

# 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

## POSITIONS

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since Apr 2022	KARLSRUHE INSTITUTE OF TECHNOLOGY Junior Professor (Tenure-Track, W1 to W3) Head of research group <i>Algebraic and Geometric Topology</i> Institute for Algebra and Geometry Department of Mathematics
Oct 2021 – Mar 2022	UNIVERSITY OF MÜNSTER Postdoctoral researcher 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, STIPENDS, AND GRANTS

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2023	Karlsruhe House of Young Scientists Aspiring Grant to fund a research visit of Robin Stoll from Stockholm University
since 2022	Principal Investigator of the Research Training Group 2229 “Asymptotic Invariants and Limits of Groups and Spaces” funded by the DFG (acquired funding for a PhD student through a supplementary proposal).
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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- Mauricio Bustamante, Manuel Krannich, and Alexander Kupers, *Finiteness properties of automorphism spaces of manifolds with finite fundamental group*. Mathematische Annalen, to appear. Online version available at [doi.org/10.1007/s00208-023-02594-x](https://doi.org/10.1007/s00208-023-02594-x).
- Thomas Goodwillie, Manuel Krannich, and Alexander Kupers, *Stability of concordance embeddings*. Proceedings of the Royal Society of Edinburgh (Memorial volume in honour of Andrew Ranicki), to appear. Online version available at [doi.org/10.1017/prm.2023.17](https://doi.org/10.1017/prm.2023.17).
- Manuel Krannich and Alexander Kupers, *Embedding calculus for surfaces*. Algebraic & Geometric Topology, to appear. Preprint available at arXiv:[2101.07885](https://arxiv.org/abs/2101.07885).
- 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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- Mauricio Bustamante, Manuel Krannich, Alexander Kupers, and Bena Tshishiku *Mapping class groups of exotic tori and actions by  $SL_d(\mathbb{Z})$* .  
Preprint (2023), arXiv:[2305.08065](#).
- Geoffroy Horel, Manuel Krannich, and Alexander Kupers, *Two remarks on spaces of maps between operads of little cubes*.  
Preprint (2022), arXiv:[2211.00908](#).
- Manuel Krannich and Alexander Kupers, *The Disc-structure space*.  
Preprint (2022), arXiv:[2205.01755](#).
- 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](#).

## CONTRIBUTIONS TO CONFERENCE PROCEEDINGS

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- Manuel Krannich, *Stability of concordance embeddings*.  
Oberwolfach Reports, **19** (2022), no. 3, 1979–1982.
- 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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| AUG 2023  | TBD, Conference: Topology of moduli spaces (on the occasion of Ulrike Tillmann’s 60th birthday), Copenhagen (scheduled).           |
| APR 2023  | TBD, Masterclass: Homotopical methods in manifold theory, Copenhagen (scheduled).  |
| FEB 2024  | TBD, Colloquium (on the occasion of Michael Weiss’ retirement), Münster (scheduled).   |
| OCT 2023  | <i>Exotic tori, actions by <math>SL_d(\mathbb{Z})</math>, and mapping class groups</i> , Geometria em Lisboa Seminar, Lisbon.      |
| AUG 2023  | TBD, Workshop: String topology and connections to BV-quantization, symplectic topology, and manifold topology, Dublin (scheduled). |
| JULY 2023 | <i>Diffeomorphism groups of discs</i> , Workshop: Algebraic K-Theory of Spaces, Regensburg.  |

