

Wim Hordijk, Ph.D.

Publications

Journals and proceedings

- 66.** M. Steel, W. Hordijk and J. C. Xavier. Autocatalytic networks in biology: structural theory and algorithms. *Journal of the Royal Society Interface* 16:20180808, 2019.
- 65.** W. Hordijk and M. Steel. Autocatalytic networks at the basis of life's origin and organization. *Life* 8:62, 2018.
- 64.** W. Hordijk, J. Naylor, N. Krasnogor and H. Fellermann. Population dynamics of autocatalytic sets in a compartmentalized spatial world. *Life* 8:33, 2018.
- 63.** R. Cazzolla Gatti, B. Fath, W. Hordijk, S. Kauffman and R. Ulanowicz. Niche emergence as an autocatalytic process in the evolution of ecosystems. *Journal of Theoretical Biology* 454:110–117, 2018.
- 62.** W. Hordijk, S. Shichor and G. Ashkenasy. The influence of modularity, seeding, and product inhibition on peptide autocatalytic network dynamics. *ChemPhysChem* 19:2437–2444, 2018.
- 61.** W. Hordijk, M. Steel and P. Dittrich. Autocatalytic sets and chemical organizations: Modeling self-sustaining reaction networks at the origin of life. *New Journal of Physics* 20:015011, 2018.
- 60.** W. Hordijk. Autocatalytic confusion clarified. *Journal of Theoretical Biology* 435:22–28, 2017.
- 59.** W. Hordijk. Autocatalytic sets and RNA secondary structure. *Journal of Molecular Evolution* 84(4):153–158, 2017.
- 58.** W. Hordijk and M. Steel. Chasing the tail: The emergence of autocatalytic networks. *BioSystems* 152:1–10, 2017.
- 57.** R. Cazzolla Gatti, W. Hordijk and S. Kauffman. Biodiversity is autocatalytic. *Ecological Modelling* 346:70–76, 2017.
- 56.** V. Di Cola et al. ecospat: an R package to support spatial analyses and modeling of species niches and distributions. *Ecography* 40(6):774–787, 2017.
- 55.** W. Hordijk. Evolution: Limited & predictable or unbounded & lawless? *Biological Theory* 11(4):187–191, 2016.
- 54.** W. Hordijk and M. Steel. Autocatalytic sets in polymer networks with variable catalysis distributions. *Journal of Mathematical Chemistry*, 54(10):1997–2021, 2016.
- 53.** W. Hordijk. Evolution of autocatalytic sets in computational models of chemical reaction networks. *Origins of Life and Evolution of Biospheres* 46(2):233–245, 2016.
- 52.** W. Hordijk and M. Steel. Comment on “Tibor Gánti and Robert Rosen” by Athel Cornish-Bowden. *Journal of Theoretical Biology* 392:122–123, 2015.
- 51.** P. Nghe, W. Hordijk, S. A. Kauffman, S. I Walker, F. J. Schmidt, H. Kemble, J. A. M. Yeates and N. Lehman. Prebiotic network evolution: six key parameters. *Molecular BioSystems* 11:3206–3217, 2015.

