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Publication List

Publications in Mathematics and Science

1. Mohamad Mousa, Birgit Wehefritz-Kaufmann, Sabre Kais, Shawn Cui, Ralph Kaufmann. “Refined Phase Diagram for a Spin-1 System Exhibiting a Haldane Phase”. Phys. Rev. B 111, 085303
2. Kaufmann, Ralph M. and Zúñiga, J. Javier. “A combinatorial model for the moduli of bordered Riemann surfaces and a compactification” Contemp. Math., 802. American Mathematical Society, [Providence], RI, 2024, 117–137.
3. Nguyen, Nghi; Hou, Tao; Amico, Enrico; Zheng, Jingyi; Huang, Huajun; Kaplan, Alan D.; Petri, Giovanni; Goñi, Joaquín; Kaufmann, Ralph; Zhao, Yize; Duong-Tran, Duy; and Shen,Li . “Volume-Optimal Persistence Homological Scaffolds of Hemodynamic Networks Covary with MEG Theta-Alpha Aperiodic Dynamics”. Medical Image Computing and Computer Assisted Intervention – MICCAI 2024 27th International Conference, Marrakesh, Morocco, October 6–10, 2024, Proceedings, Part III Lecture Notes in Computer Science, vol 15003. Springer, Cham. 2024.
4. Kaufmann, Ralph M. and Monaco, Michael. “Plethysm Products, Element and Plus Constructions” C. R. Math. Acad. Sci. Paris 362 (2024), 357-411.
5. Kaufmann, Ralph M., Li, Dan, and Wehefritz-Kaufmann, Birgit. “Topological insulators and K-theory”. J. Math. Phys. 65, 043502 (2024).
6. Duong-Tran, Duy; Kaufmann Ralph; et al. “Homological Landscape of Human Brain Functional Sub-Circuits”, Mathematics, 12 (3) 455 (2024).
7. Kaufmann, Ralph M. and Benjamin C. Ward. “Koszul Feynman Categories”, Proc. Amer. Math. Soc. 151 (2023), 3253-3267
8. Kaufmann, Ralph M. and Medina-Mardones, Anibal M. “A combinatorial E_∞ algebra structure on cubical cochains” Cahiers de topologie et géométrie différentielle catégoriques 63,4 (2022) 387-424
9. Kaufmann, Ralph M. “A detailed look on actions on Hochschild complexes especially the degree 1 co-product and actions on loop spaces” . Journal of Noncommutative Geometry 16 (2022), no. 2, 677–716.
10. Kaufmann, Ralph M. and Mo, Yang. “Pathlike Co/bialgebras and their antipodes with applications to bi- and Hopf algebras appearing in topology, number theory and physics”. SIGMA 18 (2022), 053.
11. Kaufmann, Ralph M. and Medina-Mardones, Anibal M. “Cochain level May-Steenrod operations”. Forum Math. 33 (2021), no. 6, 1507-1526

