Schuck, N.W., Frensch, P.A., Schjeide, B.-M. , Bisenack, J. , Bertram, L. & Li, S.-C. (2013). Effects of aging and dopamine genotypes on the emergence of explicit memory during sequence learning. [Neuropsychologia, 51\(13\), 2757-2769](https://doi.org/10.1101/210591).

Schuck, N.W., Doeller, C.F., Schjeide, B.-M., Bisenack, J., Frensch, P.A., Bertram, L. & Li, S.-C. (2013). Aging and KIBRA/WWC1 genotype affect spatial memory processes in a virtual navigation

task. Hippocampus, 23(10), 919-930.

Eppinger, B., **Schuck, N.W.**, Nystrom, L.E., & Cohen, J.D. (2013) Reduced striatal responses to positive reward prediction errors in older compared to younger adults. Journal of Neuroscience, 33(24), 9905-9912.

2012 **Schuck, N.W.**, Gaschler, R., Keisler, A., & Frensch, P.A. (2012). Position-item associations play a role in the acquisition of order knowledge in an implicit serial reaction time task. Journal of Experimental Psychology: LMC, 38, 440-456.

Schuck, N.W., Gaschler, R., & Frensch, P. A. (2012). Implicit learning of what comes when and where within a sequence: The time-course of acquiring serial position-item and item-item associations to represent serial order. Advances in Cognitive Psychology, 8, 83-97.

BOOK CHAPTERS

2018 **Schuck, N.W.**, Wilson, R. & Niv, Y. (2018). The role of orbitofrontal cortex in reinforcement learning and goal-directed decision making. In R. Morris and Bornstein, A. (Ed.), *Understanding Goal-Directed Decision Making: Computations and Circuits*. Amsterdam, NL: Elsevier.

2010 Burgess, C., **Schuck, N.W.** & Burgess, N. (2010). Temporal neuronal oscillations can produce spatial phase codes. In S. Dehaene and E. Brannon (Ed.), *Attention & Performance XXIV. Space, Time and Number in the Brain: Searching for Evolutionary Foundations of Mathematical Thought* (pp. 59-69). Amsterdam, NL: Elsevier.

INVITED PRESENTATIONS

- 2018 **Universität Hamburg** | Department of Psychology
- 2018 **Max Planck UCL Center** | Computational Psychiatry and Ageing Symposium
- 2018 **Google Deepmind** | Neuroscience Team – Tech talk
- 2018 **Freie Universität Berlin** | Center for Cognitive Neuroscience Berlin
- 2018 **Oxford University** | Lab of Mark Stokes & Chris Summerfield
- 2018 **Donders Institute** | Donders Inst. for Brain, Cognition and Behaviour
- 2018 **TU Dresden** | Collaborative Research Center Volition and Control
- 2017 **New York University** | Inst. for the Interdisciplinary Study of Decision Making
- 2016 **Oxford University** | Department of Experimental Psychology
- 2016 **University College London** | London Judgement & Decision Making Seminar
- 2016 **Max Planck UCL Center** | Computational Psychiatry and Ageing Symposium
- 2016 **Rutgers/Princeton University** | Center f Computational Cogn. Neuropsychiatry
- 2015 **University of Pennsylvania** | Computational Neuroscience Initiative
- 2015 **Technical University Dresden** | Spring School “Volition and Cognitive Control”

CONFERENCE TALKS & POSTERS (selected)

- 2018 **Grid Cell Meeting** | London, UK
Sequential reactivation of partially observable task states in the human hippocampus ([Talk](#))
- 2018 **Winter Conference on Brain Research** | Whistler, Canada
A state representation for learning and decision making in the orbitofrontal cortex ([Talk](#))

