Kathryn Hess Bellwald

Curriculum Vitae

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Education

1989 **PhD in mathematics**, *Massachusetts Institute of Technology*.
1985 **BSc with honors in mathematics**, *University of Wisconsin-Madison*.

Research interests

- Homotopy theory, category theory
- Applications of algebraic topology in the life sciences and in material science.

Academic positions held

2021–present **Associate vice-president for student affairs and outreach**, *EPFL*.
2019–present **Full professor**, *EPFL*.
2015–2019 **Associate professor**, *EPFL*.
2014 **Research professor in the algebraic topology program (one semester)**, *MSRI*.
1999–2014 **Adjunct professor**, *EPFL*.
1999–2000 **Visiting professor**, *University of Stockholm*, fellowship from the Swedish NSF.
1998–1999 **Scientific collaborator**, *EPFL*.
1994 **Visiting researcher (one month)**, *Université de Louvain-la-Neuve*.
1993 **Visiting researcher (one month)**, *Mittag-Leffler Institute*.
1993–1999 **Lecturer (Chargée de cours)**, *EPFL*.
1992–1998 **First assistant (position "relève académique")**, *EPFL*.
1991–1992 **Assistant**, *EPFL*.
1991 **Visiting professor (one semester)**, *University of Toronto*.
1990 **Visiting researcher (one semester)**, *University of Nice*.
1989–1990 **Visiting researcher (one year)**, *University of Stockholm*, fellowship from the Swedish NSF.

Honors and awards

2024 Fellow of the Association for Women in Mathematics
2023 Chaire de la Vallée Poussin at UC Louvain-la-Neuve
2018 Best teacher in the Faculty of Life Sciences
2017 Distinguished Speaker of the European Mathematical Society
2017 Fellow of the American Mathematical Society
2016 Individual member of the Swiss Academy of Engineering Sciences
2013 "Polysphère d'Or" (Agépoly prize for best teacher at the EPFL)
2012 Crédit Suisse prize for best EPFL teacher
2005 Agépoly prize for best teacher in the Faculty of Basic Sciences

Research grants (since 2017)

2019 Co-PI on Innosuisse grant "Topological suite for deep learning: enhanced model reliability, stability and performance" (1 MCHF over 24 months)

2019 Co-PI on Marie Curie ITN grant CANCERPREV (4 MEUR over 48 months)

2018 Co-PI on Innosuisse grant "Topological warning signals for critical system transitions" (500 KCHF over 18 months)

2018 PI on SNF-ANR grant "Operads, calculus, and homotopy theory methods in topology" (331 KCHF over four years)

2017 Co-PI on SNF Sinergia grant "Synergistic Approach to Capturing and Exploiting Microscopy Images" (2.1 MCHF over four years)

2017 PI on SNF grant "Signal processing on simplicial complexes" (488 KCHF over four years)

Conference and seminar presentations (since 2020)

2024

Topology seminar, Haifa University. Israel (online)
Math biology seminar, Arizona State University, USA (online)
Plenary lecture, GROW Bonn, Germany
Invited lecture, MUNI Seminar Series, Masaryk University, Slovakia
Maheshewari Colloquium, University of Albany, USA
Invited lecture, Annual meeting of the Swedish e-Science Research Centre, Sweden
Invited lecture, 55e Journées de statistique de la SFdS, France
Keynote lecture, International Conference on Mathematical Neuroscience, Ireland
Invited lecture, International Conference on Topology, Representation Theory, and Higher Structures, Scotland
Keynote lecture, London Geometry and Machine Learning Workshop, England

2023

Colloquium, TU Kaiserslauten, Germany
Invited lecture, Conference in Honor of Paul Goerss, Northwestern University, USA
Invited lecture, Meeting of the Mathematics-Astronomy-Physics Plenum of the Swiss Academy of Sciences, Bern, Switzerland
Invited lecture, Distinguished colloquium series of the Turkish Mathematical Society (online)
Public lecture, University of Pennsylvsania, USA
Keynote lecture, Bern Data Science Day 2023, Bern, Switzerland
Invited lecture, GAP XVIII, Paris, France (declined due to scheduling conflict)
Invited lecture, Computational Topology and Geometry Workhop, Paris, France (declined due to scheduling conflict)
Plenary lecture, International Conference on Approximation Theory and Applications, Cetraro, Italy (online)
Plenary lecture and TDA special session invited lecture, 29th Nordic Congress of Mathematicians, Aalborg, Denmark
Invited lecture, Conference in Honor of Bjørn Dundas, Nijmegen, Netherlands
Public lecture, Scientifica, ETHZ, Zurich, Switzerland
Keynote lecture, Workshop on TDA for the life sciences, Heidelberg, Germany (online)
Invited lecture, Network Science Society Colloquium (online)
Invited lecture, Progress and Visions in Consciousness Science (online)
Invited lecture series, Chaire de la Vallée Poussin, Louvain-la-Neuve, Belgique

2022

Invited lecture, Workshop on Mathematical Modeling and Statistical Analysis in Neuroscience, IHP, France (online)
Plenary lecture, CITMaGa inauguration, Santiago de Compostella, Spain (online)