12. Kaufmann, Ralph M. “Feynman categories and Representation Theory”. In: “Representations of Algebras, Geometry and Physics” 11–84, Contemp. Math., 769 (2021)
13. Kaufmann, Ralph M., Khlebnikov, Sergei, and Wehefritz-Kaufmann, Birgit “Local models and global constraints for degeneracies and band crossings” J. of Geometry and Physics 158 (2020) 103892.
14. Galvez-Carillo, Imma, Kaufmann, Ralph M., and Tonks, Andrew. “Three Hopf algebras from number theory, physics & topology, and their common background I: operadic & simplicial aspects” Comm. in Numb. Th. and Physics (CNTP), vol 14,1 (2020), 1-90.
15. Galvez-Carillo, Imma, Kaufmann, Ralph M., and Tonks, Andrew. “Three Hopf algebras from number theory, physics & topology, and their common background II: general categorical formulation” Comm. in Numb. Th. and Physics (CNTP), vol 14,1 (2020), 91-169.
16. Kaufmann, Ralph M. “Lectures on Feynman categories”, 2016 MATRIX annals, 375–438, MATRIX Book Ser., 1, Springer, Cham, 2018.
17. Kaufmann, Ralph M. and Kaufmann-Wehfritz, B. *Theoretical Properties of Materials Formed as Wire Network Graphs from Triply Periodic CMC Surfaces, Especially the Gyroid* in: “The Role of Topology in Materials”, Eds: Gupta, S. and Saxena, A., Springer series in Solid State Sciences. Springer, 2018
18. Kaufmann, Ralph and Lucas, Jason. “Decorated Feynman categories”. J. of Noncommutative Geometry, 1 (2017), no 4 1437-1464
19. Berger, C. and Kaufmann R. M. “Comprehensive Factorization Systems”. Special Issue in honor of Professors Peter J. Freyd and F.William Lawvere on the occasion of their 80th birthdays, Tbilisi Mathematical Journal 10 (2017), no. 3, 255-277
20. Kaufmann, Ralph M. and Ward, Benjamin C. “Feynman categories”. Astérisque 387 (2017), x+161 pages.
21. Kaufmann, Ralph M., Zhang, Yongheng. “Permutohedral Structures of E_2 Operads”. Forum Mathematicum, 29 (2017), no. 6, 1371–1411
22. Ralph M., Li, Dan, Kaufmann, and Wehefritz-Kaufmann, Birgit. “Notes on topological insulators”. Reviews in Math. Physics, Vol. 28, No. 10 (2016) 1630003 (57 pages)
23. Kaufmann, Ralph M., Khlebnikov, Sergei and Wehefritz-Kaufmann, Birgit. “Geometry of the momentum space: From wire networks to quivers and monopoles” J. of Singularities, J. of Singularities 15 (2016) 53-79.
24. Kaufmann, Ralph M., Khlebnikov, Sergei and Wehefritz-Kaufmann, Birgit. “Re-gauging groupoid, symmetries and degeneracies for Graph Hamiltonians and applications to the Gyroid wire network”. Ann. H. Poincaré 7, 6 (2016), 1383–1414..
25. Kaufmann, Ralph M., Ward, Benjamin C. and Zuniga, J. Javier. “The odd origin of Gerstenhaber, BV and the master equation” Journal of Math. Phys. 56, 103504 (2015).
26. Kaufmann, Ralph M., Khlebnikov, Sergei and Wehefritz-Kaufmann, Birgit. “Projective representations from quantum enhanced graph symmetries”, J. Phys.: Conf. Ser. (2015) 597 012048

27. Kaufmann, Ralph M. "Arc Geometry and Algebra: Foliations, Moduli Spaces, String Topology and Field Theory" Handbook of Teichmüller Theory IV. Ed: Athanase Papadopoulos. European Mathematical Society 2014
28. Kaufmann, Ralph M., Khlebnikov, Sergei and Wehefritz-Kaufmann, Birgit. "The geometry of the Double Gyroid wire network: Quantum and Classical". Journal of Noncommutative Geometry 4, (2012), 623-664.
29. Kaufmann, Ralph M., Khlebnikov, Sergei und Wehefritz-Kaufmann, Birgit. "Singularities, swallowtails and Dirac points. An analysis for families of Hamiltonians and applications to wire networks, especially the Gyroid" Annals of Physics, 327 (2012), 2865-2884.
30. Borisov, Lev und Kaufmann, Ralph M.. "On CY-LG correspondence for (0,2) toric models". Advances in Math, 230 (2012), 531-551
31. Kaufmann, Ralph M., Khlebnikov, Sergei and Wehefritz-Kaufmann, Birgit. "The noncommutative geometry of wire networks from triply periodic surface". Journal of Physics: Conf. Ser. 343 (2012), 012054.
32. Kaufmann, Ralph M. "Global Stringy Orbifold Cohomology, K-theory and de Rham Theory" Letters in Mathematical Physics, 94, 2 (2010) 165-195.
33. Kaufmann, Ralph M. "Open/Closed String Topology and Moduli Space Actions via Open/Closed Hochschild Actions". SIGMA 6 (2010) 036, 33 pages.
34. Kaufmann, Ralph M. "Graphs, strings and actions". in: Algebra, Arithmetic and Geometry Volume II: In Honor of Yu. I. Manin. Progress in Mathematics 270, 127–178. Birkhäuser, Boston (2010).
35. Kaufmann, Ralph M. and Schwert, Rachel. "Associahedra, Cyclohedra and a Topological solution to the A_∞ -Deligne conjecture". Advances in Math. 223, 6 (2010), 2166-2199.
36. Kaufmann, Ralph M. and Pham, David. "The Drinfel'd Double and Twisting in Stringy Orbifold Theory". Internat. J. of Math., 20, 5 (2009) 623-657.
37. Kaufmann, Ralph M. "Dimension vs. Genus: A surface realization of the little k -cubes and an E_∞ operad." in: Algebraic Topology - Old and New. M. M. Postnikov Memorial Conference, 241-274, Banach Center Publ., 85, Polish Acad. Sci., Warsaw, 2009.
38. Ralph M. Kaufmann, "A proof of a cyclic version of Deligne's conjecture via Cacti." Math. Research Letters 15, 5 (2008), pp. 901-921.
39. Kaufmann, Ralph M. "Noncommutative aspects of open/closed strings via foliations". Reports on Math. Phys., 61, 2 (2008), 281-293.
40. Kaufmann, Ralph M. "Moduli space actions on the Hochschild cochain complex II: correlators". Journal of Noncommutative Geometry 2, 3 (2008), 283-332.
41. Kaufmann, Ralph M. "Moduli space actions on the Hochschild cochain complex I: cell models". Journal of Noncommutative Geometry 1, 3 (2007), 333-384.
42. Jarvis, T.; Kaufmann, R and Kimura, T. "Stringy K-theory and the Chern character". Inventiones Math. 168, 1 (2007), 23-81.

