

MARCEL BISCHOFF

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EDUCATION

- 2009/10 – 2012/10 PhD in Mathematics at the University of Rome “Tor Vergata”. PhD thesis “Construction of Models in low-dimensional Quantum Field Theory using Operator Algebraic Methods” supervised by Prof. Roberto Longo.
- 2003/10 – 2009/07 Diploma in Physics at the Georg-August-Universität Göttingen. Diploma thesis: “On the Pole Structure of Higher Correlation Functions in Globally Conformal Invariant Quantum Field Theory” (in german) supervised by Prof. Karl-Henning Rehren.
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POSITIONS

- 2017/08 – now Assistant Professor (tenure track) in Mathematics, Ohio University, Athens, OH.
- 2014/08 – 2017/08 Assistant Professor (non-tenure track, Postdoc) in Mathematics, Vanderbilt University, Nashville, TN. Supervisor: Vaughan F. R. Jones.
- 2012/10 – 2014/08 Postdoctoral researcher in the DFG (German Research Foundation) Research Training Group 1493 “Mathematical Structures in Modern Quantum Physics”, University of Göttingen, Germany.
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SCIENTIFIC/ACADEMIC HONORS AND GRANTS

- 06/2017 – 05/2020 NSF Standard Grant (PI): DMS-1700192 *Quantum Symmetries and Conformal Nets* (\$110,000).
- 2015 – 2016 Summer research support through NSF Grant DMS-1362138, principal investigator Vaughan F. R. Jones.
- 2014 – 2017 Vanderbilt University, College of Arts and Science annual research fund and Postdoc appointment with reduced (1-1) teaching load.
- 2009 – 2012 PhD scholarship in Mathematics at the University of Rome “Tor Vergata”.
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RESEARCH INTERESTS

Algebraic Quantum Field Theory, Subfactors, Conformal Field Theory, Tensor Categories, Vertex Operator Algebras.

PUBLICATIONS

Articles and Books

- (1) M. Bischoff, *Generalized Orbifold Construction for Conformal Nets*, Reviews in Mathematical Physics Vol. 29, No. 1 (2017) 1750002. DOI: 10.1142/S0129055X17500027, (arXiv: 1608.00253).
- (2) M. Bischoff, *A Remark on CFT Realization of Quantum Doubles of Subfactors: Case Index < 4*, Letters in Mathematical Physics 106 (3), 2016, p. 341–363. DOI: 10.1007/s11005-016-0816-z, (arXiv: 1506.02606).
- (3) M. Bischoff, Y. Kawahigashi, R. Longo, K.-H. Rehren: *Phase boundaries in algebraic conformal QFT*, Communications in Mathematical Physics 342 (1), 2016, p. 1–45, DOI: 10.1007/s00220-015-2560-0, (arXiv: 1405.7863).

- (4) M. Bischoff, Y. Kawahigashi, R. Longo: *Characterization of 2D rational local conformal nets and its boundary conditions: the maximal case*, Documenta Mathematica 20 (2015) 1137–1184. <https://www.math.uni-bielefeld.de/documenta/vol-20/32.html> (open access).
- (5) M. Bischoff, Y. Tanimoto: *Integrable QFT and Longo-Witten endomorphisms*, Annales Henri Poincaré 16 (2), 2015, p. 569–608 DOI: 10.1007/s00023-014-0337-1 (open access).
- (6) M. Bischoff, Y. Tanimoto: *Construction of wedge-local nets of observables through Longo-Witten endomorphisms. II*, Communications in Mathematical Physics 317 (3), 2013 p. 667–695 DOI: 10.1007/s00220-012-1593-x (open access).
- (7) M. Bischoff: *Models in Boundary Quantum Field Theory Associated with Lattices and Loop Group Models*, Communications in Mathematical Physics 315 (3), 2012 p. 827–858 DOI: 10.1007/s00220-012-1511-2, (arXiv: 1108.4889).
- (8) M. Bischoff, D. Meise, K.-H. Rehren, I. Wagner: *Conformal quantum field theory in various dimensions*, Bulg. J. Phys. 36 (2009) 170–185. <http://www.bjp-bg.com/paper.php?id=516> (open access).

Preprints

- (9) M. Bischoff, K.-H. Rehren: *The Hypergroupoid Of Boundary Conditions for Local Quantum Observables*, (arXiv: 1612.02972).
- (10) M. Bischoff, *Conformal Net Realizability of Tambara-Yamagami Categories and Generalized Metaplectic Modular Categories*, (arXiv: 1803.04949). Submitted.