Seminar, Center for Intelligent Systems, EPFL (online)
Applied math seminar, Oxford University, UK (online)
Seminar, Mittag-Leffler Institute, Sweden
Mathematical brain modelling seminar, Oxford University, UK (online)
Keynote lecture, TDA Workshop, SIAM Data Mining Conference, USA (online)
NAGANA seminar, Montpellier, France (online)
Plenary lecture, Conference of Mathematics of Complex Data, KTH, Sweden
Invited lecture, Barcelona Conference on Higher Structures, Spain (declined due to scheduling conflict)
Invited lecture, Curves and Surfaces 2022, Arcachon, France (declined due to scheduling conflict)
Invited lecture, Conference on Applied, Combinatorial, and Toric Topology, IMS, Singapore (online)
Invited lecture, Algebraic Topology and Topological Data Analysis, IMA, Minneapolis, USA
Invited lecture, GQT Colloquium, Netherlands
Invited lecture, Classifying Spaces in Homotopy Theory, ICMS, Scotland
Invited lecture, Workshop on Geometry, Topology and Statistics in Data Sciences, IHP, France
Invited lecture, Baues Memorial Conference, Max Planck Institute for Mathematics, Germany
Invited lecture, SLMath/MSRI Scientific Advisory Council, Berkeley, USA (online)
Lecture series, Thematic program on Geometry and Statistics in Data Sciences, IHP, France
Invited lecture, Electronic Computational Homotopy Theory Seminar (online)
Invited lecture, Workshop in Honor of Clemens Berger, University of Nice, France

2021
Public lecture, William and Mary College, USA (online)
Colloquium, University of Pennsylvania, USA (online)
Seminar, Neuro and AI, University of Washington, USA (online)
Invited lecture, Journée “Mathématiques et intelligence artificielle", France (online)
Seminar, Purdue University, USA (online)
Colloquium “Jacques Morgenstern", Sophia Antipolis, France (online)
Colloquium, University of Haifa, Israel (online)
Seminar, Program on Higher Homotopical Structures, Barcelona Spain (online)
Public lecture, 8th European Congress of Mathematics, Slovenia (online)
Invited lecture, Topos Colloquium (online)
Colloquium, Berlin Mathematical School, Germany (online)
Colloquium (SFB Lecture), University of Regensburg, Germany (online)
Lecture series, Young Topologists Meeting, Stockholm, Sweden (onliine)
Invited lecture, Institute for Advanced Studies, University of Amsterdam (online)
Invited lecture, 60th Anniversary of CINVESTAV, Mexico (online)
Lecture series, Annual meeting of the GDR "Algebraic topology and applications", Strasbourg, France
Invited lecture, COGENT seminar (online)
Invited lecture, Forum des jeunes mathématiciennes, Besançon, France (online)

2020
Seminar, NTNU, Norway
Invited track speaker, Applied Machine Learning Days, EPFL, Switzerland
Invited lecture, Workshop on Geometry of Complex Webs, Les Diablerets, Switzerland
Topology seminar, MIT, USA
Topology seminar, Northeastern University, USA
Invited lecture, Journée “Mathématiques et intelligence artificielle", Paris, France (postponed)
Public lecture, General Assembly of the Belgian Mathematical Society, Brussels, Belgium (cancelled)
Colloquium, University of Neuchâtel, Switzerland (postponed)
Colloquium, TU Kaiserslauten, Germany (postponed)
Colloquium and seminar, University of Pennsylvania, USA (postponed)
Colloquium, Rutgers University, USA (postponed)
Colloquium “Jacques Morgenstern", Sophia Antipolis, France (postponed)
Invited lecture, 60th Birthday Workshop for Vincent Franjou, Nantes, France (postponed)

Plenary lecture, Workshop on Mathematics for Complex Data, KTH, Sweden (postponed)
Colloquium, Berlin Mathematical School, Germany (postponed)
Invited lecture, Online Algebraic Topology Seminar
Invited lecture, Workshop on Topological Data Analysis, Fields Institute, Canada (online)
Public lecture, European Congress of Mathematicians, Slovenia (postponed)
Lecture series, Young Topologists Meeting, Stockholm, Sweden (postponed)
Invited lecture, Workshop on Topological and Geometric Structures, TU Berlin, Germany (postponed)
Invited lecture, LMS and IMA Annual Joint Meeting, London, UK (online)
Plenary lecture, MathSEE Symposium 2020, Karlsruhe, Germany (online)
Topology seminar, Montana State University, USA (online)
Invited lecture, Symposium Developments in Statistics and Data Science, Max Planck, Berlin, Germany (cancelled)
Lectures series, Workshop of the GDR "Topologie algébrique", Strasbourg, France (postponed)
Invited lecture, Forum des Jeunes Mathématcien(ne)s, Besançon, France (postponed)
Invite lecture, I-AIM Seminar "Data Science for Materials Discovery" (online)
Colloquium, University of Sheffield, UK (online)
Keynote lecture, Workshop "Topological Data Analysis and Beyond", NeurIPS 2020 (online)

Longterm research visits

2023
ICERM (two-week research membership) (declined)
2022
Mittag-Leffler Institute (two-week research membership)
Insitut Henri Poincaré (visiting professorship)

2019
MSRI (one-month research membership)

2018
Newton Institute (one-month visitor)
2015
Stockholm University (two weeks)

2014
MSRI (three-month research professorship)

2013
Newton Institute (three-week visitor)

2012
University of Chicago (three weeks)

Published articles and preprints

1. K. Hess, *A proof of Ganea's conjecture for rational spaces*, Topology **30** (1991), 205-214.
2. K. Hess, *Twisted tensor products of DGA's and the Adams-Hilton model for the total space of a fibration*, London Mathematical Society Lecture Notes **175** (1992) 29-51.
3. K. Hess, *Mild and tame homotopy theory*, J. Pure and Applied Algebra **84** (1993) 277-310.
4. K. Hess and J.-M. Lemaire, *Generalizing LS-category to model categories*, J. Pure and Applied Algebra **91** (1994) 165-182.
5. N. Dupont and K. Hess, *Twisted tensor models of fibrations*, J. Pure and Applied Algebra **91** (1994) 109-120.
6. K. Hess and J.-M. Lemaire, *Nice and lazy cell attachments*, J. Pure and Applied Algebra **112** (1996) 29-39.