- JUN 2023 *Exotic tori, actions by  $SL_d(\mathbb{Z})$ , and mapping class groups*, Oberseminar Differentialgeometrie, Augsburg.
- JUN 2023 *A rational pullback decomposition of spaces of homeomorphisms of manifolds*, Oberseminar Topologie, Münster.
- MAY 2023 *Automorphisms of the little  $d$ -discs operad*, Workshop on Homology of Configuration Spaces and related topics, Paris.
- MAR 2023 *Pontryagin classes of Euclidean fibre bundles over spheres*, Dublin Mathematics Colloquium, Dublin.
- FEB 2023 *Diffeomorphisms of discs*, Colloquium, LMU Munich.
- JAN 2023 *Manifolds and calculus*, Chromatic Homotopy, K-Theory and Functors, CIRM, Luminy.
- OCT 2022 *Manifolds and calculus*, Ib Fest: On the occasion of Ib Madsen's 80'th birthday, Copenhagen.
- SEP 2022 *Multirelative connectivity results in geometric topology*, 4-Manifolds: from Above and Below, CIRM, Luminy.
- SEP 2022 *The Disc-structure space*, Classifying spaces in homotopy theory: in honour of Ran Levi's 60th Birthday, ICMS, Edinburgh.
- JULY 2022 *Stability of concordance embeddings*, Topologie, Oberwolfach.
- JUNE 2022 *The Disc-structure space*, Topology Seminar, Kansas State University.
- JUNE 2022 *The Disc-structure space*, Topology Seminar, Bonn.
- MAY 2022 *Top(d) and orthogonal calculus*, Topology Seminar, Stockholm.
- FEB 2022 *The Disc-structure space*, Higher algebraic structures in algebra, topology and geometry, Institut Mittag-Leffler, Stockholm.
- FEB 2022 *Pseudoisotopies of discs and  $K(\mathbb{Z})$* , Oberseminar Geometrie und Topologie, Göttingen.
- DEC 2021 *Smoothing fibre bundles and diffeomorphism groups of discs*, IMUNAM Algebraic Topology Seminar, Mexico City.
- OCT 2021 *Top(d) and orthogonal calculus*, Topology Seminar, Münster.
- JULY 2021 *(In)finiteness properties of automorphism spaces of manifolds*, AG-Seminar, Regensburg.
- APR 2021 *Embedding calculus, factorisation homology, and surfaces*, Séminaire de l'équipe Topologie Algébrique, Université Sorbonne Paris Nord (Paris 13).
- APR 2021 *Embedding calculus in codimension zero*, Building Bridges Seminar: Invariants of Embedding spaces, virtual.
- FEB 2021 *Smoothing fibre bundles and diffeomorphism groups of discs*, Geometry & Topology Seminar, Toronto.
- JULY 2020 *Moduli spaces of  $h$ -cobordisms of discs*, Topologie, Oberwolfach.
- MAY 2020 *Pseudoisotopies of discs and algebraic  $K$ -theory of the integers*, Topology Seminar, Purdue.
- MAY 2020 *The pseudoisotopy stable range*, Topology Seminar, Bonn.
- MAR 2020 *Pseudoisotopies of even discs and algebraic  $K$ -theory of the integers*, Topology Seminar, Wayne State.
- MAR 2020 *Pseudoisotopies of even discs and algebraic  $K$ -theory of the integers*, Geometry & Topology Seminar, Brown.
- MAR 2020 *Pseudoisotopies of even discs and algebraic  $K$ -theory of the integers*, 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

- 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 *On characteristic classes of bundles of manifolds connect summed with an exotic sphere* (short talk), Research School: Algebraic Topology of Manifolds, Oxford.
- JULY 2017 *On the cohomology of moduli spaces of manifolds connect summed with an exotic sphere*, Young Topologists Meeting, Stockholm.
- SEPT 2016 *Homological stability of  $E_2$ -modules and twisted stability of moduli spaces of manifolds*, European Autumn School in Topology 2016, Utrecht.

MAY 2016 *Scanning & stability — Scrutinizing topological moduli spaces*, ALG/NCG/TOP PhD students' seminar, Copenhagen.

## SERVICE

since 2018	Referee reports and opinions for various journals in mathematics including <i>Acta Mathematica</i> , <i>Advances in Mathematics</i> , <i>Algebraic &amp; Geometric Topology</i> , <i>American Journal of Mathematics</i> , <i>Crelle</i> , <i>Communications in Mathematical Physics</i> , <i>Forum of Mathematics Sigma</i> , <i>Geometry &amp; Topology</i> , <i>Journal of Topology</i> , <i>Mathematische Annalen</i> , <i>Selecta Mathematica</i> .
NOVEMBER 2023	Organiser of the workshop <i>Spaces of manifolds: algebraic and geometric approaches</i> , Banff International Research Station.
MAY 2023	External examiner for PhD thesis of Erik Lindell, Stockholm University.
SINCE MAY 2022	Organiser of the <i>Online Seminar on Manifolds, homotopy theory, and related topics</i> , jointly with Alexander Kupers and Oscar Randal-Williams.
MAY 2022	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

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.

