Michael Schnabel

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EMPLOYMENT

01/2015 - University of Chicago, Chicago, IL, USA
Research Assistant Professor, Harris School of Public Policy
Group decision making and cognitive models of opinion formation. Mathematical models of group polarization and incompatibility of views.

06/2013 - 12/2014 Kellogg School of Management and
Northwestern Institute on Complex Systems (NICO), Evanston, IL, USA
Research Assistant Professor, Managerial Economics and Decision Sciences
Models of collective decision making on complex social networks.

2010 - 2013 Northwestern University, Evanston, IL, USA
PS-OC Postdoctoral Fellow, Departments of Physics and Applied Mathematics.
Inference of gene interaction networks from microarrays of cancer cell lines.

2009 - 2010 Max-Planck Institute for Dynamics and Self-Organization, Göttingen, Germany
Postdoctoral Researcher, Department of Nonlinear Dynamics.
Modeling development and information processing in primary visual cortex.
Analysis of optical imaging recordings and of natural images.

EDUCATION

PhD (Dr. rer. nat.) Physics, University of Göttingen & Max Planck Insitute (Germany) 2008
• Thesis Topic: Neuroscience, Nonlinear Dynamics & Self-Organization
("*A Symmetry of the Visual World in the Architecture of the Visual Cortex*.")
• Advisors: Prof. Fred Wolf, Prof. Theo Geisel

MSc (Diplom) Physics, University of Regensburg (Germany) 1999
• Thesis Topic: Quantum Field Theory, High Energy Physics
("*Random Matrix Models in two-dimensional Lattice Gauge QED*")
• Advisors: Prof. Tilo Wettig, Prof. Andreas Schäfer

BSc (Vordiplom) Physics, University of Frankfurt/Main (Germany) 1996

RESEARCH INTERESTS / EXPERTISE

Quantitative modeling of opinion formation, group decision making, computational neuroscience, quantum like methods (quantum cognition and quantum games) to describe seemingly irratioal aspects in human behaviour, machine learning, network inference and graphical models, evolutionary game theory.

PUBLICATIONS

- *A conceptual introduction to Quantum Theory. (invited contribution)*
  M. Schnabel, *Quantizing International Relations, (to appear in early 2021), Oxford University Press*
- *Stock fluctuations are correlated and amplified across networks of interlocking directorates.*
  S.Saavedra, L.Gilarranz, R.Rohr, **M. Schnabel**, B.Uzzi and J.Bascompte *EPJ Data Science (2014)*
- *Dynamic Transcription Factor Networks in Epithelial-Mesenchymal Transition in Breast Cancer Models.*
  A. Siletz, **M. Schnabel**, E. Kniazeva, A. J. Schumacher, S. Shin, J. S. Jeruss and L. D. Shea,
  PLOS ONE (2013)
- *Response to Comment on "Universality in the Evolution of Orientation Columns in the Visual Cortex".*
  W. Keil, M. Kaschube, **M. Schnabel**, Z. F. Kisvárday, S. Löwel, D. M. Coppola, L.W. White, and F. Wolf
  Science 336(6080):413 (2012)
- *Universality in the Evolution of Orientation Columns in the Visual Cortex.*
  *M. Kaschube, **M. Schnabel**, S. Löwel, D. M. Coppola, L. E. White, and F. Wolf*
  Science 330:1113–1116 (2010)
- *Inter-areal coordination of columnar architectures during visual cortical development.*
  *M. Kaschube, **M. Schnabel**, F. Wolf, and S. Löwel*
  Proceedings of the National Academy of Sciences. 106, 17205 (2009)
- *Pinwheel stability, pattern selection and the geometry of visual space.*
  ***M. Schnabel**, M. Kaschube and F. Wolf*
  q-bio > arXiv.org:0801.3832 (2008)
- *Self-Organization and the Selection of Pinwheel Density in Visual Cortical Development.*
  *M. Kaschube, **M. Schnabel** and F. Wolf*
  New Journal of Physics 10, 015009 (2008)
- *Random Waves in the Brain: Symmetries and Defect Generation in the Visual Cortex.*
  ***M. Schnabel**, M. Kaschube, S. Löwel, and F. Wolf*
  The European Physical Journal - Special Topics 145, 137-157 (2007)
- *Fake symmetry transitions in lattice Dirac spectra.*
  ***M. Schnabel** and T. Wettig*
  *Physics Review **D** 62, 34501 (2000)*