7. K. Hess, *Perturbation and transfer of generic algebraic structure*, Contemporary Math. **227** (1999) 103-144.
8. K. Hess, *A history of rational homotopy theory*, History of Topology, ed. I.M. James, Elsevier Science B.V., 1999, pp. 757-796.
9. N. Dupont and K. Hess, *Noncommutative algebraic models for fiber squares*, Math. Annalen **314** (1999) 449-467.
10. N. Dupont and K. Hess, *How to model the free loop space algebraically*, Math. Annalen **314** (1999), 469-490.
11. N. Dupont and K. Hess, *Hochschild cohomology is topological*, J. Pure and Applied Algebra **165** (2001) 1-6.
12. K. Hess, *Model categories in algebraic topology*, Applied Categorical Structures **10** (2002) 195-220.
13. N. Dupont and K. Hess, *An algebraic model for homotopy fibers*, Homology Homotopy Appl. **4** (2002) 117-139.
14. K. Hess and P.-E. Parent, *Emergence of the Witt group in the cellular lattice of rational spaces*, Trans. Amer. Math. Soc. **354** (2002) 4571-4583.
15. K. Hess, *Review of "Rational Homotopy Theory" by Felix, Halperin and Thomas*, Bull. of the London Math. Soc. **34** (2002) 624-626.
16. N. Dupont and K. Hess, *Commutative free loop space models at large primes*, Math. Z. **244** (2003) 1-34.
17. G. Adagio (S. Blanc, R. Guerraoui, K. Hess, P. Kouznetsov, P.-E. Parent, B. Pochon and O. Sauvageot), *Using the topological characterization of synchronous models*, Electronic Notes in Theoretical Computer Science **81** (2003) 12 p.
18. K. Hess, P.-E. Parent, A. Tonks and K. Worytkiewicz, *Simulations as homotopies*, Electronic Notes in Theoretical Computer Science **100** (2004) 65-93.
19. K. Hess, P.-E. Parent, J. Scott, A. Tonks, *A canonical enriched Adams-Hilton model for simplicial sets*, Adv. in Math. **207** (2006), 847-875.
20. K. Hess, *An algebraic model for mod 2 topological cyclic homology*, in *String Topology and Cyclic Homology*, Advanced Courses in Mathematics CRM Barcelona, Birkhäuser, 2006, pp. 97-163.
21. K. Hess, P.-E. Parent, A. Tonks and K. Worytkiewicz, *A model structure la Thomason on 2-CAT*, J. Pure and Applied Algebra **208** (2007) 205-236.
22. K. Hess, P.-E. Parent and J. Scott, *A chain coalgebra model for the James map*, Homology Homotopy Appl. **9** (2007) 209-231.
23. K. Hess, *Rational homotopy theory: a brief introduction*, Contemporary Math. **436** (2007) 175-202
24. K. Hess, R. Levi, *An algebraic model for the loop space homology of a homotopy fiber*, Alg. Geom. Top. **7** (2007) 1699-1765.
25. K. Hess, P.-E. Parent and J. Scott, *CoHochschild homology of chain coalgebras*, J. Pure Applied Algebra **213** (2009) 536-556.
26. K. Hess, *Homotopic Hopf-Galois extensions: Foundations and examples*, Geometry and Topology Monographs **16** (2009) 79-132.
27. K. Hess and A. Tonks, *The loop group and the cobar construction*, Proc. Amer. Math. Soc. **138** (2010) 1861-1876.
28. E. D. Farjoun and K. Hess, *Normal and conormal maps in homotopy theory*, Homology Homotopy Appl. **14** (2012) 79-112.
29. K. Hess, *Multiplicative structure in equivariant cohomology*, J. Pure Applied Algebra **216** (2012) 1680-1699.
30. W. Dwyer and K. Hess, *Long knots and maps between operads*, Geometry and Topology **16** (2012) 919-955.
31. J.P.C. Greenlees, K. Hess and S. Shamir, *Complete intersections in rational homotopy theory*, J. Pure Applied Algebra **217** (2013) 636-663.
32. J. E. Harper and K. Hess, *Homotopy completion and topological Quillen homology of structured ring spectra*, Geometry and Topology **17** (2013) 1325-1416.
33. K. Hess and B. Shipley, *The homotopy theory of coalgebras over a comonad*, Proc. London Math.