43. Kaufmann, Ralph M. "On Spineless Cacti, Deligne's Conjecture and Connes–Kreimer's Hopf Algebra." *Topology* 46, 1 (2007), 39-88.
44. Kaufmann, Ralph M. and Penner, R. C. "Closed/Open String diagrammatics". *Nucl. Phys. B* 748 (2006), 335–379.
45. Kaufmann, Ralph M. "Singularities with symmetries, orbifold Frobenius algebras and mirror symmetry". *Contemp. Math.* 403 (2006), 67-116.
46. Jarvis, Tyler; Kaufmann, Ralph and Kimura, Takashi; "Pointed Admissible G -Covers and G -equivariant Cohomological Field Theories". *Compositio Mathematica* 141 (2005), 926-978.
47. Kaufmann, Ralph M. "On several varieties of cacti and their relations". *Algebraic & Geometric Topology* 5 (2005), 237-300.
48. Kaufmann, Ralph M. "The algebra of discrete torsion". *J. of Algebra*, 282 (2004), 232-259.
49. Kaufmann, Ralph M. "Second quantized Frobenius algebras". *Commun. Math. Phys* 248, 33-83 (2004).
50. Kaufmann, Ralph M. "Discrete torsion, symmetric products and the Hilbert scheme", in: C. Hertling and M. Marcolli (eds.) "Frobenius Manifolds, Quantum Cohomology and Singularities", Aspects of Mathematics E 36, Vieweg 2004.
51. Kaufmann, Ralph M. "Operads, Moduli of Surfaces and Quantum Algebras", in N. Tønning and R. C. Penner (eds.) "Woods Hole Mathematics. Perspectives in Mathematics and Physics", Series on Knots and Everything - Vol. 34, World Scientific 2004.
52. Kaufmann, Ralph M.; Livernet, Muriel and Penner, Robert C. "Arc Operads and Arc Algebras". *Geometry and Topology* 7 (2003), 511-568.
53. Kaufmann, Ralph M. "Orbifolding Frobenius Algebras". *Internat. J. of Math.* 14 (2003), 573-619.
54. Kaufmann, Ralph M. "Orbifold Frobenius Algebras, Cobordisms and Monodromies", 135–161. "Orbifolds in Mathematics and Physics" *Contemp. Math.* (310). Amer. Math. Soc. Providence, RI, 2002.
55. Kaufmann, Ralph M. "The tensor product in the theory of Frobenius manifolds". *Internat. J. of Math.* 10 (1999), 159-206.
56. Kaufmann, Ralph M. "The geometry of the moduli space of pointed curves, the tensor product in the theory of Frobenius manifolds and the explicit Künneth formula in quantum cohomology". *Bonner Mathematische Schriften* 312, 95 p., Bonn 1997.
57. Kaufmann, Ralph M. "The intersection form in $H^*(\bar{M}_{0,n})$ and the explicit Künneth formula in quantum cohomology". *Internat. Math. Res. Notices* 19 (1996), 929-954.
58. Kaufmann, R.; Manin, Yu.; and Zagier, D. "Higher Weil-Petersson Volumes of Moduli Spaces of Stable n-pointed Curves". *Comm. Math. Phys.* 181 (1996), 763-787.
59. Kontsevich, M. and Manin, Yu with appendix by Kaufmann, R. "Quantum cohomology of a product". *Invent. Math.* 124 (1996), 313-339.

60. Kaufmann, Ralph M. “Path Space Decompositions for the Virasoro Algebra and its Verma Modules”. *Internat. J. of Modern Phys. A* 10 (1995), 943-961.

