Short CV and Bibliography

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Background

Since Dr. Steen Rasmussen's Ph.D at the Technical University of Denmark (1985) his scientific activities have mostly focused on pioneering and implementing new approaches, methods, and applications for self-organizing processes in natural and human made systems. These include: Abstract self-programmable matter, which allows computer assembly code environments to program themselves and generate self-replicators from noise. Molecular dynamics (MD) lattice gases, mesoscale simulation tools developed for addressing molecular self-assembly questions. Rational and evolutionary protocell designs to identify minimal physicochemical implementation routes for self-replicating nanomachines. Web-based disaster mitigation and decision support systems that harness the collective intelligence of large stakeholder groups, in particular to address problem complexes with inherent conflicts of interest. Novel simulations developed to address key question about large-scale socio-technical systems, including instabilities in the economy, urban transportation systems, urban growth, and infrastructure vulnerabilities in particular for the agricultural sector.

Professor Rasmussen is currently the Head of the Center for Fundamental Living Technology (FLinT), a Research Director at the Department for Physics and Chemistry at University of Southern Denmark, External Research Professor at the Santa Fe Institute, USA, as well as Principle Investigator for the upstart of the Initiative for Society, and Policy (ISSP) in Denmark. Dr. Rasmussen was previously the Team Leader for the Self-Organizing Systems team at Los Alamos and a Guest Professor at University of Copenhagen (2004-5). He was heading the Los Alamos Protocell Assembly (LDRD-DR) project and the Astrobiology program (origins of life) at Los Alamos developing experimental and computational protocells and Cell-Like Entities, with USAF as a co-sponsor. Further, he is the co-director on the European Union sponsored Programmable Artificial Cell Evolution (PACE) project, and he was one of the founders of the Artificial Life movement in the late 1980s. He was the Chair of the Science and Engineering Leadership Team (SELT) for 2001-2002 in the Earth and Environmental Science (EES) Division at LANL and is currently on the Science Board for the European Center for Living Technology in Venice, Italy, which he is a co-founder of in 2004. He co-developed the Transportation Simulation System (TRANSIMS), which is now implemented by the USA Department of Transportation. He co-directed the Urban Security Initiative at LANL, developing an integrated simulation framework for urban systems as well as web-based disaster mitigation tools, which were implemented in the May 2000 Cerro Grande Wildfire where 20.000 people were evacuated. He was also part of the original Los Alamos team on Critical Infrastructure Protection, to be implemented by the US Department of Homeland Security.

Dr. Rasmussen has published more than 80 peer reviewed papers and many internal technical reports, given more than 170 invited presentations outside of home institutions, and he has co-organized eight international and several national conferences. He recently (September 2003) organized the two first international protocell meetings one at Los Alamos and the Santa Fe

Institute and one in Dortmund, Germany and published the first book on the topic (in press). Many communications about his work inside and outside of the scientific establishment have appeared on television and in newspapers, periodicals, and books. Since 2000 he has sponsored 11 postdocs (theorists and experimentalists) and 25 graduate and undergraduate students. He is also actively engaged in the public debate about science and society.

Formal education:

- Ph.D., (Physics) Technical University of Denmark (TUD) 1985.
- M.Sc., (Physics & Physical Chemistry) Technical University of Denmark (TUD) 1982. Philosophy studies at University of Copenhagen 1978-1981.

Scientific employment:

- 11/07 - today, Center Leader Fundamental Living Technology & Research Director, SDU.
- 08/04 - 05/05, Guest Professor Molecular Biochemistry and Genetics, University of Copenhagen.
- 05/04 - today, External Research Professor, SFI.
- 10/02 - 10/07, Team Leader Self-Organizing Systems, LANL.
- 02/97 - 09/02, Staff Scientist, Earth and Environmental Science, LANL
- 11/92 - 02/97, Staff Scientist, Simulation Applications, LANL
- 10/91 - 10/92, Staff Scientist, Theoretical Division, LANL.
- 09/88 - 04/04, Part time Researcher in Residence Santa Fe Institute (SFI)
- 09/88 - 09/91, Postdoc, Center for Nonlinear Studies, Los Alamos National Laboratory (LANL).
- 11/85 - 09/88, Postdoc, Physics Laboratory, Technical University of Denmark.