Soc **108** (2014) 484-516.
34. W. Dwyer and K. Hess, *The Boardman-Vogt tensor product of operadic bimodules*, Contemporary Mathematics **620** (2014) 71-98.
35. M. Bayeh, K. Hess, V. Karpova, M. Kedziorek, E. Riehl and B. Shipley, *Left-induced model category structures and diagram categories*, Contemporary Mathematics **641** (2015) 49-81.
36. C. Brisken, K. Hess, and R. Jeitziner, *Progesterone and overlooked endocrine pathways in breast cancer pathogenesis*, Endocrinology **156** (2015) 3442-3450.
37. K. Hess, *The Hochschild complex of a twisting cochain*, J. Algebra **451** (2016) 302-356.
38. K. Hess and B. Shipley, *Waldhausen K-theory of spaces via comodules*, Adv. in Math. **290** (2016) 1079-1137.
39. K. Hess, M. Kedziorek, E. Riehl, and B. Shipley, *A necessary and sufficient condition for induced model structure*, J. Topology **10** (2017) 324-369.
40. Y. Lee, S. Barthel, S. Mohammad Moosavi, P. Dłotko, K. Hess, and B. Smit, *Quantifying similarity of pore-geometry in nanoporous materials*, Nature Communications (2017) doi: 10.1038/ncomms15396.
41. M. W. Reimann, M. Nolte, M. Scolamiero, K. Turner, R. Perin, G. Chindemi, P. Dłotko, R. Levi, K. Hess, and H. Markram, *Cliques of neurons bound into cavities provide a missing link between structure and function*, Front. Comput. Neurosci., 12 June 2017, doi: 10.3389/fncom.2017.00048.
42. L. Kanari, P. Dłotko, M. Scolamiero, R. Levi, J. C. Shillcock, K. Hess, and H. Markram, *A topological representation of branching morphologies*, Neuroinformatics (2017) doi: 10.1007/s12021-017-9341-1.
43. A. Beaudry, K. Hess, M. Kędziorek, M. Merling, and V. Stojanoska, *Motivic homotopical Galois extensions*,Topology and its Applications (Virtual Special Issue – Women in Topology II: Further collaborations in homotopy theory), **235** (2018) 290-338.
44. A. Berglund and K. Hess, *Homotopic Hopf-Galois extensions revisited*, Journal of Noncommutative Geometry **12** (2018) 107-155.
45. Y. Lee, S. Barthel, P. Dłotko, S. Mohammad Moosavi, K. Hess, and B. Smit, *High-throughput screening approach for nanoporous materials genome using topological data analysis: application to zeolites*, J. Chem. Theory Comput. **14** (2018) 4427-4437.
46. A. Berglund and K. Hess, *Homotopical Morita theory for corings*, Israel Journal of Mathematics **227** (2018) 239-287.
47. W. Dwyer, K. Hess, and B. Knudsen, *Configuration spaces of products*, Trans. Amer. Math. Soc. **371** (2019) 2963-2985.
48. K. Hess and M. Kędziorek, *The homotopy theory of coalgebras over simplicial comonads*, Homology Homotopy Appl. **21** (2019) 247-268.
49. J.-B. Bardin, G. Spreemann, K. Hess, *Topological exploration of artificial neuronal network dynamics*, Network Neuroscience (2019) https://doi.org/10.1162/netn_a_00080.
50. L. Kanari, S. Ramaswamy, Y. Shi, S. Morand, J. Meystre, R. Perin, M. Abdellah, Y. Wang, K. Hess, and H. Markram, *Objective classification of neocortical pyramidal cells*, Cerebral Cortex (2019) bhy339, https://doi.org/10.1093/cercor/bhy339.
51. R. Jeitziner, M. Carrière, J. Rougemont, S.Oudot, K. Hess, and C. Brisken, *Two-Tier Mapper, an unbiased topology-based clustering method for enhanced global gene expression analysis*, Bioinformatics (2019) btz052, https://doi.org/10.1093/bioinformatics/btz052.
52. A. Doerig, A. Schurger, K. Hess, and M. H. Herzog, *The unfolding argument: why IIT and other causal structure theories of consciousness are empirically untestable*, Consciousness and Cognition **72** (2019) 49-59.
53. K. Hess, *Topological adventures in neuroscience*, in the Proceedings of the 2018 Abel Symposium: Topological Data Analysis, Springer Verlag, 2020.
54. K. Hess, P.-E. Parent, and J. Scott, *Twisting structures and morphisms up to strong homotopy*, J. Homotopy Relat. Struct. **15** (2020) 185–222.
55. M. Fournier, M. Scolamiero,..., P. Conus, K. Do Cuénod, and K. Hess, *Topology predicts long-term functional outcome in early psychosis*, Molecular Psychiatry (2020). https://doi.org/10.1038/s41380-020-0826-1.
56. L. Kanari, A. Garin, and K. Hess, *From trees to barcodes and back again: theoretical and statistical*

perspectives, Algorithms **13** (2020) 335, doi:10.3390/a13120335
57. K. Hess and B. Shipley, *Invariance properties of coHochschild homology*, J. Pure Applied Algebra **225** (2021), https://doi.org/10.1016/j.jpaa.2020.106505.
58. G. Tauzin, U. Lupo, L. Tunstall, J. Burella Prez, M. Caorsi, A. Medina-Mardones, A, Dassatti, and K. Hess, *giotto-tda: a topological data analysis toolkit for machine learning and data exploration*, J. Mach. Learn. Res. **22** (2021), 39:1-39:6.
59. K. Hess and B. Knudsen, *A Kunneth theorem for configuration spaces*, arXiv:1810.02249, J. London Math. Soc. **105** (2022) 639–664, https://doi.org/10.1112/jlms.12536.
60. L. Kanari, H. Dictus, W. Van Geit, A. Chalimourda, B. Coste, J. Shillcock, K. Hess, and H. Markram, *Computational synthesis of cortical dendritic morphologies*, Cell Reports 39, 110586, https://doi.org/10.1016/j.celrep.2022.110586.
61. K. Adamyk, T. Gerhardt, K. Hess, I. Klang, and H. Kong, *Computational tools for twisted topological Hochschild homology of equivariant spectra*, Topology and its Applications, 316 (2022), https://doi.org/10.1016/j.topol.2022.108102.
62. A-L- García-Pulido, K. Hess, J. Tan, K, Turner, B. Wang, and N. Yerolemou, *Graph pseudometrics from a topological point of view*, In: Gasparovic, E., Robins, V., Turner, K. (eds) Research in Computational Topology 2. Association for Women in Mathematics Series, vol 30. Springer, Cham. https://doi.org/10.1007/978-3-030-95519-9_5.
63. W. Jiao, G. Spreemann, E. Ruchti, S. Banerjee, Y. Shi, R. Steven Stowers, K. Hess, B. D. McCabe, *Intact whole brain cellular quantitation of gene expression*, eLife 11:e74968 (2022).
64. G. Colombo, R. J. A. Cubero, L. Kanari, A. Venturino, R. Schulz, M. Scolamiero, J. Agerberg, H. Mathys, L.-H. Tsai, W. Chachólski, K. Hess, S. Sieger, *Microglial MorphOMICs unravel region- and sex-dependent morphological signatures from murine postnatal development to degeneration*, Nature Neuroscience 25, 1379-1393 (2022). https://doi.org/10.1038/s41593-022-01167-6
65. K. Adamyk, T. Gerhardt, K. Hess, I. Klang, H. Kong, *A shadow framework for equivariant Hochschild homologies*, International Mathematics Research Notices, 2022, rnac250, https://doi.org/10.1093/imrn/rnac250.
66. P. Sandoz, R. Denhardt-Eriksson, L. Abrami, G. Spreemann, C. Maclachlan, B. Kunz, K. Hess, G. Knott, V. Hatzimanikatis, G. van der Goot, and S. Ho, *ZDHHC6-mediated palmitoylation tunes ER architecture*, Nature Communications 14, 264 (2023). https://doi.org/10.1038/s41467-023-35921-6.
68. J. Curry, J. DeSha, A. Garin, K. Hess, L. Kanari, B. Mallery, *From trees to barcodes and back again II: combinatorial and probabilistic aspects of a topological inverse problem*, Computational Geometry 116 (2024). https://doi.org/10.1016/j.comgeo.2023.102031
67. E. Mullier, J. Vohryzek, A. Griffa, Y. Alemàn-Gómez, C. Hacker, K. Hess, and P. Hagmann, *Functional brain dynamics are shaped by connectome n-simplicial organization*, submitted.
69. K. Hess, N. Rasekh, *Shadows are bicategorical traces*, arXiv:2109:02144, submitted.
70. L. Kanari, Y. Shi, A. Arnaudon, N. Barros Zulaica, R. Benavides-Piccione, J. S. Coggan, J. DeFelipe, K. Hess, H. D. Mansvelder, E. J. Mertens, I. Segev, H. Markram, and C. P.J. de Kock, *Of mice and men: Increased dendritic complexity gives rise to unique human networks*, bioRxiv preprint doi: https://doi.org/10.1101/2023.09.11.557170, submitted.
71. K. Hess, S. Lavenir, K. Maggs, *Persistent k-minimal models and the interval sphere model structure*, arXiv:2312.08326.
72. K. Bauer, R. Brooks, K. Hess, B. Johnson, J. Rasmusen, B. Schreiner, *Constructing monads from cubical diagrams and homotopy colimits*, arXiv:2402.xxxxx, submitted.
73. K. Hess, *A general framework for homotopic descent and codescent*, arXiv:1001.1556v3, 68 pages.