- 50.** W. Hordijk, J. I. Smith and M. Steel. Algorithms for detecting and analysing autocatalytic sets. *Algorithms for Molecular Biology* 10:15, 2015.
- 49.** W. Hordijk, A. Hordijk and B. Heidergott. A genetic algorithm for finding good balanced sequences in a customer assignment problem with no state information. *Asia-Pacific Journal of Operational Research* 32(3):1550015, 2015.
- 48.** F. L. Sousa, W. Hordijk, M. Steel and W. F. Martin. Autocatalytic sets in *E. coli* metabolism. *Journal of Systems Chemistry* 6:4, 2015.
- 47.** W. Hordijk and M. Steel. Autocatalytic sets and boundaries. *Journal of Systems Chemistry* 6:1, 2015.
- 46.** W. Hordijk. The algorithmic mind and what it means to solve a problem. *Emergence: Complexity & Organization* 16(4), 2014.
- 45.** W. Hordijk and M. Steel. Conditions for evolvability of autocatalytic sets: A formal example and analysis. *Origins of Life and Evolution of Biospheres* 44(2):111–124, 2014.
- 44.** A. Filisetti, M. Villani, C. Damiani, A. Graudenzi, A. Roli, W. Hordijk and R. Serra. On RAF sets and autocatalytic cycles in random reaction networks. *Communications in Computer and Information Science*, 445:113–126, 2014.
- 43.** W. Hordijk, L. Hasenclever, J. Gao, D. Mincheva and J. Hein. An investigation into irreducible autocatalytic sets and power law distributed catalysis. *Natural Computing*, 13(3):287–296, 2014.
- 42.** W. Hordijk, N Vaidya and N Lehman. Serial transfer can aid the evolution of autocatalytic sets. *Journal of Systems Chemistry* 5:4, 2014.
- 41.** J. I Smith, M. Steel and W. Hordijk. Autocatalytic sets in a partitioned biochemical network. *Journal of Systems Chemistry* 5:2, 2014.
- 40.** W. Hordijk, P. R. Wills and M. Steel. Autocatalytic sets and biological specificity. *Bulletin of Mathematical Biology* 76(1):201–224, 2014.
- 39.** W. Hordijk. Autocatalytic sets: From the origin of life to the economy. *BioScience* 63(11):877–881, 2013.
- 38.** M. Steel, W. Hordijk and J. Smith. Minimal autocatalytic networks. *Journal of Theoretical Biology* 332:96–107, 2013.
- 37.** D. W. McShea and W. Hordijk. Complexity by subtraction. *Evolutionary Biology* 40(4):504–520, 2013.
- 36.** W. Hordijk. The EvCA project: A brief history. *Complexity* 18(5):15–19, 2013.
- 35.** W. Hordijk and M. Steel. A formal model of autocatalytic sets emerging in an RNA replicator system. *Journal of Systems Chemistry* 4:3, 2013.
- 34.** W. Hordijk, M. Steel and S. Kauffman. The structure of autocatalytic sets: Evolvability, enablement, and emergence. *Acta Biotheoretica* 60(4):379–392, 2012.
- 33.** W. Hordijk and M. Steel. Autocatalytic sets extended: Dynamics, inhibition, and a generalization. *Journal of Systems Chemistry* 3:5, 2012.
- 32.** W. Hordijk and O. Broennimann. Dispersal routes reconstruction and the minimum cost arborescence problem. *Journal of Theoretical Biology* 308:115–122, 2012.
- 31.** R. Engler, W. Hordijk and A. Guisan. The MIGCLIM R package – seamless integration of dispersal constraints into projections of species distribution models. *Ecography* 35(10):872–878, 2012.