MANUSCRIPTS (IN PREPARATION)

- *A phenomenological model of social influence in opinion dynamics.*
  M. Schnabel and D.Diermeier *to be submitted to Physical Review Letters*
- *Dynamics of Public Opinion (Book Chapter)*
  M. Schnabel and D.Diermeier
- *Modeling hot cognition in opinion formation.*
  M. Schnabel and D.Diermeier

CONFERENCE ABSTRACTS (SELECTION)

- *A model of public opinion with time-dependent media bias, audience attention and social influence.*
  M. Schnabel and D. Diermeier
  Annual Meeting of the German Physical Society (DPG) (2020) (conference canceled due to Covid-19)
- *Opinion Dynamics: From utility functions to many-particle Hamiltonians.*
  M. Schnabel and D. Diermeier
  Annual Meeting of the German Physical Society (DPG) (2019)
- *Opinion Dynamics: Modeling Social Influence as a Coordination Game.*
  M. Schnabel and D. Diermeier
  Annual Meeting of the German Physical Society (DPG) (2018)

- *Opinion Formation on Networks: Topology may predict more than we think.*
  M. Schnabel and D. Diermeier
  Annual Meeting of the German Physical Society (DPG) (2017)
- *Charting and Exploring the Opinion Space of generic Spin Models on arbitrary Network Topologies.*
  M. Schnabel and D. Diermeier
  International Conference on Computational Social Science (IC2S2) (2016)
- *Do orientation preference maps arise from hexagonal retinal ganglion cell?*
  M. Schottdorf, W. Keil, **M. Schnabel**, D. Coppola, S. Löwel, L. White, M. Kaschube & F. Wolf
  Computational and Systems Neuroscience (COSYNE) (2013)
- *A shortest path tree approach for inferring and exploring gene networks.*
  ***M. Schnabel**, D. Grady, C.Thiemann, A.E. Motter, W. Kath and D. Brockmann*
  SIAM conference on the Life Sciences, (2012)
- *Active self-organization of disordered arrangements of orientation preference in cortical networks.*
  *J. Weidinger, W. Keil, D. Tsigankov, **M. Schnabel**, M. Kaschube*
  Computational and Systems Neuroscience (COSYNE), (2012)
- *A shortest path tree approach to infer interactions from correlations.*
  ***M. Schnabel**, D. Grady, A. E. Motter, W. Kath and D. Brockmann*
  NetSci conference, (2012)
- *Network analysis and dynamical modeling of cancer cells.*
  ***M. Schnabel**, N. Yungster, D. Brockmann, A. E. Motter, W. Kath*
  SIAM conference on Dynamical Systems, (2011)
- *Quantifying signatures of collinearity and cocircularity in natural images and in orientation maps.*
  ***M. Schnabel**, M. Kaschube, L. White, F. Wolf*
  Society for Neuroscience Abstracts, (2009)
- *Pattern selection, pinwheel stability and the geometry of visual space.*
  ***M. Schnabel**, M. Kaschube, L. White, F. Wolf*
  Computational Neuroscience Meeting (CNS), (2009)
- *Emergence of hyper-hexagonal patterns in orientation map models of reduced rotation symmetry.*
  *F. Wolf, W. Keil, S. Löwel, **M. Schnabel***
  Society for Neuroscience Abstracts, (2007)
- *Pinwheel stability, pattern selection and the geometry of visual space.*
  ***M. Schnabel**, M. Kaschube, L. White, D. Coppola, F. Wolf*
  Society for Neuroscience Abstracts, (2007)
- *Signatures of shift-twist symmetry in natural images and orientation maps.*
  ***M. Schnabel**, M. Kaschube, L. White, D. Coppola, S. Löwel, F. Wolf*
  FENS Abstracts, (2006)
- *Shift-twist Symmetry in natural images and orientation maps.*
  ***M. Schnabel**, M. Kaschube, L. White, D. Coppola, S. Löwel, F. Wolf*
  Society for Neuroscience Abstracts, (2005)
- *Signatures of shift-twist symmetry in the layout of orientation preference maps.*
  ***M. Schnabel**, M. Kaschube, L. White, D. Coppola, S. Löwel, F. Wolf*
  Society for Neuroscience Abstracts, (2004)
- *The ticklish spots of cortical orientation maps.*
  ***M. Schnabel**, M. Kaschube, S. Löwel, H. Dinse, F. Wolf*
  Proceedings of the 29th Göttingen Neurobiology Conference, (2003)
- *Universal fine structure of orientation pinwheels.*
  ***M. Schnabel**, T. Geisel, F. Wolf*
  Verhandlungen der Deutschen Physikalischen Gesellschaft, (2002)