Teaching and supervision

Courses taught

1st year	Linear algebra (for engineers and for mathematicians and physicists)
2nd year	Analysis (University of Toronto), general topology, abstract algebra, group theory
Upper level	Knot theory, Lie algebras, algebraic topology, homological algebra, algebraic K-theory

Doctoral Game theory, symmetric spectra, homotopy theory (University of Stockholm), cyclic homology, homotopical algebra, topological data analysis, various working groups in algebraic topology

Projects supervised

- Over 70 semester projects at the EPFL personally directed since 1991, on topics including homotopy theory, knot theory, topological groups, homological algebra, Galois theory, category theory, K-theory, the Atiyah-Singer index theorem, mathematical physics, C^*-algebras, algebraic genetics and topological data analysis.
- Over 40 masters or diploma projects at the EPFL personally directed since 1993, on topics including category theory, homological algebra, homotopy theory, K-theory, knot theory (including applications to polymer science and dynamical sytems), algebraic geometry, cryptography, mathematical physics (quantum gauge theory, quantum gravity, topological insulators), topological data analysis, triangulated categories.

Doctoral students

- Bjørnar Gullikstad Hem, started Fall 2023
- Markus Kirolos Youssef, started Fall 2023
- Kelly Maggs, "TDA and the influence of hormones on gene expression," started Fall 2020
- Melvin Vaupel, "TDA and neuron electrophysiology," co-supervision with Benjamin Dunn (NTNU), started Spring 2020
- Haoqing Wu, "A Hopf-algebra model for Dwyer's tame spaces", thesis defended July 2022 (quant at Barclay's Bank)
- Aras Ergus, "Hopf algebras and Hopf-Galois extensions in ∞-categories", thesis defended July 2022 (programmer at a high-tech start-up)
- Celia Hacker, "Reduced representations of complexes, signals, and multifiltrations", thesis defended July 2022 (postdoc at MPI-MIS Leipzig)
- Stefania Ebli, "Collapse-invariant properties of spaces equipped with signals or directions," thesis defended May 2022 (working for Expedia)
- Adélie Garin, "From trees to barcodes and back again: a combinatorial, probabilistic and geometric study of a topological inverse problem," thesis defended February 2022 (mathematics instructor at EPFL)
- Rachel Jeitziner, "Development of topological tools for the analysis of biological data," joint supervision with Cathrin Brisken (EPFL-SV), thesis defended July 2018 (working for the Swiss Bioinformatics Institute)
- Sophie Raynor, "Compact symmetric multicategories and the problem of loops," joint supervision with Ran Levi (Aberdeen), sponsored by the Blue Brain lab, thesis defended January 2018 (lecturer at James Cook University)
- Dimitri Zaganidis, "The $(\infty, 2)$-category of homotopy coherent monads in an ∞-cosmos," sponsored by FN grant 200020-144399, thesis defended May 2017 (applied science team lead at INAIT)
- Martina Rovelli, "Towards new invariants for principal bundles," sponsored by FN grant 200020-144399, thesis defended February 2017 (tenure-track assistant professor at UMass-Amherst)
- Marc Stephan, "Kan spectra, group spectra and twisting structures," thesis defended November 2014 (research assistant at the University of Bielefeld)

