Thomas Nikolaus

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Research Interests

Higher-categorical methods in geometry and topology, particularly in algebraic K-theory, homotopy theory, and higher algebra, with connections to mathematical physics and noncommutative geometry.

My current work focuses on trace methods, prismatic cohomology, continuous K-theory, equivariant homotopy theory and assembly conjectures.

Selected Publications

1. On topological cyclic homology (with P. Scholze), *Acta Mathematica* 221 (2018), 203–409. *Introduces a new homotopy-invariant framework for topological cyclic homology via cyclotomic spectra.*
2. Cartier modules and cyclotomic spectra (with B. Antieau), *Journal of the AMS* 34 (2021), 1–78. *Develops a structural theory of cyclotomic spectra via Cartier modules, linking them to the crystalline setting.*
3. On the Beilinson fiber square (with B. Antieau, A. Mathew, M. Morrow), *Duke Mathematical Journal* 171 (2022), 3707–3806. *Refines the relationship between algebraic K-theory and p-adic cohomology using topological cyclic homology.*
4. The Balmer spectrum of the equivariant homotopy category of a finite abelian group (with T. Barthel, M. Hausmann, N. Naumann, J. Noel, N. Stapleton), *Inventiones Mathematicae* 216 (2019), 215–240. *Determines the Balmer spectrum of equivariant stable homotopy categories, advancing chromatic homotopy theory.*
5. Hermitian K-theory for stable ∞-categories II (with B. Calmès, E. Dotto, Y. Harpaz, F. Hebestreit, M. Land, K. Moi, D. Nardin and W. Steimle), *Acta Mathematica* 235 (2025), 149–400. *Develops a homotopy-theoretic framework for hermitian K-theory via cobordism categories and additivity.*
6. Hermitian K-theory for stable ∞-categories III (with B. Calmès, E. Dotto, Y. Harpaz, F. Hebestreit, M. Land, K. Moi, D. Nardin and W. Steimle), to appear in *Annals of Mathematics*. *Relates Grothendieck–Witt theory to K- and L-theory and resolves structural questions beyond the classical setting.*
7. L-theory of C^*-algebras (with M. Land, M. Schlichting), *Proceedings of the LMS* 127 (2023), 1451–1506. *Establishes a structural description of L-theory for C^*-algebras and connects it to K-theory and assembly conjectures.*
8. Maps between spherical group rings (with S. Carmeli and A. Yuan), preprint, arXiv:2405.06448. *Shows rigidity of $\mathbb{E}_\infty$-maps between spherical group rings, reducing them to group homomorphisms.*
9. On the K-theory of $\mathbb{Z}/p^n$ (with B. Antieau and A. Krause), preprint, arXiv:2405.04329. *Gives explicit algebraic descriptions of K-groups of truncated discrete valuation rings using prismatic methods.*
10. Frobenius homomorphisms in higher algebra, *Proceedings of the ICM 2022*. *Surveys and advances the role of Frobenius maps in higher algebra and their connections to conjectures in homotopy theory and algebraic K-theory (old and new).*

Positions

since 2018	Professor, University of Münster
2017–2018	Nachwuchsgruppenleiter (W2), Max Planck Institute for Mathematics, Bonn
2015–2016	Postdoctoral Researcher, Max Planck Institute for Mathematics, Bonn
2014–2015	Vertretungsprofessor, University of Bonn
2011–2014	Akademischer Rat auf Zeit, University of Regensburg
2010–2011	Research Associate, Landesexzellenzcluster "Connecting Particles with the Cosmos", University of Hamburg
2009–2010	Research Associate, DFG Collaborative Research Centre 676 "Particles, Strings, and the Early Universe", University of Hamburg

Academic Leadership, Funding, and Service

- Spokesperson of the Center for Mathematics Münster (CMM), since 2026.
- One of the main applicants for the Center for Mathematics Münster (CMM) as a research building project under the German *Forschungsbauten* programme pursuant to Art. 91b GG.
- Since 2024: Spokesperson of the Cluster of Excellence EXC 2044 "Mathematics Münster: Dynamics - Geometry - Structure". Second phase granted in 2025.
- Since 2020: Principal Investigator in CRC 1442 "Geometry: Deformations and Rigidity".
- Since 2019: Principal Investigator in the Cluster of Excellence "Mathematics Münster: Dynamics - Geometry - Structure".
- Principal Investigator in SFB 1085 "Higher Invariants - Interactions between Arithmetic Geometry and Global Analysis", Regensburg.
- Main applicant of the DFG research network "String Geometry".
- Since 2023: Editorial Board, *Journal of the European Mathematical Society*.
- Since 2020: Editorial Board, *Algebraic & Geometric Topology*.
- 2021–2024: Editor of *Manifolds and K-theory: Memorial volume in honour of Andrew Ranicki*.

