

# MANUEL KRANNICH

## PERSONAL DATA

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ADDRESS: Karlsruhe Institute of Technology  
Department of Mathematics  
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RESEARCH INTERESTS: Algebraic and Geometric Topology  
(topology of moduli spaces, manifold bundles and their characteristic classes, automorphism and embedding spaces of manifolds, mapping class groups, surgery theory, cobordism categories, configuration spaces, K-theory, arithmetic groups, applications to differential geometry)

## POSITIONS

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since Apr 2022	KARLSRUHE INSTITUTE OF TECHNOLOGY Tenure-Track Professor (W <sub>1</sub> to W <sub>3</sub> ) Department of Mathematics
Oct 2021 – Mar 2022	UNIVERSITY OF MÜNSTER Postdoc Mathematics Münster: Dynamics–Geometry–Structure Postdoctoral mentor: Michael Weiss
Oct 2018 – Sept 2021	UNIVERSITY OF CAMBRIDGE Research Associate Department of Pure Mathematics and Mathematical Statistics Postdoctoral mentor: Oscar Randal-Williams

## EDUCATION

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2015 – 2018	UNIVERSITY OF COPENHAGEN PhD in Mathematics Member of the Centre for Symmetry and Deformation Thesis: <i>On characteristic classes of manifold bundles</i> Advisor: Nathalie Wahl
2013 – 2015	KARLSRUHE INSTITUTE OF TECHNOLOGY Master of Science (M.Sc.) in Mathematics
2010 – 2013	KARLSRUHE INSTITUTE OF TECHNOLOGY Bachelor of Science (B.Sc.) in Mathematics

## AWARDS

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2019	UNIVERSITY OF COPENHAGEN <i>SCIENCE PhD Award 2019</i> for one of the three best PhD theses in sciences of the year.
2015	KARLSRUHE INSTITUTE OF TECHNOLOGY <i>Faculty Award 2015</i> for the best master's degree of the year.
2013	KARLSRUHE INSTITUTE OF TECHNOLOGY <i>Faculty Award 2013</i> for the best bachelor's degree of the year.

## SCHOLARSHIPS AND STIPENDS

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2015 – 2018	University of Copenhagen, Centre of Symmetry and Deformation, Department of Mathematical Sciences <i>PhD stipend.</i>
2013 – 2015	German National Academic Foundation <i>Scholarship.</i>
2012 – 2013	German Federal Ministry of Education and Research <i>Scholarship Deutschlandstipendium.</i>
2011 – 2012	German Federal Ministry of Education and Research <i>Scholarship Deutschlandstipendium.</i>

## EXTENDED VISITS

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JAN 2022 – MAR 2022	INSTITUT MITTAG-LEFFLER Attending research programme: <i>Higher algebraic structures in algebra, topology and geometry.</i>
APR 2018, MAR 2019, MAR 2020	HARVARD UNIVERSITY Visiting Alexander Kupers.
FEB 2018 – APR 2018	STANFORD UNIVERSITY Visiting Søren Galatius.
JAN 2017 – APR 2017	UNIVERSITY OF CAMBRIDGE Visiting Oscar Randal-Williams.

