

# CURRICULUM VITAE

*Martin Nilsson Jacobi*

- Date of birth: August 31, 1972      Address: Complex systems group  
Pre-marriage name: Martin Nilsson      Department energy and environment  
Place of birth: Växjö, Sweden      Chalmers University of Technology  
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Education:  
Undergraduate: Chalmers University of Technology, Göteborg, 1992–1994.  
Graduate: M.Sc. in Engineering Physics, Göteborg, 1995,  
thesis: *Supersymmetry*, supervisor: Prof. Bengt E.W. Nilsson.  
PhD student at the Institute of Theoretical Physics, Chalmers University of Technology,  
Göteborg, 1995–2000.  
Licentiate Thesis, Göteborg, 1998, thesis: *Computational Complexity of Physical Models*.  
PhD Thesis, Göteborg, 2000, thesis: *Mathematical Models of Molecular Evolution*.  
PhD in physics, Chalmers University of Technology and University of Gothenburg, 2001.  
Docent, Chalmers University of Technology, Gothenburg, 2008.
- Awards: John Ericsson medal for outstanding scholarship, Chalmers University of Technology,  
Göteborg, 1996.
- Grants:
  - 1) Partner in integrated EU project: Programmable Artificial Cell Evolution (PACE).
  - 2) Partner in EU project: Emergent Organization in Biomolecular Systems (EMBio).
  - 3) Four year research grant for a position as assistant professor from the Swedish science foundation.
  - 4) Partner in EU project: Morphogenesis and gene regulatory networks in plants and animals: a complex systems modelling approach (MORPHEX)
  - 5) Ph.D. research grant for Kolbjørn Tunstrøm from the Norwegian science foundation.
- Work positions:
  - 1) PhD student, Chalmers University of Technology, Göteborg, 1995–2000
  - 2) Director funded Post Doctoral Fellow, Los Alamos National Laboratory, 2000–2002
  - 3) Post Doctoral Fellow in the Self-Organizing Systems group, Los Alamos National Laboratory, 2002
  - 4) Post Doctoral Fellow, Nordic Institute for Theoretical Physics (NORDITA), Copenhagen, 2003–2004.
  - 5) Assistant professor in the Complex systems group at Chalmers University of Technology, Gothenburg, Sweden, 2004–2008.
  - 6) Associate professor in the Complex systems group at Chalmers University of Technology, Gothenburg, Sweden, 2008–2010.
  - 7) Professor in Complex systems, Chalmers University of Technology, Gothenburg, Sweden, 2010–.
- Committees: Member of the European Complex Systems Society council.  
Track chair for the Complex Systems Methods track, "European Conference on Complex Systems (ECCS)," Oxford, 2006 and Dresden 2007.  
Member of the program committee for the ALife 2013 conference.
- Publications **(Note: for most publications the ordering of the authors is alphabetical):**
- 1) *The Computational Complexity of Sandpiles*, Journal of Statistical Physics, 96, 205–224, 1999, (Authors: C. Moore and M. Nilsson).