Academic Distinctions

- 2024: von Kaven-Ehrenpreis für Mathematik.
- 2023: Frontiers of Science Award at the ICBS.
- 2022: Sectional talk at the International Congress of Mathematicians.
- Since 2021: Member of the K-Theory Foundation.
- 2006–2009: Scholar of the German National Academic Foundation.

Supervision

Current PhD Students

- Edith Hübner: Spherical δ-rings
- Phil Pützstück: Equivariant non-commutative motives.
- Thorger Geiss: Ad-theories and (∞, ∞)-spectra.

Completed PhD Theses

- Stefano Ariotta: *Coherent cochain complexes and Beilinson t-structures*, University of Münster, 2022.
- Jonas McCandless: *TR and its relation to algebraic K-theory*, University of Münster,

2022.
- Marin Janssen: *Genuine cohomology theories*, University of Münster, 2024.
- Konrad Bals: De Rham–Witt complexes and topological periodic homology. University of Münster, 2025.

Current Postdocs

- Dr. Ferdinand Wagner, since 2026.
- Dr. Georg Lehner, since 2025.
- Dr. Maxime Ramzi, since 2024.
- Dr. Catherine Ray, since 2023.

Former Postdocs

- Dr. Devarshi Mukherjee (2024–2025).
- Dr. Achim Krause (2018–2024), now Professor at the University of Oslo.
- Dr. Jay Shah (2021–2024).
- Dr. Julia Semikina (2020–2023).
- Prof. Dr. Manuel Krannich (2021–2022), now Professor at Karlsruhe Institute of Technology.
- Prof. Dr. Fabian Hebestreit (2021–2022), now Professor at Bielefeld University.
- Dr. Christoph Schrade (2018–2021).

Education

2011	PhD in Mathematics, University of Hamburg. Advisor: Christoph Schweigert. Thesis: “Higher Categorical Structures in Geometry - General Theory and Applications to Quantum Field Theory”
2009	Diploma in Mathematics, University of Hamburg. Advisor: Christoph Schweigert. Thesis: “Äquivariante Gerben und Abstieg”
2003	Abitur, Otto-Hahn-Gymnasium Gifhorn

Conference and Workshop Organisation

- Organiser, Beyond the telescope conjecture, Cambridge, June 2025.
- Organiser, Young Topologists Meeting, Münster, August 2024.
- Organiser, “From Homotopy Theory to Analysis - a conference in honor of Ulrich Bunke’s 60th Birthday”, Greifswald, March 2024.
- Organiser, Mid-term Conference Mathematics Münster, March 2023.
- Organiser, Oberwolfach Workshop on Non-commutative Geometry, August 2022.
- Organiser, ICM Sectional Workshop, Copenhagen, July 2022.
- Organiser, Oberwolfach Arbeitsgemeinschaft, April 2019.
- Organiser, European Autumn School in Topology, Utrecht, September 2017.
- Organiser, Conference on Invertible Objects and Duality in Derived Algebraic Geometry and Homotopy Theory, Regensburg, April 2017.
- Organiser, European Autumn School in Topology, Utrecht, September 2016.
- Organiser, “Modular Invariants in Topology and Analysis”, Regensburg, September 2014.
- Organiser, “From Poisson to String Geometry”, Erlangen, September 2012.

Personal Data

Name	Thomas Nikolaus
Address	FB Mathematik und Informatik, Universität Münster, Einsteinstr. 62, 48149 Münster, Germany
Date and place of birth	06.06.1984, Esslingen am Neckar, Germany
Nationality	German