- Varvara Karpova, “Homotopic Hopf-Galois theory of commutative differential graded algebras," sponsored by FN grant 200020-132379, thesis defended February 2014 (gymnasium math professor in Zug)
- Patrick Müller, “Homotopic descent over monoidal model categories," sponsored by FN grants 200020-121864 and 200020-132379, thesis defended September 2011 (gymnasium math professor in St Gallen)
- Nicolas Michel, “Categorical foundations of K-theory," thesis defended September 2010, sponsored by FN grant 200020-121864 (gymnasium math teacher in Morges)
- Ilias Amrani, “Catégories simpliciales et K-théorie de Waldhausen," thesis defended September 2010, sponsored by FN grants 200020-113707 and 200020-121864 (researcher at Academic University of St. Petersburg)
- Théophile Naïto, “Alexander-Whitney coalgebras: an algebraic model for topological spaces," thesis defended May 2009, sponsored by FN grant 200020-113707 (librarian at BCU Lausanne)
- Jan Brunner, “The link between the infinite mapping class group of the disk and the braid group on infinitely many strands," thesis defended June 2008, sponsored by FN grant 200020-105383 (math professor at the HES Bienne)
- Sylvestre Blanc, “Modèles tordus d'espaces de lacets libres et fonctionnels," thesis defended September 2004, sponsored by FN grant 2000-068137.02 (IT quant at Grammont Finance S.A)
- Orin Sauvageot, “Stabilisation de complexes croisés," thesis defended November 2002, sponsored by FN grant 21-061707.00 (Chief Operating Officer at Tetral SA)
- Chantal Oberson, “Etude des relations structure-propriété des polymères par des méthodes topologiques," thesis defended June 1999, sponsored by FN grant 21-43404.95 (working for a high-tech start up)
- Fabio Simoncini, “Autour de quelques invariants d'homotopie rationnelle," thesis defended October 1998, sponsored by FN grant 21-43406.95 (portfolio manager on Swiss Fixed Income at Banque Cantonale Vaudoise)

Postdocs supervised

- Caio Beta Lopes (Universidade de Sao Paulo, 2023): September 2023–present
- Henry Kirveslahti (Duke, 2022): September 2022–present
- Victor Roca Lucio (Sorbonne Paris Nord, 2022): September 2022–present
- Bernadette Stolz (Oxford, 2019): September 2022–present
- Hadrian Heine (Osnabrück, 2018): September 2021–August 2023 (postdoc at the University of Oslo)
- Darrick Lee (University of Pennsylvania, 2021): September 2021–August 2022 (postdoc at Oxford)
- Kursat Sözer (Indiana University-Bloomington, 2020): September 2021–August 2022 (postdoc at McMaster)
- Nicolas Berkouk (INRIA Saclay, 2020): November 2020–August 2023 (working for CNIL in France)
- Raphael Reinauer (Münster, 2020): November 2020–October 2022 (working for startup)
- Jens Jakob Kjaer (Notre Dame, 2019): September 2019–August 2021 (working for 3M)
- Nima Rasekh (University of Illinois at Urbana-Champaign, 2018): September 2019–August 2022 (postdoc at MPI Bonn)

- Anibal Medina Mardones (Stony Brook, 2015): June 2019–August 2020 (assistant professor at Western Ontario
- Guillaume Tauzin (Wüppertal/Roma Tor Vergata, 2019): March 2019–February 2020 (working for Inait, a high-tech start-up)
- Inbar Klang (Stanford, 2018): September 2018–August 2019 (assistant professor at VU Amsterdam)
- Daniela Egas Santander (Copenhagen, 2015): October 2017–May 2020 (scientist at Blue Brain Project)
- Beren Sanders (UCLA, 2014): September 2017–August 2018 (assistant professor at UC Santa Cruz)
- Nicolas Ninin (Paris XI, 2017): August 2017–May 2020 (scientist at Blue Brain Project)
- Dimitri Zaganidis (EPFL, 2017): July 2017–February 2019 (working for Inait, a high-tech startup)
- Jean Verrette (Hawaii, 2016): March 2016–February 2017 (working for a high-tech startup)
- Gard Spreemann (NTNU, 2015): February 2016–November 2019 (working for Telenor)
- Senja Barthel (Imperial College, 2015): September 2015–August 2019 (assistant professor at VU Amsterdam)
- Katharine Turner (Chicago, 2015): September 2015–August 2017 (lecturer at Australian National University)
- Martina Scolamiero (KTH, 2015): July 2015–July 2018 (assistant professor at KTH)
- Magdalena Kędziorek (Sheffield, 2014): February 2015–August 2017 (associate professor at Radboud University Nijmegen)
- Justin Young (Indiana, 2012): September 2012–August 2014 (lecturer at Ohio State University-Newark)
- Eric Finster (Virginia, 2010): August 2010–August 2012 (postdoc at University of Birmingham)
- Gavin Seal (VU Brussels, 2000): January 2009–December 2012 (teacher for the Euler course and high school math teacher)
- John E. Harper (Notre Dame, 2008): August 2008–July 2010 (associate professor at Ohio State University-Newark)
- Samuel Wüthrich (Bern, 2004): September 2006–July 2008 (employed by the CFF)
- Christine Vespa (Paris XIII, 2006): September 2006–August 2007 (maître de conférence at the University of Strasbourg)
- Sverre Lunøe-Nielsen (Oslo, 2005): September 2005–August 2006 (lecturer at Universitet i Agder)
- Jonathan Scott (Toronto, 2000): September 2004–July 2006 (associate professor at Cleveland State University)
- Peter Bubenik (Toronto, 2003): September 2003–July 2005 (full professor at the University of Florida)
- Paul-Eugène Parent (Louvain-la-Neuve, 2001): September 2001–August 2003 (full professor at the University of Ottawa)

Professional service

Assessments and advisory roles

2023–present Member of the scientific advisory board of the CRM (Centre de Recerca Matemàtica)

2023–present Member of the scientific advisory board of AI4IDF (Artificial Intelligence for Ile-de France)