- 2) *Error Thresholds for Quasi-Species on Dynamic Fitness Landscapes*, Physical Review Letters, 84: 191–194, 2000, (Authors: M. Nilsson and N. Snoad).
- 3) PhD Thesis: *Mathematical Models of Molecular Evolution*, Göteborg 2000.
- 4) *Ansatz for dynamical hierarchies*, Artificial Life 7: 329–353, 2001, (Authors: S. Rasmussen, N. Baas, B. Mayer, M. Olsen, and M. Nilsson)
- 5) *Defense of the Ansatz for dynamical hierarchies*, Artificial Life 7: 367–373, 2001 (Authors: S. Rasmussen, N. Baas, B. Mayer, M. Olsen, and M. Nilsson)
- 6) *Parallel Quantum Computation and Quantum Codes*, SIAM Journal on Computing, Vol. 31, 3, 799–815, 2001, (Authors: C. Moore and M. Nilsson).
- 7) *Quasi-Species on a Fitness Landscape with a Fluctuating Peak*, Physical Review E, 65, 031901, 2002, (Author: M. Nilsson and N. Snoad).
- 8) *Quasi-Species Evolution on Dynamic Fitness Landscapes* Evolutionary Dynamics: Exploring the Interplay of Selection, Accident, Neutrality and Function, edited by J. P. Crutchfield and P. Schuster, p. 275–290, Santa Fe Institute Studies in the Sciences of Complexity Series, New York: Oxford University Press, 2002, (Authors: M. Nilsson and N. Snoad).
- 9) *Hierarchical Clustering Using Non-Greedy Principal Direction Divisive Clustering*, Information Retrieval 5(4), 311–321, 2002, (Author: M. Nilsson).
- 10) *Optimal Mutation Rates in Dynamic Environments*, Bulletin of Mathematical Biology 64 (6) 1033–1043, 2002, (Authors: M. Nilsson and N. Snoad).
- 11) *Constructive Molecular Dynamics (MD) Lattice Gases: 3-D Molecular Self-Assembly*, New Constructions in Cellular Automata, Eds. David Griffeath and Christopher Moore, p. 183–210: Oxford University Press, 2003, (Authors: M. Nilsson, S. Rasmussen, B. Mayer, and D. Whitten).
- 12) *A Cellular Automata for Simulating Molecular Self-Assembly*, conference proceedings of Discrete Models for Complex Systems (DMCS'03), Lyon, France, June 16–19, 2003, (Authors: M. Nilsson and S. Rasmussen).
- 13) *Bridging Non-Living and Living Matter*, Artificial Life, 9 (3), p. 269–316, 2003 (Authors: S. Rasmussen, L. Chen, M. Nilsson, and S. Abe).
- 14) *Generalized Singular Spectrum Time Series Analysis and Continuous Transformation Groups*, Proceedings of the Royal Society of London A, 460(2043), p. 929–938, 2004, (Author: M. Nilsson).
- 15) *Hierarchical Structures in Smooth Dynamical Systems*, Artificial Life, 11, 493–512, 2005 (Author: Martin Nilsson).
- 16) *Homochiral growth through enantiomeric cross-inhibition*, Origins of Life and Evolution in the Biosphere, 35, p. 225–241, 2005 (Authors: A. Brandenburg, A.C. Andersen, S. Höfner and M. Nilsson).
- 17) *Dissociation in a polymerization model of homochirality*, Origins of Life and Evolution in the Biosphere, 35, p. 507–521, 2005 (Authors: A. Brandenburg, A. Andersen and M. Nilsson).
- 18) *Modeling the dynamics of a minimal protocell container*, International Journal of Astrobiology 4, p. 79–89, 2005, (Authors: M. Nilsson Jacobi, S. Rasmussen and K. Tunstrøm).
- 19) *Unidirectional polymerization leading to homochirality in the RNA world*, International Journal of Astrobiology, 4, 233–239, 2005 (Authors: M. Nilsson, A. Brandenburg, A.C. Andersen and S. Höfner).
- 20) *Quasi-Species and Aggregate Dynamics*, proceedings of Alife X, p. 145–151, 2006 (Authors: A. Eriksson, O. Görnerup, M. Nilsson Jacobi and S. Rasmussen).
- 21) *Quasispecies and recombination*, Theoretical Population Biology, 70, 4, 479–485, 2006, (Authors: M. Nilsson Jacobi and M. Nordahl).
- 22) *Quotient Manifold Projections and Hierarchical Dynamics*, proceeding of ECCS, 2006, (Author: M. Nilsson Jacobi).
- 23) *Emergence of protocellular growth laws*, Philosophical Transactions of the Royal Society B, Volume 362, Number 1486, 1841–1845, 2007, (Authors: T. Rocheleau, S. Rasmussen, P.E. Nielsen, M. Nilsson Jacobi, and H. Ziock.)
- 24) *A Method for Inferring Hierarchical Dynamics in Stochastic Processes*, in Advances in Complex Systems, 11 (1), p. 1–16, 2008, (Authors: O. Görnerup