- 30.** A. Espíndola, L. Pellissier, L. Maiorano, W. Hordijk, A. Guisan and N. Alvarez. Predicting present and future intra-specific genetic structure through niche hindcasting across 24 millenia. *Ecology Letters* 15(7):649–657, 2012.
- 29.** W. Hordijk and M. Steel. Predicting template-based catalysis rates in a simple catalytic reaction model. *Journal of Theoretical Biology* 295:132–138, 2012.
- 28.** W. Hordijk, S. A. Kauffman and M. Steel. Required levels of catalysis for emergence of autocatalytic sets in models of chemical reaction systems. *International Journal of Molecular Sciences* 12(5):3085–3101, 2011.
- 27.** W. Hordijk, J. Hein and M. Steel. Autocatalytic sets and the origin of life. *Entropy* 12(7):1733–1742, 2010.
- 26.** S. Guindon, J-F. Dufayard, V. Lefort, M. Anisimova, W. Hordijk and O. Gascuel. New algorithms and methods to estimate maximum-likelihood phylogenies: Assessing the performance of PhyML 3.0. *Systematic Biology* 59(3):307–321, 2010.
- 25.** P. Jebaraj Selvapeter and W. Hordijk. Cellular automata for image noise filtering. In A. Abraham, A. Carvalho, F. Herrera and V. Pai (eds.), *Proceedings of the World Congress on Nature and Biologically Inspired Computing 2009*, pp. 193–197, 2009.
- 24.** P. Vajda, A. E. Eiben and W. Hordijk. Parameter control methods for selection operators in genetic algorithms. In G. Rudolph et al. (eds.), *Parallel Problem Solving from Nature — PPSN X*, Springer, pp. 620–630, 2008.
- 23.** S. Paulson, W. Hordijk, P. Gift, Subarani and Shanmugam. Design of an interleaver for turbo codes using genetic algorithms. *International Journal of Artificial Intelligence and Machine Learning* 6(2):1–5, 2006.
- 22.** W. Hordijk. An overview of biologically inspired computing in information security. In K. Anbumani (ed.), *Proceedings of the National Conference on Information Security*, pp. 1–14, 2005.
- 21.** W. Hordijk. An introduction to evolutionary computation. In K. Krithivasan and R. Rama (eds.), *Formal Language Aspects of Natural Computing*, pp. 77–84, 2005.
- 20.** W. Hordijk. An overview of computation in cellular automata. In K. Krithivasan and R. Rama (eds.), *Formal Language Aspects of Natural Computing*, pp. 7–16, 2005.
- 19.** W. Hordijk and O. Gascuel. Improving the efficiency of SPR moves in phylogenetic tree search methods based on maximum likelihood. *Bioinformatics* 21(24):4338–4347, 2005.
- 18.** W. Hordijk and S. A. Kauffman. Correlation analysis of coupled fitness landscapes. *Complexity* 10(6):41–49, 2005.
- 17.** L. M. Rocha and W. Hordijk. Material representations: From the genetic code to the evolution of cellular automata. *Artificial Life* 11(1-2):189–214, 2005.
- 16.** W. Hordijk and M. Steel. Detecting autocatalytic, self-sustaining sets in chemical reaction systems. *Journal of Theoretical Biology* 227(4):451–461, 2004.
- 15.** C. Semple, P. Daniel, W. Hordijk, R. D. M. Page and M. Steel. Supertree algorithms for ancestral divergence dates and nested taxa. *Bioinformatics* 20(15):2355–2360, 2004.
- 14.** T. Biyikoglu, W. Hordijk, J. Leydold, T. Pisanski and P. F. Stadler. Graph laplacians, nodal domains, and hyperplane arrangements. *Linear Algebra and its Applications* 390:155–174, 2004.
- 13.** C. Fried, W. Hordijk, S. J. Prohaska, C. R. Stadler and P. F. Stadler. The footprint sorting problem. *Journal of Chemical Information and Computer Sciences* 44:332–338, 2004.

