

## CURRICULUM VITAE

CHRISTIAN M. REIDYS

### Degrees:

- 1991, Diploma, Mathematics, *The Fröhlich fixed module of  $\mathrm{PSL}_2(p)$* , Prof. S. Böge, University of Heidelberg, Germany.
- 1995, PhD in Graph and Probability Theory, *Neutral networks of RNA secondary structures*, University of Jena, Germany, advisors Prof. R. Fichtner and Prof. P. Schuster.

### Work experience:

- 1996, Febr.-Nov., PostDoctoral Fellow, Los Alamos National Laboratory, USA.
- 1996, Nov.- 2006 Staff Member, Los Alamos National Laboratory, USA
- 2007 - 2011, Professor for Mathematics at Nankai University at the Center for Combinatorics.
- 2007 - 2011, Deputy Director of the Center for Combinatorics, LMPC, Nankai University.
- 2011 - 2015, Professor for Mathematics at the University of Southern Denmark.
- 2015 - 2018, Director and Professor, Mathematical Biocomplexity at BI VT.
- 2018 - 2019, Division Director and Professor, Department of Mathematics, Mathematical Biocomplexity at Biocomplexity Institute UVA.

### Research interests:

- Discrete mathematics
- Computational Biology
- Molecular evolution, structure, prediction and evolution of RNA
- DNA combinatorics, topology of large data sets

### Awards:

- The Society for Mathematical Biology (SMB), Lee Segel Prize, 2008,
- The Ministry of Education of P.R.China (MOE) awarded the *Chang Jiang Scholar*, the Chinese national research prize in mathematics, 2009.

### Books:

- Reidys, C.M., *Combinatorial and Computational Biology of Pseudoknot RNA*, Springer, Applied Math series 2010,
- Mortveit, H.S., Reidys, C.M., *An Introduction to Sequential Dynamical Systems*, Universitext, ISBN: 978-0-387-30654-4, 2008.

## Selected Publications:

### • Mathematics

- [41] Li T.J.X., Reidys C.M., 2021, *On the Loop Homology of a Certain Complex of RNA Structures*, [MDPI Mathematics](#), 9(15):1749.
- [40] Bura, Andrei C., Qijun He, and Christian Reidys., 2021, *Weighted homology of Bi-structures over certain discrete valuation rings*, [MDPI Mathematics](#), 9(7), 744.
- [39] Bura A.C., He Q., Reidys C.M.,2021, *Loop Homology of Bi-secondary Structures*, [Discrete Mathematics](#), Volume 344, Issue 6, 112371.
- [38] Bura A.C., He Q., Reidys C.M.,2020, *Loop Homology of Bi-secondary Structures II*, [Journal of Algebraic Combinatorics](#), Under Review.
- [37] Ricky X.F. Chen, Andrei C. Bura, Christian M. Reidys, 2019, *D-chain tomography of networks: a new structure spectrum and an application to the SIR process*, [SIAM Journal on Applied Dynamical Systems](#), 18(4), 2181-2201.
- [36] Chen Ricky X. F., McNitt Joseph, Mortveit Henning, Pederson Ryan, Reidys Christian, *Phase space invariance for asynchronous Boolean networks under shifts of update sequence*, [Under Review](#).
- [35] Thomas J. X. Li and Christian M. Reidys, 2018, *From unicellular fatgraphs to trees via reversals*. [Under Review](#).
- [34] Ricky X. F. Chen and Christian M. Reidys, 2017, *A combinatorial identity concerning plane colored trees and its applications*, [Journal of Integer Sequences](#), 20 (2017), Article 17.3.7.