- and M. Nilsson Jacobi).
- 25) *Using force covariance to derive effective stochastic interactions in dissipative particle dynamics*, Physical Review E 77, 016707, 2008, (Authors: A. Eriksson, M. Nilsson Jacobi, J. Nyström, and K. Tunstrøm).
  - 26) *Hierarchical Dynamics*, review article in Springer's Encyclopedia on Complex Systems, 2009 (Author: M. Nilsson Jacobi).
  - 27) *Effective thermostat induced by coarse-graining of SPC water*, Journal of Chemical Physics 129, 024106, 2008, also selected for publication in Virtual Journal of Biological Physics Research, 16 (2) 2008, (Authors: A. Eriksson, M. Nilsson Jacobi, J. Nyström, and K. Tunstrøm).
  - 28) *A method for estimating the interactions in dissipative particle dynamics from particle trajectories*, Journal of Physics: Condensed Matter, 21, 095401, 2009, (Authors: A. Eriksson, M. Nilsson Jacobi, J. Nyström, and K. Tunstrøm).
  - 29) *A spectral method for aggregating variables in linear dynamical systems with application to cellular automata renormalization*, in Advances in Complex Systems, 12(2), p.131-155, 2009, (Authors: M. Nilsson Jacobi and O. Görnerup).
  - 30) *Bottom-up derivation of an effective thermostat for united atoms simulations of water*, Journal of Chemical Physics, 164509, 2009, also selected for publication in the May 1, 2009 issue of Virtual Journal of Biological Physics Research. Authors: A. Eriksson, M. Nilsson Jacobi, J. Nyström, and K. Tunstrøm).
  - 31) *On the microscopic foundation of mesoscopic particle methods*, Europhysics Letters, 86 44001, 2009 (Authors: A. Eriksson, M. Nilsson Jacobi, J. Nyström, and K. Tunstrøm).
  - 32) *Deriving time-dependent diffusion and relaxation rate in porous systems using eigenfunctions of the Laplace operator*, Journal of Magnetic Resonance, 201(2), p. 205-211, 2009, (Authors: M. Nordin, M. Nilsson Jacobi, M. Nyden.)
  - 33) *New mixed basis approach to approximate the spectrum of the Laplace operator*, Proceedings of ITP-09 2009 Interdisciplinary Transport Phenomena VI, Volterra, Italy, October 4-9, 2009 (Authors: M. Nordin, M. Nilsson Jacobi, M. Nyden.)
  - 34) *An algorithm for aggregating variables in linear dynamical systems*, Advances in Complex Systems, 13(2), p. 199-215, 2010 (Authors: O. Görnerup and M. Nilsson Jacobi).
  - 35) *A model-independent approach to infer hierarchical codon substitution dynamics*, BMC Bioinformatics, 11:201, 2010. (Authors: O. Görnerup and M. Nilsson Jacobi).
  - 36) *Renormalization of cellular automata and self-similarity*, Journal of Statistical Physics, 139 (6), p. 972, 2010, (Authors: E. Edlund and M. Nilsson Jacobi)
  - 37) *A robust spectral method for finding lumpings and meta stable states of non-reversible markov chains*, Electronic Transactions on Numerical Analysis, 37, p. 296-306, 2010, (Author: M. Nilsson Jacobi).
  - 38) *Determining interaction rules in animal swarms*, Behavioral Ecology, 21:1106-1111, 2010 (Authors: A. Eriksson, M. Nilsson Jacobi, J. Nyström, and K. Tunstrøm).
  - 39) *Universality of striped morphologies*, Physical Review Letters, 105, (13), 2010, (Authors: E. Edlund and M. Nilsson Jacobi).
  - 40) *Identification of metastable states in peptide's dynamics*, Journal of Chemical Physics, 133, 164102, 2010, (Authors: S. Ruzhytska, M. Nilsson Jacobi, C. Jensen and D. Nerukh.)
  - 41) *Optimal networks of nature reserves can be found through eigenvalue perturbation theory of the connectivity matrix*, Ecological Applications, 21(5), p. 1861-1870, 2011, (Authors: M. Nilsson Jacobi and P. Jonsson.)
  - 42) *A mixed basis approach in the SGP-limit*, Journal of Magnetic Resonance (in press), (Authors: M. Nordin, M. Nilsson Jacobi and M. Nyden.)
  - 43) *Designing Isotropic Interactions for Self-Assembly of Complex Lattices*, Physical Review Letters, 107, 085503, 2011, (Authors: E. Edlund, O. Lindgren, and M. Nilsson Jacobi.)
  - 44) *Novel Self-Assembled Morphologies from Isotropic Interactions*, Physical Review Letters, 107, 085501, 2011, (Authors: E. Edlund, O. Lindgren, and

- M. Nilsson Jacobi.)
- 45) *Chiral Surfaces Self-Assembling in One-Component Systems with Isotropic Interactions*, to appear in *Physical Review Letters*, (Authors: E. Edlund, O. Lindgren, and M. Nilsson Jacobi.)
  - 46) *Optimal selection of marine protected areas based on connectivity and habitat quality*, to appear in *Ecological Modelling*, (Authors: M. Berglund, M. Nilsson Jacobi and P. Jonsson).
  - 47) *Identification of subpopulations from connectivity matrices*, to appear in *Ecography*, (Authors: M. Nilsson Jacobi, C. Andre, K. Döös and P. Jonsson).