## PUBLICATIONS

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- Manuel Krannich, *A homological approach to pseudoisotopy theory. I.* Inventiones Mathematicae, **227** (2022) no. 3 1093–1167.
- Manuel Krannich, Alexander Kupers, and Oscar Randal-Williams, *An  $HP^2$ -bundle over  $S^4$  with nontrivial  $\hat{A}$ -genus.* Comptes Rendus. Mathématique, Tome **359** (2021) no. 2, pp. 149–154.
- Bena Tshishiku, with an appendix by Manuel Krannich, *Geometric cycles and characteristic classes of manifold bundles.* Commentarii Mathematici Helvetici, **96** (1) (2021), 1–45.
- Manuel Krannich, *Mapping class groups of highly connected  $(4k + 2)$ -manifolds.* Selecta Mathematica, **26**, 81 (2020).
- Manuel Krannich and Oscar Randal-Williams, *Mapping class groups of simply connected high-dimensional manifolds need not be arithmetic.* Comptes Rendus. Mathématique, Tome **358** (2020) no. 4, pp. 469–473.
- Manuel Krannich, *A note on rational homological stability of automorphisms of manifolds.* The Quarterly Journal of Mathematics **71** (3) (2020), 1069–1079.
- Manuel Krannich and Alexander Kupers, *Some Hermitian  $K$ -groups via geometric topology.* Proceedings of the American Mathematical Society **149** (2021), 2745–2752.
- Manuel Krannich and Jens Reinhold, *Characteristic numbers of manifold bundles over surfaces with highly connected fibers.* Journal of the London Mathematical Society **102** (2) (2020), 879–904.
- Manuel Krannich, *On characteristic classes of exotic manifold bundles.* Mathematische Annalen **379** (2021), 1–21

- Manuel Krannich, *Homological stability of topological moduli spaces*.  
Geometry & Topology **23** (5) (2019), 2397–2474.

## PREPRINTS

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- Manuel Krannich and Oscar Randal-Williams, *Diffeomorphisms of discs and the second Weiss derivative of  $B\mathrm{Top}(-)$* .  
Preprint (2021), arXiv:[2109.03500](#).
- Manuel Krannich and Alexander Kupers, *On Torelli groups and Dehn twists of smooth 4-manifolds*.  
Preprint (2021), arXiv:[2105.08904](#).
- Mauricio Bustamante, Manuel Krannich, and Alexander Kupers, *Finiteness properties of automorphism spaces of manifolds with finite fundamental group*.  
Preprint (2021), arXiv:[2103.13468](#).
- Manuel Krannich and Alexander Kupers, *Embedding calculus for surfaces*.  
Preprint (2021), arXiv:[2101.07885](#).

## CONTRIBUTIONS TO CONFERENCE PROCEEDINGS

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- Manuel Krannich, *Moduli spaces of  $h$ -cobordisms of discs*.  
Oberwolfach Reports **17** (2020), no. 21, 1089–1090.
- Manuel Krannich, *Pseudoisotopies of even discs, revisited*.  
Oberwolfach Reports **17** (2020), no. 1, 431–432.

## INVITED TALKS

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SEP 2022	<i>TBD</i> , 4-Manifolds: from Above and Below, CIRM, Luminy (scheduled).
SEP 2022	<i>TBD</i> , Classifying spaces in homotopy theory, ICMS, Edinburgh (scheduled).
FEB 2022	<i>The Disc-structure space</i> , Higher algebraic structures in algebra, topology and geometry, Institut Mittag-Leffler, Stockholm.
FEB 2022	<i>Pseudoisotopies of discs and <math>K(\mathbb{Z})</math></i> , Oberseminar Geometrie und Topologie, Göttingen.
DEC 2021	<i>Smoothing fibre bundles and diffeomorphism groups of discs</i> , IMUNAM Algebraic Topology Seminar, Mexico City.
OCT 2021	<i>Top(d) and orthogonal calculus</i> , Topology Seminar, Münster.
JULY 2021	<i>(In)finiteness properties of automorphism spaces of manifolds</i> , AG-Seminar, Regensburg.
APR 2021	<i>Embedding calculus, factorisation homology, and surfaces</i> , Séminaire de l'équipe Topologie Algébrique, Université Sorbonne Paris Nord (Paris 13).
APR 2021	<i>Embedding calculus in codimension zero</i> , Building Bridges Seminar: Invariants of Embedding spaces, virtual.
FEB 2021	<i>Smoothing fibre bundles and diffeomorphism groups of discs</i> , Geometry & Topology Seminar, Toronto.
JULY 2020	<i>Moduli spaces of <math>h</math>-cobordisms of discs</i> , Topologie, Oberwolfach.
MAY 2020	<i>Pseudoisotopies of discs and algebraic <math>K</math>-theory of the integers</i> , Topology Seminar, Purdue.
MAY 2020	<i>The pseudoisotopy stable range</i> , Topology Seminar, Bonn.
MAR 2020	<i>Pseudoisotopies of even discs and algebraic <math>K</math>-theory of the integers</i> , Topology Seminar, Wayne State.
MAR 2020	<i>Pseudoisotopies of even discs and algebraic <math>K</math>-theory of the integers</i> , Geometry & Topology Seminar, Brown.
MAR 2020	<i>Pseudoisotopies of even discs and algebraic <math>K</math>-theory of the integers</i> , Topology Seminar, Brandeis.