Memorial Article

61. Bogomolov, Fedor; Tschinkel, Yuri; Beilinson, Alexander; Berkovich, Vladimir; Colliot-Thélène, Jean-Lois; Drinfeld, Vladimir; Goncharov, Alexander; Michael Harris, Michael; Katz, Nicholas M.; Kaufmann, Ralph; Marcolli, Matilde; Penkov, Ivan; Schechtman, Vadim; Skorobogatov, Alexei; Shokurov, Vyacheslav V.; Tsfasman, Michael; Voronov, Alexander; Zagier, Don; and Zarhin, Yuri G.. “Memorial Article for Yuri Manin”. *Notices of the AMS*, 70 (11), 2023.

Reports in Proceedings

62. Kaufmann, Ralph M. “New Developments in Feynman Categories: Bar and Koszul”. Oberwolfach Reports. Report No. 39/2024, 25–29.
63. Duy Duong-Tran*, Ralph Kaufmann*, Xuan Wang, Enrico Amico, Alan Kaplan, Giovanni Petri, Yize Zhao, Joaquín Goñi, Moo Chung, Li Shen. “On topological landscapes of human brain functional networks” Extended Abstract/Poster at 2023 Organization for Human Brain Mapping (OHB) , Montreal, CA.
64. Kaufmann, Ralph M. “Derived Decorated Feynman categories”. Oberwolfach Reports, Report No. 46/2021. Homotopical Algebra and Higher Structures. pp. 20-24.
65. Kaufmann, Ralph M. “BV and Feynman categories” Oberwolfach Reports Volume 11, Issue 1, 2014, Batalin-Vilkovisky Algebras, Operads, and Hopf Algebroids, organized by: V. Dotsenko and U. Krähmer pp. 624-626.
66. Kaufmann, Ralph M. “Moduli Spaces, Foliations and Algebraic Structures”. Oberwolfach Reports Issue 4, 2010, Report 53/2010 Teichmüller Theory Organized by: Shigeyuki Morita, Athanase Papadopoulos and Robert C. Penner pp. 3124–3128

Preprints

67. Kaufmann, Ralph M., Li, Dan, and Wehefritz-Kaufmann, Birgit. “The Stiefel-Whitney theory of topological insulators”. arXiv: arXiv:1604.02792
68. Kaufmann, Ralph M., Li, Dan, and Wehefritz-Kaufmann, Birgit. “Noncommutative topological \mathbf{Z}_2 invariant”. arXiv:1604.02792
69. Kaufmann, Ralph M. and C. Berger. “Trees, graphs and aggregates: a categorical perspective on combinatorial surface topology, geometry, and algebra”. arXiv:2201.10537
70. Kaufmann, Ralph M. and Monaco, Michael. “Plus constructions, plethysm, and unique factorization categories with applications to graphs and operad-like theories”. arXiv:2209.06121
71. Ralph M. Kaufmann, Benjamin C. Ward. “Schwarz Modular Operads Revisited: $SM=S^{\circ}M$ ”. arXiv:2404.17540

Volume Edited

72. Kaufmann, Ralph M., Markl, Martin and Voronov, Alexander A. [Edts.] “Higher Structures in Topology, Geometry and Physics”. *Contemp. Math.* 802; 323 pp. American Mathematical Society, Providence, RI, 2024.