Conferences:	<p>Invited speaker at the “Future directions in complex systems” workshop in Lyon 2003.</p> <p>Invited speaker at the “Discrete Models for Complex Systems (DMCS’03)” conference in Lyon 2003.</p> <p>Invited speaker at the “Astrobiological problems for physicists” conference at Nordita, Copenhagen 2004.</p> <p>Invited speaker at the “Future Directions in Complex Systems” conference in Santa Fe 2005.</p> <p>Invited speaker at ”Dissipative Particle Dynamics: Addressing deficiencies and establishing new frontiers“, at Centre Europeen de Calcul Atomique et Moleculaire, Lausanne, 2008.</p> <p>Invited speaker at ”Model reduction. Algorithms for Approximation“ conference, Ambleside, North Lake District, England, 2009.</p> <p>Invited speaker at ”8th European conference on computational chemistry“, Lund, Sweden, 2010.</p> <p>Invited speaker at the ”Peridynamics, Dissipative Particle Dynamics, and the Mori-Zwanzig formulation” workshop at Brown University, Providence, 2012.</p>
Teaching Experience:	<p>Assistant teacher at Chalmers University of Technology and Göteborg University, 1995–2000. Courses include: General physics (undergraduate level), Experimental physics (undergraduate level), Classical Mechanics (undergraduate level), Quantum mechanics and Quantum field theory (graduate level), Mathematical biology (graduate level), guest lecturer in astrobiology at the University of Lund (undergraduate level).</p> <p>Main lecturer in “Simulation of complex systems”, Chalmers University of Technology, 2004– (M.Sc. level).</p> <p>Main lecturer in “Complex systems seminars”, Chalmers University of Technology, 2008– (M.Sc. level).</p> <p>Main lecturer in ”Environmental modeling”, Chalmers University of Technology, 2011 (B.Sc. level).</p> <p>Lecturer on nonlinear dynamical systems at “West African regional college on applied mathematics”, Cape Coast, Ghana, 2004.</p> <p>Lecturer on model reconstruction and parameter estimation at “West African regional college on applied mathematics”, Cape Coast, Ghana, 2005.</p> <p>Lecturer on functional analysis with applications at “West African regional college on applied mathematics”, Cape Coast, Ghana, 2006.</p>
Ph.D. students:	<p>Olof Görnerup, 2005–2008 (main supervisor)</p> <p>Kolbjørn Tunstrøm, 2005–2009 (main supervisor)</p> <p>Johan Nyström, 2005–2009 (main supervisor)</p> <p>Matias Nordin, 2009– (co-supervisor)</p> <p>Erik Edlund, 2010– (main supervisor)</p> <p>Oskar Lindgren, 2010– (main supervisor)</p>
Conference org.	<p>Co-organizer of the “Astrobiological problems for physicists” conference at Nordita Copenhagen 2004.</p> <p>Co-organizer and lecturer at “West African spring school in applied mathematics,” Cape Coast, Ghana, 2005.</p>

Co-organizer and lecturer at “West African spring school in applied mathematics,” Cape Coast, Ghana, 2006.

Main organizer of “Workshop on mesoscopic simulation methods in biomolecular systems,” at the European Center for Living Technology in Venice, Italy, 2006.

Track chair for the Complex Systems Methods track, ”European Conference on Complex Systems (ECCS),” Oxford, 2006 and Dresden 2007.

Member of science committee of ALife 13 conference, 2012.

Miscellaneous:

Official opponent on Claes Andersson’s Licentiate thesis defense.

Official opponent on Anders Erikson’s Licentiate thesis defense.

External examiner for Christian Jensen’s PhD degree defense in Cambridge 2009.

Examination committee at Bodil Ahlström’s PhD defense in theoretical chemistry, Gothenburg University, 2010.

Business Experience:

1999 Co-founder of TiFiC AB (automated computer support systems).

2000 Co-founder of Mindmetric AB (semi-automatic customer relations and knowledge management platforms).

2000–2001 Research and development manager for Mindmetric AB.