- FEB 2020 *Pseudoisotopies of even discs, revisited*, Manifolds and Groups, Oberwolfach.
- JAN 2020 *A homological approach to pseudoisotopy theory*, Topology Seminar, Warwick.
- DEC 2019 *A homological approach to pseudoisotopy theory*, Topology Seminar, Münster.
- NOV 2019 *Diffeomorphism groups of discs*, Topology Seminar, Aberdeen.
- OCT 2019 *Mapping class groups, signatures, and arithmeticity*, MPI Topology Seminar, Bonn.
- JULY 2019 *Diffeomorphism groups of discs*, Four Manifolds: Confluence of High and Low Dimensions, Fields Institute, Toronto.
- JUNE 2019 *Rational homotopy groups of diffeomorphism group of discs, revisited* (short talk), Conference: SYM 10 Years Old, Copenhagen.
- APR 2019 *Mapping class groups of highly connected manifolds*, Utrecht Geometry Centre Seminar, Utrecht.
- APR 2019 *Mapping class groups of highly connected manifolds*, Seminar in Algebra & Geometry, Stockholm.
- MAR 2019 *Mapping class groups of highly connected manifolds*, Topology Seminar, MIT.
- JAN 2019 *Mapping class groups of highly connected manifolds*, Geometry and Topology Seminar, Durham.
- DEC 2018 *On the signature of bundles over surfaces*, Oberseminar Differentialgeometrie, Augsburg.
- DEC 2018 *Mapping class groups of highly connected manifolds*, Bavarian Geometry and Topology Seminar, Augsburg.
- NOV 2018 *Detecting exotic smooth structures in diffeomorphism groups*, Differential Geometry and Topology Seminar, Cambridge.
- SEPT 2018 *Topological moduli spaces,  $E_2$ -algebras, and homological stability*, Workshop: Cohomological study of mapping class groups and related topics, Strasbourg.
- APR 2018 *Characteristic numbers of manifold bundles over surfaces with highly connected fibres*, Oxford–Aberdeen–Cambridge Meeting on Manifolds, Cambridge.
- APR 2018 *Homological stability of topological moduli spaces*, Topology Seminar, Purdue.
- APR 2018 *Detecting exotic smooth structures in diffeomorphism groups*, Topology Seminar, Northwestern.
- APR 2018 *Topological moduli spaces,  $E_2$ -algebras, and homological stability*, Geometry/Topology Seminar and Topology Seminar (joint), University of Chicago.
- JAN 2018 *On characteristic classes of exotic manifold bundles*, Topology Seminar, Bonn.
- JAN 2018 *On characteristic classes of exotic manifold bundles*, Topology Seminar, Karlsruhe.
- JAN 2018 *On characteristic classes of exotic manifold bundles*, Topology Seminar, Münster.
- OCT 2017 *On characteristic classes of exotic manifold bundles*, Topology Seminar, Copenhagen.
- MAR 2017 *Homological stability of  $E_1$ -modules over  $E_2$ -algebras and twisted stability of topological moduli spaces*, Topology Seminar, Aberdeen.
- MAR 2017 *Moduli spaces of manifolds*, Geometry Tea, Cambridge.
- JUNE 2015 *Through scanning to the theorem of Galatius-Madsen-Tillmann-Weiss*, Topology Seminar, Karlsruhe.