- [33] Jørgen Ellegaard Andersen, Hiroyuki Fuji, Robert C. Penner, and Christian M. Reidys, 2017, *The boundary length and point spectrum enumeration of partial chord diagrams using cut and join recursion*, [Travaux mathématiques, Volume 25 \(2017\), 213232.](#)
- [32] Chen R.X. and Reidys C.M., 2016, *Plane permutations and applications to a result of Zagier-Stanley and distances of permutations*, [SIAM J. Discrete Math. 30-3 \(2016\), p.1660-1684.](#)
- [31] Chen, R.X. and Reidys C.M., 2017, *On the local genus distribution of graph embeddings*, [Journal of Combinatorial Mathematics and Combinatorial Computing, 101\(2017\), pp.157-173.](#)
- [30] Chen, R.X. and Reidys C.M., 2018, *Linear sequential dynamical systems, incidence algebras, and Möbius functions*, [Linear Algebra and its Applications 553 \(2018\), 270-291.](#)
- [29] Huang, F.W. and Reidys C.M., 2017, *A topological framework for signed permutations*, [Discrete Mathematics, 340\(9\) pp.2161-2182.](#)
- [28] Reidys, C.M. and Jin, E.Y., 2013, *The evolution of the random reversal graph*, [AMC, Vol 227, 15, p.347-358, 2014.](#)
- [27] Han, H.S.W., Reidys, C.M., 2013, *A bijection for tri-cellular maps*. [ISRN, Discrete Math. 2014712431, 2013.](#)
- [26] J. E. Andersen, L. O. Chekhov, R. C. Penner, Reidys, C.M., Piotr Sulkowski, 2013, *Topological recursion for chord diagrams, RNA complexes, and cells in moduli spaces*, [Nucl.Phys. B, Volume 866, Issue 3, 21 January 2013, Pages 414-443.](#)

- [25] Li, T.J.X. and Reidys, C.M., 2013, *The topological filtration of  $\gamma$ -structures*, *Math. Biosc.*, Volume 241, Issue 1, January 2013, Pages 24-33.
- [24] Andersen, J.E., Penner, R.C., Reidys, C.M. and Waterman, M.S., 2012, *Topological classification and enumeration of RNA structures by genus*, *J. Math. Bio.*, DOI 10.1007/s00285-012-0594-x.
- [23] Jin, E.Y. and Reidys, C.M., 2011, *Random induced subgraphs of Cayley graphs induced by transpositions*, *Discr. Math.*, (**311**), 21, 2496-2511.
- [22] Hofacker, I.L., Reidys, C.M. and Stadler, P.F., 2011, *Symmetric Circular Matchings and RNA Folding*, *Discr. Math.* (**312**), 1, 100-112. .
- [21] Huang, W.D. and Reidys, C.M., 2010, *On the uniform generation of modular diagrams*, *E. J. Combin.*, (**17**), 1, R175.
- [20] Reidys, C.M., Wang, R.R. and Zhao, A.Y.Y., 2010, *Modular,  $k$ -noncrossing diagrams*, *E.J. Combin.*, (**17**), 1, R76.
- [19] Chen W.Y.C., Han, H.S.W. and Reidys, C.M., 2009, *Random  $k$ -noncrossing RNA structures*, *PNAS*, (**106**), 52, 22061-22066.
- [18] Jin, E.Y., and Reidys, C.M., 2009, *RNA Pseudoknots Structures with Arc-length  $\geq 3$  and Stack-length  $\geq \sigma$* , *Discr. Appl. Math.*, (**158**), 1, 25-36.
- [17] Jin, E.Y., and Reidys, C.M., 2009, *On the decomposition of  $k$ -noncrossing RNA Structures*, *Adv. Appl. Math.*, (**44**), 1, 53-70.

- [16] Chen, W.Y.C., Qin, J., Reidys, C.M. and Zeilberger, D., 2009, *Efficient Counting and Asymptotics of  $k$ -noncrossing tangled-diagrams*, [Electr. J. Combin.](#) **(16)**, R37.
- [15] Chen, W.Y.C., Qin, J., and Reidys, C.M., 2009, *Crossings and Nestings of tangled-diagrams*, [Electr. J. Combin.](#), **(15)**, R86.
- [14] Reidys, C.M., 2009, *Large Components of Random induced subgraphs of  $n$ -cubes*, [Discr. Math.](#), **(309)**, 3113-3124.
- [13] Jin, E.Y., and Reidys, C.M., 2009, *Combinatorial design of pseudoknot RNA*, [Adv. Appl. Math.](#), **(42)**, 135-151.
- [12] Reidys, C.M., 2007, *Combinatorics of Sequential Dynamical Systems*, [Discr. Math.](#), **(308)**, 514-528.
- [11] Reidys, C.M., 2006, *Sequential Dynamical Systems over Words*, [Ann. Combin.](#), **(10)**, 481-498.
- [10] Reidys, C.M., 2005, *Certain Morphisms of Sequential Dynamical Systems*, [Discr. Math.](#), **(296)**, 245-257.
- [9] Reidys, C.M., 2004, *Distance-2-Matchings of Random Graphs*, [Ann. Combin.](#), **(8)**, 93-101.
- [8] Reidys, C.M., 2003, *Covering Maps over  $n$ -Cubes*, [Ann. Comb.](#), **(6)**, 419-426.
- [7] Reidys, C.M., 2003, *Distances in Random Induced Subgraphs of generalized  $n$ -Cubes*, [Combin., Prob. and Comput.](#), **(11)**, 599-605.