2022–present	Member of the scientific board of ISTA (Institute of Science and Technology Austria)
2021–present	Member of the scientific advisory board of CITMAga (Galician Center for Mathematical Research and Technology)
2021–present	Member of the expert committee for promotion of STEM fields of the Swiss Academy of Arts and Sciences
2020–2023	Member of the expert committee of the Labex CEMPI
2020–present	Member of the scientific committee of the Fondation Mathématique Jacques Hadamard
2020–present	Member of the scientific committee of the EUR Maths-Info of Paris 13
2019–2022	Member of the International Advisory Committee for ICM 2022
2018–2022	Member of the WASP committee selecting Swedish universities to receive funding for establishing professorships in mathematics and AI
2018–present	Member of the Advisory Board of the Centre for Topological Data Analysis at Oxford University
2018–2020	Vice-chair of the mathematics panel of Swedish Research Council
2017–2018	Member of the selection committee for the ICM 2018 Emmy Noether Lecture
2016–2020	Member (chair in 2020) of the international peer review panel on mathematics, statistics and computer science of the Danish Council for Independent Research
2016–2022	Member of the Standing Committee of the association of European Women in Mathematics
2016	Member of the Review Panel for the Mathematical Institute at Oxford
2015–2018	Member of the Association for Women in Mathematics Noether Lecture selection committee
2013–2017	Member of the selection committee for the Heidelberg Laureate Forum
2012–2015	Chair of the committee evaluating undergraduate mathematics education in all Swedish universities
2012	Member of the mathematics panel of the international commission evaluating KTH in its Research Assessment Exercise
2004–present	Member of the selection committee for choosing a new professor for the mathematics departments of the Universities of Aalborg (2005, 2009, 2015), Bergen (2004), Copenhagen (2015), ETHZ (2014, 2018), Göteborg (2015, 2017), Lille (2012), Nantes (2017), Nijmegen (2012, 2014), Osnabrück (2012), Paris VII (2018), Paris XIII (2015), Paris Sud (2020), Stockholm (2014), Trondheim (2006, 2012, 2013, 2018), Utrecht (2016), and Vienna (2019, 2020) and for promotion to professor at KTH (2010) and Copenhagen (2012, 2014). Reviewer for creation of Junior Research Group at FU Berlin (2013)
2001	Member of the international commission evaluating the mathematics departments of all Swedish universities
2000–present	Reviewer of grant applications for the U.S. National Science Foundation, the Norwegian Research Council, the Academy of Finland, the US-Israel Binational Science Foundation, the Netherlands Organisation for Scientific Research, the European Research Commission (EURYI prize), France's National Research Agency, Canada's National Science and Engineering Research Council, Georgia's Shota Rustaveli National Science Foundation, the Research Foundation-Flanders, the Centre de Recerca Matematicà, the UK's Leverhulme Trust, UKRI.
1992–present	Member of thesis and habilitation juries in Aalborg (3), Aberdeen, Amiens, Copenhagen (3), ETHZ (1), Lille (6), Louvain-la-Neuve (2), Malaga, Nantes, Nice (2), Nijmegen, Oslo, Oxford (2), Paris (7), Sheffield (2), Singapore, Stockholm (3), Toulouse, Trondheim (4), and Utrecht (2). Reporter for theses in Angers and Paris.

Service internal to EPFL

2021–2023	Member of the hiring committee for joint professorships in life sciences and computer science

2019–2020 Member of the faculty recruitment committee for the faculty of informatics and communication

2019–2020 Member of the EPFL pilot committee on equality issues

2018–2020 Member of the computational biology doctoral program committee

2018–2019 Member of hiring committees for professorships in computational neuroscience, neuroengineering, and computational biology

2017–2020 Member of the neuroscience doctoral program committee

2015–2020 Member of the mathematics doctoral program committee

2015–2019 EPFL representative on the board of the Fondation Erna Hamburger

2014–2019 Vice-president of the EPFL-WISH Foundation (for the promotion of women in science)

2012–2015 Director of the Doctoral program in mathematics

2010–2012 Member of the committee selecting the laureat of the EPFL doctoral prize

2010–2020 Member of the Bureau of the EPFL-WISH Foundation

2008–2015 Member of the Research Commission (chair of the mathematics and computer science panel starting in 2013)

2008–2012 Vice-director of the Doctoral program in mathematics

2006–2012 Member of the Teaching committee of the section of mathematics

2006–2012 Exchange coordinator for the section of mathematics

2004–2008 Member of the Evaluating Committee of the FSB (responsible for evaluating applications for internal promotion)

1995–present Numerous presentations to visiting high school and elementary school students (Journée des gymnasiennes, Journée des gymnasiens, Journée des classes)