- 12.** W. Hordijk and J. F. Fontanari. Catalytic reaction sets, decay, and the preservation of information. In *Proceedings of the IEEE International Conference on Integration of Knowledge Intensive Multi-Agent Systems*, pp. 133–138, 2003.
- 11.** P. F. Stadler, W. Hordijk and J. F. Fontanari. Phase transition and landscape statistics of the number partitioning problem. *Physical Review E* 67:056701, 2003.
- 10.** W. Hordijk, J. F. Fontanari and P. F. Stadler. Shapes of tree representations of spin-glass landscapes. *Journal of Physics A* 36:3671–3681, 2003.
- 9.** D. Rockmore, P. Kostelec, W. Hordijk and P. F. Stadler. Fast fourier transform for fitness landscapes. *Applied and Computational Harmonic Analysis* 12(1):57–76, 2002.
- 8.** W. Hordijk, C. R. Shalizi and J. P. Crutchfield. Upper bound on the products of particle interactions in cellular automata. *Physica D* 154:240–258, 2001.
- 7.** W. Hordijk, J. P. Crutchfield and M. Mitchell. Mechanisms of emergent computation in cellular automata. In A. E. Eiben, Th. Bäck, M. Schoenauer, and H-P. Schwefel (eds.), *Parallel Problem Solving from Nature — PPSN V*, Springer, pp. 613–622, 1998.
- 6.** W. Hordijk and P. F. Stadler. Amplitude spectra of fitness landscapes. *Advances in Complex Systems* 1(1):39–66, 1998.
- 5.** W. Hordijk. Correlation analysis of the synchronizing-CA landscape. *Physica D* 107:255–264, 1997.
- 4.** W. Hordijk, J. P. Crutchfield and M. Mitchell. Embedded-particle computation in evolved cellular automata. In T. Toffoli, M. Biafore, and J. Leão (eds.), *PhysComp96*, New England Complex Systems Institute, pp. 153–158, 1996.
- 3.** W. Hordijk. The structure of the synchronizing-CA landscape. In M. Coombs and M. Sulcoski (eds.), *Proceedings of the Workshop on Control Mechanisms for Complex Systems*, pp. 93–107, 1996.
- 2.** W. Hordijk. A measure of landscapes. *Evolutionary Computation* 4(4):335–360, 1996.
- 1.** W. Hordijk and B. Manderick. The usefulness of recombination. In F. Morán, A. Moreno, J. J. Merelo and P. Chacón (eds.), *Advances in Artificial Life, Proceedings of the Third European Conference on Artificial Life*, Springer-Verlag, pp. 908–919, 1995.

Book chapters

- 2.** W. Hordijk. Correlation analysis of coupled fitness landscapes. In H. Richter and A. Engelbrecht (eds.), *Recent Advances in the Theory and Application of Fitness Landscapes*, Springer, pp. 369–393, 2013.
- 1.** W. Hordijk, M. Steel and S. Kauffman. Autocatalytic sets: The origin of life, evolution, and functional organization. In P. Pontarotti (ed.), *Evolutionary Biology: Exobiology and Evolutionary Mechanisms*, Springer, pp. 49–60, 2013.

Other contributions

- 30.** W. Hordijk. Workshop report: Developmental biases in evolution. *Extended Evolutionary Synthesis Blog*, November 20, 2018.
extendedevolutionarysynthesis.com/workshop-report-developmental-biases-in-evolution/
- 29.** W. Hordijk. From an ecologist’s nightmare to a mathematician’s dream. *Plus magazine*, November 6, 2018.
plus.maths.org/content/ecologists-nightmare-mathematicians-dream