- [6] Reidys, C.M., 2001, *On Acyclic Orientations and Sequential Dynamical Systems*, *Adv. Appl. Math.*, **(27)**, 790-804.
- [5] Mortveit, H.S., and Reidys, C.M., 2000, *Discrete, sequential dynamical systems*, *Discr. Math.*, **(226)**, 281-295.
- [4] Reidys, C.M., 2000, *Random Subgraphs of Cayley Graphs over  $p$ -Groups*, *Europ. J. of Combin.*, **(21)**, 1057-1066.
- [3] Reidys, C.M., 2000, *Random Structures*, *Ann. Combin.*, **(4)**, 375-382.
- [2] Reidys, C.M., 1998, *Acyclic Orientations of Random Graphs*, *Adv. Appl. Math.*, **(21)**, 181-192.
- [1] Reidys, C.M., 1997, *Random induced subgraphs of generalized  $n$ -cubes*, *Adv. Appl. Math.*, **(19)**, 360-377.

#### • **Mathematical Biology**

- [39] Li, T.J.X. and Reidys, C.M., 2020, *On an enhancement of RNA probing data using Information Theory*, *Algorithms for Molecular Biology*, 15:15.
- [38] Ricky, X.F. Chen, Christian M. Reidys, Michael S. Waterman, *Exact enumeration of RNA secondary structures by stacks and loops*, *Journal of Mathematical Biology*, Under Review.
- [37] Li, T.J.X., Burriss, C. S., and Reidys, C.M., 2019, *The block spectrum of RNA pseudoknot structures*, *J. Math. Biol.* 79, 791-822 (2019).

- [36] Reza Rezazadegan, Chris Barrett, Christian Reidys, 2018, *Multiplicity of phenotypes and RNA evolution*, [Journal of Theoretical Biology](#), 447, p. 139-146.
- [35] Huang F, Reidys C, Rezazadegan R., 2017, *Fatgraph models of RNA structure*, [Molecular Based Mathematical Biology](#). 2017;5(1):1-20. doi:10.1515/mlbmb-2017-0001.
- [34] Huang F.W., and Reidys C.M., 2016, *Topological language for RNA*, [Mathematical Biosciences](#), 282, pp. 109-120.
- [33] Li, T.J.X., and Reidys C.M., 2018, *The rainbow-spectrum of RNA secondary structures*, [Bulletin of Mathematical Biology](#), (80):1514-1538.
- [32] Li, T.J.X., and Reidys C.M., 2017, *Statistics of topological RNA structures*, [Journal of mathematical biology](#), (74):1793-1821.
- [31] Barrett, C., Li, T.J.X., and Reidys C.M., 2016, *RNA Secondary Structures Having a Compatible Sequence of Certain Nucleotide Ratios*, [Journal of computational biology](#), 23(11), 857-873. doi:10.1089/cmb.2016.0049.
- [30] Barrett, C., Huang F.W., and Reidys C.M., 2015, *Evidence of higher order patterns in information transmission between nucleotide sequences and folded molecular shapes of RNA*, [9th EAI International Conference on Bio-inspired Information and Communications Technologies \(formerly BIONETICS\)](#). 2015: New York City, New York, USA.
- [29] Huang, F.W. and Reidys C.M., 2015, *Shapes of topological RNA structures*, [Math. Biosci](#), 2015. 270, Part A: p. 57-65.