Conferences co-organized

2025 Emphasis semester on equivariant homotopy theory at the Newton Institute, UK

2023 ICERM emphasis semester on Math+Neuroscience, USA

2023 Women in Computational Topology workshop, Bernoulli Center, EPFL

2023 CIRM Workshop on Chromatic Homotopy Theory, France

2021 MSRI Hot Topics Workshop: Topological Insights in Neuroscience, USA

2021 IMSI Workshop on Topological Data Analysis, USA

2021 Thematic Einstein Semester “Geometric and Topological Structure of Materials" (Berlin, Germany)

2020 Algebraic Topology: Methods, Computation, and Science (Ohio State University, USA)

2020 Workshop on Statistics for Topological and Discrete Data (EPFL)(postponed)

2019 Inaugural workshop of the OCHoTop network (EPFL)

2019 Second Engineering PhD Summit (EPFL)

2019 Mini-symposium at SIAM AG 2019 (Bern, Switzerland)

2018 Workshop on topology and neuroscience (EPFL)

2018 General meeting of the association of European Women in Mathematics (Graz, Austria)

2018 Abel Symposium on Applied Topology (Geiranger, Norway)

2017 Women in Topology Workshop (MSRI)

2017 Conference in applied algebraic topology (Sapporo, Japan)

2017 Program “Applied and Computational Algebraic Topology” (Hausdorff Research Institute for Mathematics, Bonn)

2015	Workshop in category theory and algebraic topology (Louvain)
2014	Introductory Workshop, Emphasis semester in algebraic topology (MSRI)
2013, 2014	Summer schools in algebraic topology and category theory (Université Catholique de Louvain/EPFL)
2013, 2016	Women in Topology Workshop (Banff International Research Station)
2011	André Memorial Conference (EPFL)
2010	Workshop on Tannakian Categories (EPFL)
2007–present	Young Topologists Meetings (held annually in Switzerland, Denmark, or Sweden since 2007)
2006	Alpine Operad Workshop (Villars)
2006	Emphasis semester in algebraic topology (Mittag-Leffler Institute)
1999–present	Arolla Conferences on Algebraic Topology (1999, 2004, 2008, 2012, 2016)

Editorial work

- Editorial board, *Mathematical Neuroscience* book series of SIAM (2024-26)
- Co-editor of special issue on topological data analysis in the life sciences in *Entropy* (2021)
- Co-editor of special issue on topological data analysis in *Foundations of Data Science* (2020)
- Co-editor of *Frontiers* Research Topic "Topology in Real-World Machine Learning and Data Analysis" (2020)
- Co-editor of the Proceedings of the 2013 and 2016 Women in Topology workshops, in the *Contemporary Mathematics* series of the AMS and in *Topology and its Applications*
- Co-editor of the Proceedings of the 1999, 2004, 2008, 2012, and 2016 Arolla Conferences on Algebraic Topology, in the *Contemporary Mathematics* series of the AMS
- Member of the editorial board of *Algebraic and Geometric Topology* (2001-present, chief editor from 2012), *Communications of the American Mathematical Society* (2021-present), *EMS Magazine*(2021-2022),*Journal of Applied and Computational Topology* (2016-present), *Proceedings of the Edinburgh Mathematical Society* (consulting editor, 2023–present), *Network Neuroscience* (2019-present), *Publicacions Matematiques* (2007-present), and *Theory and Applications of Categories* (2011-2022)
- Member of the Steering Board of *Compositionality* (2018–present)

Referee work

- Contributor to *Mathematical Reviews* (89 reviews since 1995)
- Referee for numerous journals, including *Acta Mathematica*, *Advances in Mathematics*, *Algebraic and Geometric Topology*, *Annales Mathmatiques du Qubec*, *Annals of Mathematics*, *Bulletin de la Socit Mathmatique de France*, *Commentarii Mathematici Helvetici*, *Communications in Algebra*, *Compositio Mathematicae*, *Documenta Mathematicae*, *Expositiones Mathematicae*, *Homology, Homotopy and Applications*, *IMRN*,*Israel Journal of Mathematics*, *Journal of Algebra*, *Journal of the American Mathematical Society*, *Journal of Applied and Computational Topology*, *Journal of K-theory*, *Journal of Pure and Applied Algebra*, *Journal of Topology*, *Journal of Topology and Analysis*, *K-Theory*, `manuscripta mathematica`, *Mathematica Scandinavica*, *Mathematische Annalen*, *Mathematische Zeitschrift*, *Network Neuroscience*, *PLOS Computational Biology*, *Pure and Applied Mathematics Quarterly*, *Proceedings of the American Mathematical Society*, *Selecta Mathematica*, *Theory and Applications of Categories*, *Topology*, *Topology and its Applications*, *Transactions of the American Mathematical Society*, and journals of the London Mathematical Society
- Manuscript reviewer for Springer Verlag, University of Chicago Press, the American Mathematical Society, and the MIT Press

- Referee for the Annual Computational Neuroscience meetings CNS*2018 and CNS*2019
- Program committee member for Applied Category Theory 2019 and for the Workshop on Applications of Topological Data Analysis 2019

Outreach

2021, 2022	MATHilda presentations to lower secondary girls interested in math
2021	Guest speaker at TecLadies Lunch of the SATW
2020	Talk at the kickoff of the 2021 Championnat de jeux mathématiques et logiques
2019, 2023	Speaker at the "Portes Ouvertes" science festival at the EPFL
2019	Invited speaker at roundtable "Mathématiques et société" at HEPL
2019	Invited speaker on International Women's Day at Nyon high school
2017	Invited talk at TEDxLugano
2016	Organizer of the mathematical activities at the "Portes Ouvertes" science festival at the EPFL
2013	Invited speaker at "Women Inspire Innovation", Swiss Embassy, Washington D.C.
2011–2013	Speeches given to sections of the Rotary Club, the Business and Professional Women's Club, the Lions Club, Kiwanis and the Equal Opportunity Office of the Canton of Valais
2010, 2011	EPFL coordinator of the Lausanne semi-final and the Swiss final of the Championnat de jeux mathématiques et logiques
2009–2013	Regular (bimonthly) mathematical columnist in *Le Temps* (Swiss newspaper)
2007–present	Founder of the Cours Euler, a fast-paced mathematics course for young students with very high potential in mathematics (http://euler.epfl.ch)
2007–2012	Talks at "Maths en Jeu" graduation ceremonies
2001	Translated (from Swedish to French), staged, and acted in a play about mathematical history for the EPFL open house "Science et Cité"
2000–2006	Acted (in Swedish) in plays about mathematical history, while on leave at the University of Stockholm and on various visits to Sweden

Languages

English	**Native speaker**
French	**Fluent**
Swedish	**Fluent**
Norwegian	**Excellent oral and written comprehension**
German	**Excellent oral and written comprehension**