Recent scientific project leadership:

- Principle Investigator: Initiative for Science, Society, and Policy (ISSP), SDU, 2008-2010, $1M
- Director: Fundamental Living Technology, Danish National Science Foundation, 2007-2012, $7.2M
- Principle Investigator: Protocell Assembly, LDRD-DR, Los Alamos, October 2004-2007, $5M
- Co-Director: Programmable Artificial Cell Evolution, EC 6th Framework, April 2004-2008, $10.5M
- Principle Investigator: Cell-Like Entities, US Air Force, November 2004-2005, $25K
- Co-Principle Investigator: Water on Mars, LDRD-DR, Los Alamos, October 2003-2005, $2.4M

Selected scientific honours and awards:

- 1988 P. Gorm-Petersens Mindelegat, in the presence of Her Majesty the Queen, Magrethe II of Denmark.
- 2000 Los Alamos Cerro Grande Wildfire Award: Web-based disaster mitigation, People finder databases.
- 2004 Los Alamos Achievement Awards for Excellence: Protocell design.
- 2004 Los Alamos Achievement Awards for Excellence: Simulation of Critical Infrastructures.

- 2005 World Technology Network Reward, Biotechnology Category: Protocell design.

Selected scientific papers:

- T. Rouchelau, S. Rasmussen, P. Nielsen, M. Jacobi, and H. Ziock, Emergence of protocellular growth laws, Phil. Trans. R. Soc B 362 (2007) 1841
- A. Munteanu, C. Attolini, S. Rasmussen, H. Ziock, and R. Solé, Generic Darwinian selection in catalytic protocell assemblies, Phil. Trans. R. Soc B 362 (2007) 1848
- J. McCaskill, N. Packard, S. Rasmussen, and M. Bedau, Evolutionary self-organization in complex fluids, Phil. Trans. R. Soc B 362 (2007) 1881
- P. Ehrenfreund, S. Rasmussen, J. Cleaves, and L. Chen, Experimentally tracking the key steps in the origins of life: The Aromatic World, Astrobiology 6 (2006) 490
- S. Rasmussen, M. Bedau, L. Chen, D. Deamer, D. Krakauer, N. Packard, & P. Stadler, Living and nonliving matter, Science (letters) 305 (2004) 41-43
- S. Rasmussen, L. Chen, B. Stadler, and P. Stadler, Proto-organism kinetics, Origins Life & Evol. Biosph., 34 (2004) 171
- S. Rasmussen, L. Chen, D. Deamer, D. Krakauer, N. Packard, P. Stadler, & M.Bedau, Transitions from nonliving to living matter, Science 303 (2004) 963
- S. Colgate, S. Rasmussen, J. Solem, and K. Lackner, An astrophysical basis for a universal origin of life, Adv. Complex Sys., 6 (2003) 1
- S. Rasmussen, L. Chen, M. Nilsson, and S. Abe, Bridging nonliving and living matter, Artificial Life, 9 (2003) 269
- S. Rasmussen, M. Raven, G. Keating, and M. Bedau, Collective intelligence of the artificial life community on its own successes, failures, and future, Artificial Life, 9 (2003) 207
- D. Yamins, S. Rasmussen, and D. Fogel, Growing urban roads, Networks and Spatial Economics, 3 (2003) 69
- C. Andersson, K. Lindgren, S. Rasmussen, and R. White, Urban growth from "first principles", Phys Rev E, 66 (2002) 026204
- C. Andersson, S. Rasmussen, and R. White, Urban settlement transitions, Env. & Planning B 29 (2002) 841
- S. Rasmussen, N. Baas, M. Olesen, B. Meyer, and M. Nilsson, Ansatz for dynamical hierarchies, Artificial Life, 7 (2001) 329
- M. Nilsson, S. Rasmussen, B. Mayer, and D. Whitten, Molecular Dynamics (MD) Lattice Gas: 3-D molecular self-assembly, in: New Constructions in Cellular Automata, Eds D. Griffeath and C. Moore, Oxford University Press (2003) 183
- M. Bedau, J. McCaskill, N. Packard, S. Rasmussen, C. Adami, D. Green, T. Ikegami, K. Kaneko, and T. Ray, Open problems in artificial life, Artificial Life 6 (2000) 363 B. Mayer and S. Rasmussen, Dynamics and simulation of self-reproducing micelles, Int. J. of Modern Phys. C 11 (2000) 809
- G. Heiken, G.A. Valentine, M. Brown, S. Rasmussen, D. George, R. Greene, E. Jones, K. Olsen, C. Andersson, Modeling Cities - The Los Alamos Urban Security Initiative, Journal of Public Works Management and Policy 4 (2000) 198
- B. Mayer, G. Koehler, and S. Rasmussen, Simulation and Dynamics of Entropy Driven, Molecular Self-Assembly Processes, Physical Review E 55 (1997) 4489-4499
- T.T. Puck, R. Johnson, and S. Rasmussen, A system for mutation measurement in mammalian cells: Application to gamma-irradiation, Proc. Natl. Acad. Sci. USA 94 (1997) 1218
- K. Nagel and S. Rasmussen, Traffic at the edge of chaos, Artificial Life IV, Ed. R.A. Brooks and P. Maes, MIT Press (1994) 222
- R. Feldberg, C. Knudsen, S. Rasmussen, Recursive definition of global cellular automata mappings, Phys. Rev. E 49 (1994) 1699
- H. Hotani, R. Lahoz-Beltra, B. Combs, S. Hameroff, S. Rasmussen, Liposomes, Microtubules, and Artificial Cells; Nanobiology 1 (1992) 61