- [28] Fu, B.M.M. and Reidys, C.M., 2014, *Shapes of interacting RNA complexes*, *J. Comp. Biol.*, in press. 21(9): p. 649664.
- [27] Fu, B.M.M., Han, H.S.W. and Reidys, C.M., 2013, *On RNA-RNA interaction structures of fixed topological genus*, *Math. Biosci.*, (**262**), 2015, p. 88-104.
- [26] Han, H.S.W., Li, T.J.X., Reidys, C.M., 2014, *Combinatorics of  $\gamma$ -structures*, *JCB*, ISSN 1557-8666, 21(8), p. 591608.
- [25] Huang, W.D., Nebel, M.E. and Reidys, C.M., 2013, *Uniform generation of RNA pseudoknot structures with genus filtration*, *Math Biosci.* 2013 Jul 27. doi:pii: S0025-5564(13)00178-8. 10.1016/j.mbs.2013.07.014.
- [24] Qin, J. and Reidys, C.M., 2013, *On topological RNA interaction structures*, *JCB*, July 2013,20(7):495-513, Doi: 10.1089/cmb.2012.0282.
- [23] Han, H.S.W., Reidys, C.M., 2012, *A phase transition in energy-filtered RNA secondary structures*, *J. Comp. Biol*, Volume 19, Number 10, 2012. Pp. 1105-1119, DOI:10.1089/cmb.2012.0151.
- [22] Andersen, J.E., Huang, W.D., Penner, R.C. and Reidys, C.M., 2012, *Topology of RNA-RNA interaction structures*, *JCB*, Volume 19, Number 7, pp. 928943.
- [21] Han, H.S.W., Reidys, C.M., 2012, *The 5'-3' distance of RNA secondary structures*, *J. Comp. Biol.* July 2012, 19(7):867-878.
- [20] Li, T.J.X. and Reidys, C.M., 2011, *Combinatorial analysis of interacting RNA molecules*, *Math. Biosc.*, (**233**), 1, 47-58.

- [19] Nebel, M.E., Reidys, C.M. and Wang, R.R., 2011, *Loops in canonical RNA pseudoknot structures*, *J. Comp.Bio.*, **(18)**, 12: 1793-1806.
- [18] Li, T.J.X. and Reidys, C.M., 2012, *Combinatorics of RNA-RNA interaction*, *J. Math. Bio.*, **(64)**:529-556.
- [17] Reidys, C.M. and Wang, R.R., 2010, *Shapes of RNA pseudoknot structures*, *J. Comp. Bio.*, **(17)**, 11, 1575-1590.
- [16] Jin, E.Y., and Reidys, C.M., 2010, *Irreducibility in RNA structures*, *Bull. Math. Biol.*, **(72)**, 2, 375-399.
- [15] Han, H.S.W., Reidys, C.M., 2009, *Stacks in canonical RNA pseudoknot structures*, *Math. Biosciences*, **(219)**, 7-14.
- [14] Reidys, C.M., 2009, *Local connectivity of neutral networks*, *Bull. Math. Biol.*, **(71)**, 265-290.
- [13] Ma, G., Reidys, C.M., 2008, *Canonical RNA pseudoknot structures*, *J. Comp. Biol.*, **(15)**, 1257-1273.
- [12] Han, H.S.W., Reidys, C.M., 2008, *Pseudoknot RNA structures with arc-length  $\geq 4$* , *J. Comp. Biol.*, **(15)**, 1195-1208.
- [11] Huang, W.D., Reidys, C.M., 2008, *Statistics of canonical RNA Pseudoknot Structures*, *J. Theoret. Biol.*, **(253)**, 570-578.
- [10] Jin, E.Y., Qin, J., Reidys, C.M., 2008, *Neutral networks of sequence to shape maps*, *J. Theoret. Biol.*, **(250)** 484-497.

- [9] Jin, E.Y., Reidys, C.M., 2008, *Central and Local Limit Theorems for RNA Structures*, *J. Theoret. Biol.* **(250)**, 547-559.
- [8] Jin, E.Y., Reidys, C.M., 2008, *Asymptotic enumeration of RNA structures with pseudoknots*, *Bull. Math. Biol.*, **(70)**, 951-970.
- [7] Jin, E.Y., Qin. J., Reidys, C.M., 2008, *Combinatorics of RNA structures with pseudoknots*, *Bull. Math. Biol.* **(70)**, 45-67.
- [6] Reidys, C.M., Stadler, P.F., 2002, *Combinatorial Landscapes*, *SIAM Rev.*, **(44)**, 3-54.
- [5] Mortveit, H.S., and Reidys, C.M., 2001, *Towards a calculus of biological networks*. *Z. Phys. Chem.*,**(216)**, 1-13.
- [4] Reidys, C.M., Stadler, P.F., 2001, *Neutrality in fitness landscapes*, *Appl. Math. Comp.*, **(117)**, 321-350.
- [3] Reidys, C.M., Forst, C.V., Schuster, P., 2001, *Replication and mutation on neutral networks*, *Bull. Math. Biol.*, **(63)**, 57-94.
- [2] Reidys, C.M., Stadler, P.F., Schuster, P.K., 1997, *Generic Properties of Combinatory Maps and Neutral Networks of RNA Secondary Structures*, *Bull. Math. Biol.*, **(59)**, 339-397.
- [1] Reidys, C.M., Stadler, P.F., 1996, *Bio-molecular Shapes and Algebraic Structures*, *Comp. Chem.* **(20)**, 85-94.