Publications

1. Unbounded Weight Structures: (Re)construction and Completion (with P. Pützstück). Preprint, arXiv:2605.00783.
2. Bredon sheaf cohomology (with G. Arnone and D. Mukherjee). Preprint, arXiv:2604.08066.
3. Trace methods for stable categories I: The linear approximation of algebraic K-theory (with Y. Harpaz and V. Saunier). Preprint, arXiv:2411.04743.
4. An alternative to spherical Witt vectors (with M. Yakerson). To appear in *Proceedings of the American Mathematical Society*. arXiv:2405.09606.
5. Maps between spherical group rings (with S. Carmeli and A. Yuan). Preprint, arXiv:2405.06448.
6. On the K-theory of $\mathbb{Z}/p^n$ (with B. Antieau and A. Krause). Preprint, arXiv:2405.04329.
7. Witt vectors with coefficients and TR (with E. Dotto, A. Krause and I. Patchkoria). *Proceedings of the London Mathematical Society* 130 (2025), no. 5, e70047. arXiv:2312.12971.
8. Prismatic cohomology relative to δ-rings (with B. Antieau and A. Krause). Preprint, arXiv:2310.12770.
9. Polygonic spectra and TR with coefficients (with A. Krause and J. McCandless). Preprint, arXiv:2302.07686.
10. L-theory of C^*-algebras (with M. Land and M. Schlichting). *Proceedings of the London Mathematical Society* 127 (2023), no. 5, 1451–1506. arXiv:2208.10556.
11. Frobenius homomorphisms in higher algebra. In *Proceedings of the International Congress of Mathematicians 2022*.
12. On the K-theory of $\mathbb{Z}/p^n$ – announcement (with B. Antieau and A. Krause). Preprint, arXiv:2204.03420.
13. K-theory and polynomial functors (with C. Barwick, S. Glasman and A. Mathew). Preprint, arXiv:2102.00936.
14. Hermitian K-theory for stable ∞-categories I: Foundations (with B. Calmès, E. Dotto, Y. Harpaz, F. Hebestreit, M. Land, K. Moi, D. Nardin and W. Steimle). *Selecta Mathematica, New Series* 29 (2023), no. 1, Paper No. 10. arXiv:2009.07223.
15. Hermitian K-theory for stable ∞-categories II: Cobordism categories and additivity (with B. Calmès, E. Dotto, Y. Harpaz, F. Hebestreit, M. Land, K. Moi, D. Nardin and W. Steimle). *Acta Mathematica* 235 (2025), no. 2, 149–400. arXiv:2009.07224.
16. Hermitian K-theory for stable ∞-categories III: Grothendieck–Witt groups of rings (with B. Calmès, E. Dotto, Y. Harpaz, F. Hebestreit, M. Land, K. Moi, D. Nardin and W. Steimle). To appear in *Annals of Mathematics*. arXiv:2009.07225.
17. On the homotopy type of L-spectra of the integers (with F. Hebestreit and M. Land). *Journal of Topology* 14 (2021), 183–214. arXiv:2004.06889.
18. The initial quadratic form on an abelian group (with F. Hebestreit and M. Land). Short note/erratum to a remark in "On the homotopy type of L-spectra of the integers". https://www.uni-muenster.de/IVV5WS/WebHop/user/nikolaus/papers.html.
19. On the Beilinson fiber square (with B. Antieau, A. Mathew and M. Morrow). *Duke Mathematical Journal* 171 (2022), no. 18, 3707–3806. arXiv:2003.12541.

20. Witt vectors with coefficients and characteristic polynomials over non-commutative rings (with E. Dotto, A. Krause and I. Patchkoria). *Compositio Mathematica* 158 (2022), 366–408. arXiv:2002.01538.

21. Bökstedt periodicity and quotients of DVRs (with A. Krause). *Compositio Mathematica* 158 (2022), 1683–1712. arXiv:1907.03477.

22. Topological cyclic homology (with L. Hesselholt). In *Handbook of Homotopy Theory*, CRC Press/Chapman Hall Handbooks in Mathematics, 619–656, 2020. arXiv:1905.08984.

23. Algebraic K-theory of planar cuspidal curves (with L. Hesselholt). In *K-theory in Algebra, Analysis and Topology*, Contemporary Mathematics 749, American Mathematical Society, 139–148, 2020. arXiv:1903.08295.

24. Cartier modules and cyclotomic spectra (with B. Antieau). *Journal of the American Mathematical Society* 34 (2021), 1–78. arXiv:1809.01714.

25. Higher geometry for non-geometric T-duals (with K. Waldorf). *Communications in Mathematical Physics* 374 (2020), 317–366. arXiv:1804.00677.

26. The Balmer spectrum of the equivariant homotopy category of a finite abelian group (with T. Barthel, M. Hausmann, N. Naumann, J. Noel and N. Stapleton). *Inventiones Mathematicae* 216 (2019), 215–240. arXiv:1709.04828.

27. On the Blumberg–Mandell Künneth theorem for TP (with A. Mathew and B. Antieau). *Selecta Mathematica, New Series* 24 (2018), 4555–4576. arXiv:1710.05658.