- S. Rasmussen, Aspects of Information, Life, Reality, and Physics, Artificial Life II, SFI Studies in the Sciences of Complexity, Vol. X, Ed. C. Langton, et al., Addison-Wesley, 1991, 767
- S. Rasmussen, C. Knudsen, R. Feldberg, and M. Hindsholm, The Coreworld: Emergence and Evolution of Cooperative Structures in a Computational Chemistry, Physica D 42 (1990) 11
- S. Rasmussen, H. Karampurwala, R. Vaidyanath, K. Jensen, and S. Hameroff, Computational Connectionism within Neurons: A Model of Cytoskeletal Automata Subserving Neural Networks, Physica D 42 (1990) 428
- B. Bollobas and S. Rasmussen, First Cycles in Random Directed Graph Processes, Discrete Math., 75 (1989) 55
- S. Rasmussen, Toward a Quantitative Theory of the Origin of Life, In: Artificial Life, Ed. C. Langton, Addison-Wesley, (1989) 79
- S. Rasmussen, J. Holst, and E. Mosekilde, Empirical Indicators of Economic Long Waves in Aggregate Production", European Journal of Operational Research, 42 (1989) 279
- E. Mosekilde and S. Rasmussen, Technical Economic Succession and the Economic Long Wave, Solicited paper, European Journal of Operational Research, 25 (1986) 27
- S. Rasmussen, E. Mosekilde, and J. D. Sterman, Bifurcations and Chaotic Behavior in a Simple Model of he Economic Long Wave, System Dynamics Review, 1 (1985) 92.

Selected edited books:

- S. Rasmussen, M. Bedau, L. Chen, D. Krakauer, N. Packard, and P. Stadler, eds., Protocells: Transitions from nonliving to living matter, MIT Press Book, November (2008)
- R. Solé, S. Rasmussen, and M. Bedau, eds., Towards the artificial cell, Phil. Trans. R. Soc B 362 (2007) special issue.
- M. A. Bedau, J. McCaskill, N. Packard, S. Rasmussen, eds., Artificial Life VII: Proceedings of the Seventh International Conference on the Simulation and Synthesis of Living Systems (Cambridge: MIT Press) 2000.
- C. Langton, C. Taylor, D. Farmer, S. Rasmussen, eds., Artificial Life II, SFI Studies in the Sciences of Complexity, Vol. X, Addison-Wesley, 1991

Selected popular communications:

- S. Rasmussen, public lecture, American Association for the Advancement of Science (AAAS) Dialogue on science, religion, and ethics, Washington D.C., December 1, 2005.
- Life from dust, NOVA, Public Broadcasting Services (Television), October 18, 2005
- Science on the verge of "creation", Chicago Tribune (cover story), March 28, 2004
- Researchers seek to create a living cell, Wall Street Journal (cover story), April 2, 2004
- Predicting the future of urban sprawl, Public Broadcasting Services (Radio), August 26, 2002
- The next disaster, where IT's at, Wired Magazine, May 23, 2000
- Playing God: The making of artificial life, Discover Magazine, August issue, 1992

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