#### CONTRIBUTED TALKS

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- JUNE 2021 *The Disc-structure space*, Conference *Manifolds and K-theory: the legacy of Andrew Ranicki*, Edinburgh.
- DEC 2018 *Mapping class groups of highly connected manifolds*, Workshop "Manifolds", part the programme "Homotopy harnessing higher structures", Newton Institute, Cambridge.
- JUN 2018 *On the signature of smooth bundles over surfaces*, International Conference on Manifolds, Groups and Homotopy, Skye.

SEPT 2017	<i>On characteristic classes of bundles of manifolds connect summed with an exotic sphere</i> (short talk), Research School: Algebraic Topology of Manifolds, Oxford.
JULY 2017	<i>On the cohomology of moduli spaces of manifolds connect summed with an exotic sphere</i> , Young Topologists Meeting, Stockholm.
SEPT 2016	<i>Homological stability of <math>E_2</math>-modules and twisted stability of moduli spaces of manifolds</i> , European Autumn School in Topology 2016, Utrecht.
MAY 2016	<i>Scanning &amp; stability — Scrutinizing topological moduli spaces</i> , ALG/NCG/TOP PhD students' seminar, Copenhagen.

## SERVICE

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since 2018	Referee reports and opinions for various journals in mathematics including Acta Mathematica, Advances in Mathematics, Algebraic & Geometric Topology, Forum of Mathematics Sigma, Journal of Topology, Mathematische Annalen, Selecta Mathematica.
NOVEMBER 2023	Organiser of the workshop <i>Spaces of manifolds: algebraic and geometric approaches</i> , Banff International Research Station.
MAY 2023	External examiner for licentiate thesis of Robin Stoll, Stockholm University.
SPRING 2021	Organiser of the <i>Seminar on Factorisation Homology</i> , Cambridge.
FALL 2019	Organiser of the <i>Seminar on work of Weiss and Williams</i> , Cambridge.
JAN 2016 – SEPT 2018	Organiser of pre-talks to the <i>Topology Seminar</i> , Copenhagen.
AUG 2016 – SEPT 2018	Organiser of the <i>ALG/NCG/TOP PhD students' seminar</i> , Copenhagen.
JULY 2016	Organiser of the conference <i>Young Topologists Meeting 2016</i> , Copenhagen.

## OUTREACH

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SEPT 2019	Talk <i>Symmetries of exotic spheres</i> , PhD Graduation Ceremony, Faculty of Science, Copenhagen.
MAY 2018	Talk <i>An algebraic topological aperitif</i> , course on University Pedagogy, Department of Science Education, Copenhagen.
OCT 2017	Talk <i>What is an exotic sphere?</i> , site visit of the DNRF (Danish National Research Foundation), Department of Mathematical Sciences, Copenhagen.

## TEACHING EXPERIENCE

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FALL 2020	<i>Lectures on Manifold Topology: Exotic Spheres</i> , Lecturer (as part of the Online Graduate Lecture Series of the London Mathematical Society).
FALL 2017	<i>Algebraic Topology</i> , Copenhagen, Teaching Assistant.
FALL 2016	<i>Algebraic Topology</i> , Copenhagen, Teaching Assistant.
SUMMER 2015	<i>Algebraic Topology</i> , Karlsruhe, Tutor.
WINTER 2014/2015	<i>Introduction into Geometry and Topology</i> , Karlsruhe, Tutor.
WINTER 2013/2014	<i>Differential Geometry</i> , Karlsruhe, Teaching Assistant.
SUMMER 2013	<i>Introduction into Algebra and Number Theory</i> , Karlsruhe, Tutor.
WINTER 2012/2013	<i>Introduction into Geometry and Topology</i> , Karlsruhe, Tutor
SUMMER 2012	<i>Linear Algebra II</i> , Karlsruhe, Tutor.
WINTER 2012/2013	<i>Linear Algebra I</i> , Karlsruhe, Tutor