GRANTS:

2020 (with Alex Wendt and Joyce Wang, Ohio State University):
Awarded a $400k grant from the Carnegie Foundation in NY to organize yearly "quantum bootcamps" for social and political scientists in 2021 and 2022 (with option to extend).

TALKS (SELECTION)

2019 *ISA, Toronto, Canada: Panelist "Quantizing IR - Physics meets Social Science."*
2018 *Ohio State University, Mershon Center, Columbus, OH*
2018 *University of Chicago, Harris School of Public Policy, Chicago, IL*
2017 *Frankfurt University, Physics Dept., Frankfurt, Germany*
2014 *Max-Planck Institute for Self-Organization, Göttingen, Germany*
2012 *Northwestern Institute on Complex Systems, Evanston, IL, USA*
2011 *Northwestern University, Dept. of Applied Mathematics. Evanston, IL, USA*
2009 *Max-Planck-Institute for Brain Research, Frankfurt/Main, Germany*
2009 *Northwestern Institute on Complex Systems, Evanston, IL, USA*
2008 *Kavli Institute for Theoretical Physics, Santa Barbara, USA*
2007 *Max-Planck-Institute for Biological Cybernetics, Tübingen, Germany*
2006 *Bernstein Center for Computational Neuroscience, Berlin, Germany*
2006 *Japan-Germany Symposium on Computational Neuroscience, RIKEN, Tokyo*
2004 *Max-Planck-Institute for Mathematics in the Sciences, Leipzig, Germany*
2004 *Institut de Neurosciences Cognitives de la Méditerranée, Marseille, France*
2004 *Weizmann Institute of Science, Rehovot, Israel*

CONFERENCES / SUMMER SCHOOLS / WORKSHOPS / INTERNSHIPS

2019 CCN & BCCN, Berlin, Germany: ***Computational Cognivive Neuroscience meeting***.
2019 ISA, Toronto, CA: Panel "***Physics meets Social Science.***"
2018 ISEM, Nice, France: Quantum Interaction "***Quantum Cognition in Social Sciences.***"
2018 University of Madison, USA: CogSci, "***Quantum Models of Cognition and Decision.***"
2018 Mershon Center, Ohio State University, USA: "***Quantum Theory and the International.***"
2017 University of Warwick, Coventry, UK: "***Quantum Cognition Workshop."***
2013 KITP, Santa Barbara, USA: Workshop "***New Quantitative Approaches to Morphogenesis.***"
2008 KITP, Santa Barbara, USA: Workshop "***Anatomy, Development, and Evolution of the Brain.***"
2004 Weizmann Inst., Israel: Dept of Physics of Complex Systems: "***Workshop on Nodal Domains.***"
2003 Ecole d'été de Phys. Théorique, Les Houches, France "***Methods and Models in Neurophysics.***"
2002 Peyresq, France: Euro-workshop on "***Non-equilibrium in Physics and Biology.***"
2001 KITP, Santa Barbara, USA: "***Dynamics of Neural Networks.***"
2000 MPI for Complex Systems, Dresden, Germany: "***Problems in Systems Neuroscience.***"
2000 Leibniz Institute for Neurobiology, Magdeburg, Germany (3 weeks internship)