28. On topological cyclic homology (with P. Scholze). *Acta Mathematica* 221 (2018), 203–409. arXiv:1707.01799.

29. Correction to "On topological cyclic homology" (with P. Scholze). *Acta Mathematica* 222 (2019), 215–218.

30. Localization of cofibration categories and groupoid C^*-algebras (with M. Land and K. Szumiło). *Algebraic & Geometric Topology* 17 (2017), 3007–3020. arXiv:1609.03805.

31. On the relation between K- and L-theory of C^*-algebras (with M. Land). *Mathematische Annalen* 371 (2018), 517–563. arXiv:1608.02903.

32. Stable ∞-operads and the multiplicative Yoneda lemma. Preprint, arXiv:1608.02901.

33. The Beilinson regulator is a map of ring spectra (with U. Bunke and G. Tamme). *Advances in Mathematics* 333 (2018), 41–86. arXiv:1509.05667.

34. Homology of dendroidal sets (with M. Bašić). Preprint, arXiv:1509.00702.

35. Presentably symmetric monoidal ∞-categories are represented by symmetric monoidal model categories (with S. Sagave). *Algebraic & Geometric Topology* 17 (2017), 3189–3212. arXiv:1506.01475.

36. Lax colimits and free fibrations in ∞-categories (with D. Gepner and R. Haugseng). *Documenta Mathematica* 22 (2017), 1225–1266. arXiv:1501.02161.

37. Twisted differential cohomology (with U. Bunke). *Algebraic & Geometric Topology* 19 (2019), 1631–1710. arXiv:1406.3231.

38. Universality of multiplicative infinite loop space machines (with D. Gepner and M. Groth). *Algebraic & Geometric Topology* 15 (2015), 3107–3153. arXiv:1305.4550.

39. T-duality via gerby geometry and reductions (with U. Bunke). *Reviews in Mathematical Physics* 27 (2015), no. 5, 1550013, 46 pp. arXiv:1305.6050.

40. Algebraic K-theory of ∞-operads. *Journal of K-Theory* 14 (2014), no. 3, 614–641. arXiv:1303.2198.

41. Principal ∞-bundles: Presentations (with U. Schreiber and D. Stevenson). *Journal of Homotopy and Related Structures* 10 (2015), 565–622. arXiv:1207.0249.

42. Principal ∞-bundles: General theory (with U. Schreiber and D. Stevenson). *Journal of Homotopy and Related Structures* 10 (2015), 749–801. arXiv:1207.0248.

43. Differential cohomology theories as sheaves of spectra (with U. Bunke and M. Völkl). *Journal of Homotopy and Related Structures*. arXiv:1311.3188.

44. Dendroidal sets as models for connective spectra (with M. Bašić). *Journal of K-Theory* 14 (2014), no. 3, 387–421. arXiv:1203.6891.

45. Lifting problems and transgression for non-abelian gerbes (with K. Waldorf). *Advances in Mathematics* 242 (2013), 50–79. arXiv:1112.4702.

46. Four equivalent versions of non-abelian gerbes (with K. Waldorf). *Pacific Journal of Mathematics* 264 (2013), no. 2, 355–420. arXiv:1103.4815.

47. Bicategories in field theories – an invitation (with C. Schweigert). In *Strings, Gauge Fields, and the Geometry Behind*, World Scientific, 119–132, 2013. arXiv:1111.6896.

48. A smooth model for the string group (with C. Sachse and C. Wockel). *International Mathematics Research Notices* 2013, no. 16, 3678–3721. arXiv:1104.4288.

49. Strictification of weakly equivariant Hopf algebras (with J. Maier and C. Schweigert). *Bulletin of the Belgian Mathematical Society – Simon Stevin* 20 (2013), no. 2, 269–285. arXiv:1109.0236.

50. Equivariant modular categories via Dijkgraaf–Witten theory (with J. Maier and C. Schweigert). *Advances in Theoretical and Mathematical Physics* 16 (2012), no. 1, 289–358. arXiv:1103.2963.

51. Equivariance in higher geometry (with C. Schweigert). *Advances in Mathematics* 226 (2011), no. 4, 3367–3408. arXiv:1004.4558.

52. Algebraic models for higher categories. *Indagationes Mathematicae, New Series* 21 (2011), no. 1–2, 52–75. arXiv:1003.1342.

53. Bundle gerbes and surface holonomy (with J. Fuchs, C. Schweigert and K. Waldorf). In *European Congress of Mathematics*, EMS Publishing House, 167–197, 2008. arXiv:0901.2085.