## CONFERENCES AND WORKSHOPS ATTENDED

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JAN 2023	Workshop, Morphisms in Low Dimensions, Oberwolfch (scheduled).
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SEP 2022	Workshop, 4-Manifolds: from Above and Below, CIRM, Luminy (scheduled).
SEP 2022	Workshop, Classifying spaces in homotopy theory, ICMS, Edinburgh (scheduled).
JULY 2022	Workshop, Topologie, Oberwolfach (scheduled).
JUNE 2021	Conference <i>Manifolds and K-theory: the legacy of Andrew Ranicki</i> , Edinburgh.
JULY 2020	Workshop <i>Topologie</i> , Oberwolfach.
FEB 2020	Workshop <i>Manifolds and Groups</i> , Oberwolfach.
OCT 2019	Workshop <i>2019 Clay Research Conference and Workshops</i> , Oxford.
SEPT 2019	Workshop <i>Automorphisms of Manifolds</i> , Hausdorff Center, Bonn.
JUL 2019	Workshop <i>Four Manifolds: Confluence of High and Low Dimensions</i> , Fields Institute, Toronto.
JUN 2019	Conference <i>SYM 10 years old</i> , Copenhagen.
DEC 2018	Conference <i>Bavarian Topology and Geometry Meeting</i> , Augsburg.
DEC 2018	Workshop <i>Manifolds</i> , part of the programme <i>Homotopy harnessing higher structures</i> , Isaac Newton Institute, Cambridge.
SEPT 2018	Workshop <i>Cohomological study of mapping class groups and related topics</i> , Strasbourg.
JULY 2018	Conference <i>Young Topologists Meeting 2018</i> , Copenhagen.
JUNE 2018	Conference <i>Manifolds, Groups and Homotopy</i> , Skye.
JUNE 2018	Workshop <i>Secondary and delocalized index invariants</i> , Copenhagen.
APR 2018	Oxford–Aberdeen–Cambridge meeting on <i>Manifolds</i> , Cambridge.
APR 2018	Conference <i>Graduate Student Topology and Geometry Conference</i> , Chicago.
SEPT 2017	Research School <i>Algebraic Topology of Manifolds</i> , Oxford.
JULY 2017	Conference <i>Young Topologists Meeting 2017</i> , Stockholm.
JUNE 2017	Masterclass <i>Stable Homotopy Theory and p-Adic Hodge Theory</i> , Copenhagen.
JUNE 2017	Conference <i>Groups, Manifolds and K-Theory</i> , Münster.
MAY 2017	Masterclass <i>Cohomology of Arithmetic Groups</i> , Copenhagen.
APR 2017	Conference <i>Moduli and Traces</i> , Copenhagen.
MAR 2017	Oxford–Aberdeen–Cambridge meeting on <i>Manifolds</i> , Oxford.
DEC 2016	Winter School on <i>Bordism, L-theory, and Real Algebraic K-Theory</i> , Regensburg.
OCT 2016	Conference <i>Configuration Spaces and Moduli Spaces in Homotopy Theory</i> , Bonn.
SEPT 2016	Autumn School <i>European Autumn School in Topology 2016</i> , Utrecht.
JULY 2016	Conference <i>Young Topologists Meeting 2016</i> , Copenhagen.
JUNE 2016	Conference <i>Topology of Manifolds</i> , Lisbon.
JUNE 2016	Conference <i>Algebra in Geometry</i> , Copenhagen.
FEB 2016	Oxford–Aberdeen–Cambridge meeting on <i>Manifolds</i> , Oxford.
NOV 2015	Workshop on <i>Automorphism of Free Groups</i> , Copenhagen.
MAY 2015	Introductory School to TP <i>Homotopy Theory, Manifolds and Field Theories</i> , Bonn.
FEB 2014	Karlsruhe–Stuttgart Seminar <i>Representation Theory and Geometry</i> , Blaubeuren.
JUNE 2014	Summer School on <i>Surgery Theory and its Applications in Geometry</i> , Münster.