- 28.** W. Hordijk. The evolution of emergent computation. *TVOL*, 10 September 2018.
<https://evolution-institute.org/article/the-evolution-of-emergent-computation>
- 27.** W. Hordijk. The evolutionary roots of irrationality. *TVOL*, 16 July 2018.
<https://evolution-institute.org/article/the-evolutionary-roots-of-irrationality>
- 26.** W. Hordijk. Citizen science: Schumann resonances. *Plus magazine*, June 7, 2018.
plus.maths.org/content/citizen-science-schumann-resonances
- 25.** W. Hordijk. Evolution as a problem solver in computer science. *TVOL*, 29 January 2018.
<https://evolution-institute.org/article/evolution-as-a-problem-solver-in-computer-science>
- 24.** W. Hordijk. What's your problem? *Plus magazine*, January 24, 2018.
plus.maths.org/content/whats-your-problem
- 23.** W. Hordijk. Geneva attractions: From high energy physics to high altitude views. *Swiss Vistas*, September 20, 2017.
www.swissvistas.com/geneva-attractions.html
- 22.** W. Hordijk. The origin of life: A selfish act or a cooperative effort? *TVOL*, 18 September 2017.
<https://evolution-institute.org/article/the-origin-of-life-a-selfish-act-or-a-cooperative-effort>
- 21.** W. Hordijk. An unconventional place for unconventional science. *Extended Evolutionary Synthesis Blog*, 11 September 2017.
extendedevolutionarysynthesis.com/an-unconventional-place-for-unconventional-science
- 20.** W. Hordijk. Citizen science: The statistics of language. *Plus magazine*, June 7, 2017.
plus.maths.org/content/statistics-language
- 19.** W. Hordijk. Cause and process in evolution. *Extended Evolutionary Synthesis Blog*, May 17, 2017.
extendedevolutionarysynthesis.com/workshop-report-cause-and-process-in-evolution
- 18.** W. Hordijk. Grottes de Vallorbe. *Swiss Vistas*, May 2, 2017.
www.swissvistas.com/grottes-de-vallorbe.html
- 17.** W. Hordijk. Citizen science: Facts or fake news? *Plus magazine*, March 20, 2017.
plus.maths.org/content/citizen-science-public-databases-and-bit-maths
- 16.** W. Hordijk. Can computers help us conserve biodiversity? *The Naked Scientists*, February 15, 2017.
www.thenakedscientists.com/articles/science-features/can-computers-help-us- conserve-biodiversity
- 15.** W. Hordijk. A perfect view from mount le Grammont. *Swiss Vistas*, January 23, 2017.
www.swissvistas.com/le-grammont.html
- 14.** W. Hordijk. Spontaneous spirals. *Plus magazine*, December 22, 2016.
plus.maths.org/content/spontaneous-spirals
- 13.** W. Hordijk. Grande Dixence: The tallest gravity dam in the world. *Swiss Vistas*, December 1, 2016.
www.swissvistas.com/grande-dixence.html
- 12.** W. Hordijk. The mathematics of kindness. *Plus magazine*, November 1, 2016.
plus.maths.org/content/mathematics-kindness
- 11.** W. Hordijk. Evolution: It's as real as gravity! *Plus magazine*, July 13, 2016.
plus.maths.org/content/evolution-its-real-gravity

- 10.** W. Hordijk. Preserving species in the face of climate change. *Plus magazine*, April 25, 2016.
plus.maths.org/content/preserving-species-face-climate-change
- 9.** W. Hordijk. How a game of billiards solved a queueing problem. *Plus magazine*, March 29, 2016.
plus.maths.org/content/how-game-billiards-solved-queueing-problem
- 8.** W. Hordijk. Life: It's chemistry! *The Naked Scientists*, March 15, 2016.
www.thenakedscientists.com/HTML/articles/article/life-it-s-chemistry
- 7.** W. Hordijk. The living set. *The Scientist*, June 1, 2015.
www.the-scientist.com/?articles.view/articleNo/43082/title/The-Living-Set
- 6.** W. Hordijk. Is the mind algorithmic? Confusing science speak with layman language. *Sciworthy*, January 1, 2015.
sciworthy.com/science-news/science-authors/mind-algorithmic-confusing-science-speak-layman-language
- 5.** W. Hordijk. From salt to salary: Linguists take a page from science. *NPR 13.7*, November 8, 2014.
www.npr.org/blogs/13.7/2014/11/08/362478685/from-salt-to-salary-linguists-take-a-page-from-science
- 4.** W. Hordijk. Recognizing the illusion of 'Homo Economicus'. *NPR 13.7*, July 20, 2014.
www.npr.org/blogs/13.7/2014/07/20/331975032/recognizing-the-illusion-of-homo-economicus
- 3.** W. Hordijk. An eclectic mix of giants takes on the origin of life. *NPR 13.7*, March 10, 2013.
www.npr.org/blogs/13.7/2013/03/10/172875449/an-eclectic-mix-of-giants-takes-on-the-origin-of-life
- 2.** W. Hordijk. Particles that compute. *SFI Bulletin* 16(1):17–20, 2001.
- 1.** W. Hordijk. Optimization through evolution. *Medium Econometrische Toepassingen* 4(2), 1996.

Theses

- 2.** W. Hordijk. *Dynamics, Emergent Computation, and Evolution in Cellular Automata*. Ph.D. dissertation, University of New Mexico, 1999.
- 1.** W. Hordijk. *Population Flow on Fitness Landscapes*. Unpublished undergraduate thesis, 1994.