- **Bioinformatics**

- [18] Barret, C.L., , Bura, A.C., He, Q., Huang F.W., Li, T.J. and Reidys, C.M., 2021. *Buying time: detecting VoCs in SARS-COV-2 via co-evolutionary signals*, [Submitted to RNA](#)
- [17] Huang, F.W., Barrett, C.L. and Reidys, C.M., 2021. *The energy-spectrum of bicompatible sequences*, [Algorithms for Molecular Biology, Under Review](#).
- [16] Barrett, C., Bura, A.C., He, Q., Huang, F.W., Li, T.J., Waterman, M.S. and Reidys, C.M., 2021. *Multiscale feedback loops in SARS-CoV-2 viral evolution*, [Journal of Computational Biology](#), 28(3), pp.248-256.
- [15] Reza Rezazadegan and Christian Reidys, 2018, *Degeneracy and genetic assimilation in RNA evolution*, [BMC Bioinformatics volume: 19, article number: 543](#).
- [14] Christopher Barrett, Qijun He, Fenix W. Huang, Christian M. Reidys, 2019, *A Boltzmann sampler for 1-pairs with double filtration*, [Journal of Computational Biology](#). 26(3).173-192.
- [13] Qijun He, Fenix W. Huang, Christopher Barrett and Christian M. Reidys, 2019, *Genetic robustness of let-7 miRNA sequence-structure pairs*, [RNA](#), 25(12), pp.1592-1603.
- [12] Christopher Barrett, Qijun He, Fenix W. Huang, Christian M. Reidys, 2018, *An efficient dual sampling algorithm with Hamming distance filtration*, [Journal of computational biology](#) 25(11) pp. 1179-1192.
- [11] Barrett, C., Huang F.W., and Reidys C.M., 2016, *Sequence-structure relations of biopolymers*, [Bioinformatics](#) 33(3) pp. 382-389.

- [10] Huang, W.D. and Reidys, C.M., 2012, *On the combinatorics of sparsification*, *Alg. Molec. Bio.*, 2012,7.28,Alg.Molec.Bio., doi:10.1186/1748-7188-7-28,Published: 22 October 2012.
- [9] Reidys, C.M., Huang, W.D., Andersen, J.E., Penner, R.C., Stadler, P.F. and Nebel, M.E., 2011, *Topology and prediction of RNA pseudoknots*, *Bioinformatics*, (27), 8, 1076-1085.
- [8] Li, A.X., Marz, M., Qin, J. and Reidys, C.M., 2011, *RNA-RNA interaction prediction based on multiple sequence alignments*, *Bioinformatics*, (27), 4, 456-463.
- [7] Huang, F.W.D, Qin, J., Reidys, C.M., and Stadler, P.F., 2010, *Target prediction and a statistical sampling algorithm for RNA-RNA interaction*, *Bioinformatics*, (26), 2, 175-181.
- [6] Gao, J.Z.M., Li, L.Y.M., and Reidys, C.M., 2010, *Inverse Folding of RNA Pseudoknot Structures*, *Algor. Molec. Biol.*, (5), R27.
- [5] Huang, F.W.D., Qin, J., Reidys, C.M., and Stadler, P.F., 2009, *Partition function and base pairing probabilities for RNA-RNA interaction prediction*, *Bioinformatics*, (25), 20, 2646-2654.
- [4] Huang, F.W.D., Li, L.Y.M., Reidys, C.M., 2009, *Sequence-structure relations of pseudoknot RNA*, *BMC Bioinformatics*, (10), Suppl 1, S39.
- [3] Huang, F.W.D., Peng W.W.J., Reidys, C.M. 2009, *Folding 3-noncrossing RNA pseudoknot structures*, *J. Comp. Biol.*, (16), 11, 1549-1575.

[2] Grüner, W.G., Strothmann, D., Reidys, C.M., Weber, J., Hofacker, I.L., Stadler, P.F., Schuster, P., 1996, *Analysis of RNA Sequence Structure Maps by Exhaustive Enumeration II. Neutral Networks*, *Chem. Month.* **(127)**, 375-389.

[1] Grüner, W.G., Strothmann, D., Reidys, C.M., Weber, J. Hofacker, I.L., Stadler, P.F., Schuster, P., 1996, *Analysis of RNA Sequence Structure Maps by Exhaustive Enumeration I. Neutral Networks*, *Chem. Month.* **(127)**, 355-374.