- 2017 **SfN** (Annual Meeting of the Society for Neuroscience) | *Washington, USA*
Sequential replay of non-spatial task states in the human hippocampus ([Talk](#))
- 2017 **CoSyNe** (Computational & Systems Neuroscience) | *Salt Lake City, USA*
Task states are represented in OFC during task performance and replayed in hippocampus at rest ([Poster](#))
- 2017 **CNS** (Cognitive Neurosci. Society Annual Meeting) | *San Francisco, USA*
Task states are represented in OFC during task performance and replayed in hippocampus at rest ([Talk](#))
- 2016 **ICOM** (International Conference on Memory) | *Budapest, Hungary*
Human prefrontal representations reflect established and simulated mental state spaces ([Talk](#))
- 2015 **CoSyNe** (Computational & Systems Neuroscience) | *Salt Lake City, USA*
Human orbitofrontal cortex encodes a cognitive map of state space ([Poster](#))
- 2015 **OFC 2015** (Fourth Quadriennial Meeting on OFC function) | *Paris, France*
Human orbitofrontal cortex encodes a cognitive map of state space ([Poster](#))
- 2015 **RLDM** (Reinforcement Learning & Decision Making) | *Edmonton, Canada*
Human orbitofrontal cortex encodes a cognitive map of state space ([Poster](#))
- 2014 **CSHL Symposium on Quantitative Biology** | *Cold Spring Harbor, USA*
Neural circuitry involved in controlling the flexibility/stability balance and the discovery of alternative task solutions ([Talk](#))
- 2013 **SfN** (Annual Meeting of the Society for Neuroscience) | *San Diego, USA*
Human Aging Alters Neural Computation and Representations During Spatial Navigation ([Poster](#))
- 2012 **Einstein Symposium on Decision Making** | *Berlin, Germany*
Reconfiguration of Instructed Task-Sets Based on Incidental Learning of Irrelevant Information ([Poster](#))

MEDIA COVERAGE

- 2018 **Bayrischer Rundfunk, Radio Wissen (11/18)** | *Interview about our work on replay*
- 2015 **DER SPIEGEL (15/2015)** | *Interview about our 2015 paper in Neuron*
- 2015 **Berliner Zeitung (07/2015)** | *Interview about our 2015 paper in Neuron*
- 2015 **Princeton Journal Watch** | *Article about our 2015 paper in Neuron*

TEACHING

- 2018 **Advanced fMRI data acquisition techniques** | *Seminar*
Max Planck Institute for Human Development
- 2018 **Rhythms/variability/patterns in fMRI** | *Seminar, 1 session*
IMPRS COMP2PSYCH (Graduate Program)
- 2018 **Computational modelling of age differences in cognition** | *Seminar, 1 session*
IMPRS LIFE (Graduate Program)
- 2015 **Neuroscience Junior Tutorials** | *Seminar*
Princeton University, Princeton Neuroscience Institute
- 2015, 2014 **Matlab for Neuroscientists** | *Seminar*
Princeton University, Princeton Neuroscience Institute

2012

Reinforcement Learning and Neural Network Models | Seminar
Humboldt-Universität zu Berlin, Department of Psychology

STUDENT SUPERVISION

Undergraduates

Riley MacAuley (17, Princeton)
Kelsey McDonald (16, Princeton)

PhD students

Lennart Wittkuhn (MPIB, 17–20)
Christoph Koch (MPIB, 17–20)

Visitors/Interns

Ondrej Zika (PhD Oxford, '18)
Lion Schulz (TU Dresden, '18)

Master Students

Nir Moneta (MPIB, 17–18)
Anika Löwe (MPIB, 18–19)

Postdocs

Sam Chien (MPIB, 17–20)

PROFESSIONAL SERVICES

PhD committees

Juan Balaguer (Oxford, 2018, Examiner)
Nicole Drummond (Princeton, 18-21, committee member)

Graduate Schools

International Max Planck Research School (IMPRS) COMP2PSYCH (since 2017)
IMPRS LIFE (since 2017)

Journal Reviewing (ad hoc)

Acta Psychologica	Frontiers in Cognition	NeuroImage
Aging, Neuropsych. & Cognition	Journal of Neuroscience	Neuropsychologia
Cortex	J Exp Psychology: General	PLoS ONE
Cerebral Cortex	Nature Communication	Psychological Research
Developmental Psychology	Nature Human Behaviour	Psychoneuroendocrinology
Experimental Brain Research	Neurobiology of Aging	Scientific Reports

Grant Reviewing

Humboldt-Foundation (Ger), Medical Research Council (UK)

Conference Reviewing

Cosyne (2018)

REFERENCES

Prof. Dr. Yael Niv

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Princeton University
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Postdoc Supervisor

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Collaborator

Prof. Dr. Christian Doeller

Director Kavli Center for Systems Neuroscience
Norwegian University of Science and Technology
Trondheim, Norway

Prof. Dr. Ulman Lindenberger

Director Lifespan Psychology
Max Planck Institute for Human Development
14195 Berlin, Germany
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Collaborator

Prof. Dr. Shu-Chen Li

Professor in Lifespan Developmental Neuroscience
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PhD supervisor