## SUPERVISION AND MENTORING EXPERIENCE

since Apr 2023	PhD advisor of João Lobo Fernandes.
since Oct 2022	Postdoctoral mentor of Florian Kranhold.
WINTER 2023/2024	Supervision of a Master's thesis and a Bachelor's thesis.
SUMMER 2023	Supervision of a Master's thesis.

## TEACHING EXPERIENCE

WINTER 2023/2024	Lecture: <i>Elementary Geometry</i> , Karlsruhe, Lecturer.
SUMMER 2023	Seminar: <i>Cohomology and Characteristic Classes</i> , Karlsruhe, Lecturer.
WINTER 2022/2023	Lecture: <i>Algebraic Topology</i> , Karlsruhe, Lecturer.
SUMMER 2022	Seminar: <i>Vector bundles and topological K-theory</i> , Karlsruhe, Lecturer.
FALL 2020	Lecture series: <i>Lectures on Manifold Topology: Exotic Spheres</i> , Lecturer (as part of the Online Graduate Lecture Series of the London Mathematical Society).
FALL 2017	Lecture: <i>Algebraic Topology</i> , Copenhagen, Teaching Assistant.
FALL 2016	Lecture: <i>Algebraic Topology</i> , Copenhagen, Teaching Assistant.
SUMMER 2015	Lecture: <i>Algebraic Topology</i> , Karlsruhe, Tutor.
WINTER 2014/2015	Lecture: <i>Introduction into Geometry and Topology</i> , Karlsruhe, Tutor.
WINTER 2013/2014	Lecture: <i>Differential Geometry</i> , Karlsruhe, Teaching Assistant.

SUMMER 2013	Lecture: <i>Introduction into Algebra and Number Theory</i> , Karlsruhe, Tutor.
WINTER 2012/2013	Lecture: <i>Introduction into Geometry and Topology</i> , Karlsruhe, Tutor
SUMMER 2012	Lecture: <i>Linear Algebra II</i> , Karlsruhe, Tutor.
WINTER 2012/2013	Lecture: <i>Linear Algebra I</i> , Karlsruhe, Tutor

#### CONFERENCES AND WORKSHOPS ATTENDED

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AUG 2023	Conference: Topology of moduli spaces (on the occasion of Ulrike Tillmann's 60th birthday), Copenhagen (scheduled).
JULY 2022	Workshop, Topologie, Oberwolfach.
APR 2024	Masterclass: Homotopical methods in manifold theory, Copenhagen (scheduled).
NOVEMBER 2023	Workshop <i>Spaces of manifolds: algebraic and geometric approaches</i> , Banff International Research Station (scheduled).
AUGUST 2023	Workshop: String topology and connections to BV-quantization, symplectic topology, and manifold topology, Dublin.
JULY 2023	Workshop: Algebraic K-Theory of Spaces, Regensburg.
JAN 2023	Workshop, <i>Workshop on Homology of Configuration Spaces and related topics</i> , Paris.
JAN 2023	Conference, <i>Chromatic Homotopy, K-Theory and Functors</i> , CIRM, Luminy.
OCT 2022	Conference, <i>Ib Fest: Conference on the occasion of Ib Madsen's 80th birthday</i> , Copenhagen.
SEP 2022	Workshop, <i>4-Manifolds: from Above and Below</i> , CIRM, Luminy.
SEP 2022	Workshop, <i>Classifying spaces in homotopy theory: in honour of Ran Levi's 60th Birthday</i> , ICMS, Edinburgh.
JULY 2022	Workshop, Topologie, Oberwolfach.
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.