Publications in Philosophy and Liberal Arts

73. Kaufmann, Ralph M. “Hegel’s mechanics as a system of steps from space and time to celestial motion.” In: *Hegel’s Philosophy of Nature. A Critical Guide.* Marina F. Bykova (Ed). Cambridge University Press 2024.
74. Kaufmann, Ralph M. and Yeomans, Christopher L. “Hegel’s Theory of Space-Time”. In: “Life, Organism and Human Nature: New Perspectives on Classical German Philosophy between Classical German Philosophy and Contemporary Debates”, Luca Corti and Johannes-Georg Schülein (Eds), *Studies in German Idealism*, Springer Cham, 2023.
75. Kaufmann, Ralph M. “Beseelte Natur. Alexander von Humboldt and Data Driven Paradigm Segues”. To appear in: “Alexander von Humboldt: Perceiving the World”, Allert, Beate; Clason, Christopher; Peach, Niall A. and Quintana, Ricardo (Eds). Purdue Univ. Press 2023 expected.
76. Kaufmann, Ralph M. “Zeitlicher Gedankenraum/räumliche Gedankenzeit (Darstellung einer verdichteten Ideenreihung)” (Time-like Mental-space/space-like Mental-time, A Presentation of a Condensed String of Ideas). In: “Das Buch vom Drehen und Wenden der Blätter” (The book on the Twisting and Turning of Leaves.) Egger, Oswald; Schestag, Thomas and Eckert, Jennifer (Eds). Das Böhmishe Dorf, 2022.
77. Kaufmann, Ralph M. “Wörtlich. Ummantelndes und Fügendes in Oswald Eggers “Harlekinsmäntel & andere Bewandtnisse. A-Z”” (Verbatim. Enclosing and Joining Elements in Oswald Eggers “Halequins’ Coats & other Circumstances. A–Z.”). In: ““Wort für Wort’ – Lektüren zum Werk von Oswald Egger”’ (“Word for word” —Readings on the Works of Oswald Egger), Endres, Martin and Simon, Ralf (Eds). *Theorie der Prosa*, De Gruyter, 2021
78. Kaufmann, Ralph M., Lyssy, Ansgar and Yeomans, Christopher L. “Hegel’s Philosophy of Nature: The Expansion of Particularity as the Filling of Space and Time”. In: *Cambridge Guide to Hegel’s Encyclopedia*, Stein, Sebastian and Wretzel, Joshua (Eds). Cambridge Univ. Press, 2021.
79. Kaufmann, Ralph M. and Yeomans, Christopher L. “Hegel on Calculus”. *History of Philosophy Quarterly* 34 (2017), 371–390.
80. Kaufmann, Ralph M. and Yeomans, Christopher L. “Math by Pure Thinking: **R** First and the Divergence Of Measures in Hegel’s Philosophy of Mathematics”. *European Journal of Philosophy* 25, 4 (2017), 985–1020.
81. Kaufmann, Ralph M. “Der Dichter spricht: Eine Rezeption Hölderlins ’Verfahrensweise des Poetischen Geistes’” (The Poet Speaks: A Reception of Hölderlin’s ‘On the Mode of Operation of the Poetic Spirit’), *Zeitschrift für Kulturphilosophie*, 2017/1 “Sprache und Gestalt”, Meiner Verlag, Hamburg.

82. Egger, Oswald, "Nach dem Muster. Vom innigen Band der Begriffe symplektischer Wortgeflechte mit Anmerkungen von Ralph M. Kaufmann zu Oswald Eggers Hölderlin-Schnitten" (Following the pattern. On the intimate band of expressions in symplectic word-weaves, with remarks by Ralph M. Kaufmann on Oswald Eggers Hölderlin cuts). In: Paradigmenwechsel: Wandel in den Künsten und Wissenschaften (Change of Paradigms: Changes in the Arts and Sciences), Eds: A. Sakoparnig, A. Wolfsteine and, J. Bohm. De Gruyter 2014.
- Kaufmann, Ralph. "Anmerkungen zu dem Hölderlin Text von Oswald Egger" (Remarks on the Text on Hölderlin by Oswald Egger) in Paradigmenwechsel: Wandel in Den Künsten und Wissenschaften, (Change of Paradigms: Changes in the Arts and Sciences). Eds: A. Sakoparnig, A. Wolfsteine and, J. Bohm. De Gruyter 2014.
83. Kaufmann, Ralph M. "Truth or Beauty: what can mathematical language do for you?" Institute for Advanced Studies Newsletter Spring 2014.
84. Kaufmann, Ralph M. "Anmerkungen zu Oskar Pastiors Algorismus" (Remarks on Oskar Pastior's Algorism). In: Oskar Pastior, "Gewichtete Gedichte: Chronologie der Materialien" (Weighted Poems: Chronology of the Material). Mit Beiträgen von Ralph Kaufmann und Oswald Egger. (With contribution by) Edition: Das böhmische Dorf 2006.

Theses and Dissertations

85. Ralph M. Kaufmann "Moduli spaces and Deformations." *Habilitation Bonn, Germany 2003.* 251p. *Universität Bonn*
86. Ralph M. Kaufmann "The geometry of the moduli space of pointed curves, the tensor product in the theory of Frobenius manifolds and the explicit Künneth formula in quantum cohomology." *Dissertation 1997 Universität Bonn.*
87. Ralph M. Kaufmann. "Socrates' enigma of false identity-judgements in Plato's 'Theaetetus' and Gottlob Frege's theory of sense and reference as a possible answer." *Master thesis 1996 Universität Bonn.*
88. Ralph M. Kaufmann. "Path space decompositions for the Virasoro algebra and its Verma modules." *Diploma (Master) thesis 1994. Universität Bonn.*