TEACHING / TUTORING

2020 - 2021 advising UChicago Harris students Pedrag Pandilowski (PhD program) and Eda Erensoy (Masters program) in their research.
2019 - 2020 Thesis advisor of Grace Wright *"A quantum like model for conflict in deferred decisions."* (submitted 07/2020 to accomplish her UChicago's Master of Social Science program.)
2012 - 2014 Facilitating the NICO reading group on complex systems at Northwestern University.
2008 - 2009 Master's thesis co-supervisor of Ghazaleh Afshar at MPIDS Göttingen, Germany.
2006 - 2007 Diploma thesis co-supervisor of Wolfgang Keil at MPIDS Göttingen, Germany.
2006 Organized a seminar on pattern formation in physics and biology for graduate students at the MPIDS and Univ. Göttingen.
2005 Organized a seminar on stochastic processes for graduate students at the MPIDS and Univ. Göttingen.
2004 Tutor of Klaus Wunderlich, student in the neuroscience program who did a lab-rotation at the MPIDS.
2004 Tutor of Min Huang, student in the neuroscience program who did a lab-rotation at the MPIDS and later on decided to do her PhD at the MPIDS.
2004 Tutoring the class "Non-linear Dynamics", Univ. Göttingen, Germany.
2003 Tutoring the class "Quantum Mechanics", Univ. Göttingen, Germany.
2002 Tutoring the class "Thermodynamics and Statistical Mechanics", Univ. Göttingen, Germany.

PEER REVIEWING

Journal of Biological Physics (Springer), Proceedings of the Royal Society of London, Economic Thought, Journal of Economic Dynamics and Control (Elsevier), Foundations of Science (Springer), New Journal of Physics, Chaos (AIP), Discrete Dynamics in Nature and Society, Europhysics Letters.

VOLUNTEERING:

2020: Core team member of the dharmarelief.org initiative that managed to raise over $600k of donations to import over 1.2 Mio PPE (surgical masks) from China and distribute them to hospitals and health care workers in the United States and in Canada with Covid-19 patients during the early days of the pandemic.

MEMBERSHIPS

- Society for Neuroscience
- Germany Physical Society

PROGRAMMING SKILLS

Python, C/C++, Matlab, Mathematica, R, UNIX/Linux, shell scripting, MySQL, NetLogo, Processing

LANGUAGES

English, German (native), French (native), Italian (basic)

REFERENCES

- *Prof. Daniel Diermeier, PhD, Chancellor*
  Office of the Chancellor
  Vanderbilt University
  211, Kirkland Hall, Nashville, TN 37230, USA
  Phone: +1 615-322-1812, email: daniel.diermeier@vanderbilt.edu

- *Prof. Leonard E. White, PhD*
  Duke Institute for Brain Sciences
  Levine Science Research
  Durham, NC 27708, USA
  Phone: +1 919-613-5028, email: len.white@duke.edu

- *Prof. Seth Lichter, PhD*
  Engineering Sciences and Applied Mathematics
  McCormick School of Engineering
  Northwestern University
  2145 Sheridan Road, Evanston, Illinois 60208-3125, USA
  Phone: +1 847-467-1885, email: s-lichter@northwestern.edu

- *Prof. Dr. Theo Geisel, Director (former, now emeritus)*
  Max-Planck-Institute for Dynamics and Self-Organization
  Department of Nonlinear Dynamics
  Am Faßberg 17, 37077 Göttingen, Germany
  Phone: +49 551-5176-400, email: geisel@nld.ds.mpg.de