Proceedings

- (11) M. Bischoff: *The rank of G -crossed braided extensions of modular tensor categories*, accepted at Contemporary Mathematics series, (arXiv: 1807.06131).
- (12) M. Bischoff: *The Relation between Subfactors arising from Conformal Nets and the Realization of Quantum Doubles*, To appear in Volume 46 of the Proceedings of the Centre for Mathematics and its Applications, in honor of Vaughan F. R. Jones’ 60th birthday. (arXiv: 1511.08931).
- (13) M. Bischoff (joint with Yasuyuki Kawahigashi, Roberto Longo, Karl-Henning Rehren): *An Algebraic Conformal Quantum Field Theory Approach to Defects*, p. 906–908. In: Oberwolfach Reports, Subfactors and Conformal Field Theory, Volume 12, Issue 2, 2015, p. 849–926. DOI: 10.4171/OWR/2015/16.

TEACHING AND PROFESSIONAL EXPERIENCE

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|-----------------|---|
| 08/2017-now | Teaching at Ohio University. <ul style="list-style-type: none"> • Instructure for “Math: 6301: Analysis I” (Fall 2018) • Instructor for “Math 6710: Algebraic Topology” (Spring 2018) • Instructor for “Math 3200: Applied Linear Algebra” (Spring 2018) • Instructor for “Math 3210: Linear Algebra” (Fall 2017) |
| 08.2015-now | Teaching Graduate classes in Mathematics at Vanderbilt University. <ul style="list-style-type: none"> • Instructor for “Math 9600: Algebraic and Topological Quantum Field Theory” (Fall 2015) |
| 08/2014-08/2017 | Teaching Undergraduate classes in Mathematics at Vanderbilt University. <ul style="list-style-type: none"> • Instructor for “Math 3110: Complex Variables” (Spring 2017) • Instructor for “Math 2600: Linear Algebra” (Fall 2016) • Instructor for “Math 3110: Complex Variables” (Spring 2016) • Instructor for “Math 196: Differential Equations with Linear Algebra” (Spring 2015) • Teaching Assistant for “Math 155A: Accelerated Single-Variable Calculus I” (Fall 2014) |
| 02.2013–08.2014 | Assistant at the University of Göttingen. <ul style="list-style-type: none"> • Chief Assistant for “Mathematical Methods for Physicists II” (first term/academic year 2013/2014) • Chief Assistant for “Theoretical Physics III” (second term/academic year 2012/2013) |
| 02.2011–06.2011 | Teaching Assistant at the University of Rome “Tor Vergata” <ul style="list-style-type: none"> • Recitation of “Fourier Analysis II for Media Science” (second term/academic year 2010/2011) • Recitation of “Mathematical Physics for Mathematicians” (second term/academic year 2010/2011) |
| 10.2007–10.2008 | Teaching Assistant at the University of Göttingen: |

- Recitation of “Quantum Mechanics” (summer term 2008)
 - Instructor for a one week revision course of “Mathematical Methods in Physics”
 - Recitation of “Mathematical Methods in Physics” (winter term 2007/2008)
- 2014-2016 I attended the following courses regarding Teaching:
- Effective Teaching Strategies for International Faculty (Fall 2014) at the English Learning Center, Vanderbilt University.
 - Seminar for Certificate in College Teaching (Spring 2016) at the Center for Teaching, Vanderbilt University.
- 08.2006–03.2007 Student Assistant at the Institute of Aeroelastics of the German Aerospace Center (DLR) Göttingen. Projects: “Coupling of multi-body simulations to finite elements programs” and “Development of a force element simulating aerodynamic forces”.

OTHER SCIENTIFIC ACTIVITIES

- Co-organizer *Analysis Seminar*, since Fall 2017, Ohio University.
- Co-organizer *Subfactor Seminar*, Spring 2016, Vanderbilt University.
- Co-organizer and proposal co-writer of “AMS Special Session on Tensor Categories and Diagrammatic Methods” for the Spring Southeastern Sectional Meeting Vanderbilt University, Nashville, TN. April 14-15, 2018.
- Co-organizer and proposal co-writer of “AMS Special Session on Advances in Operator Algebras” for the Joint Mathematics Meeting, San Diego, CA. January 10-13, 2018.
- Co-organizer and proposal co-writer of “AMS Special Session on Classification Problems in Operator Algebras” for the Joint Mathematics Meeting, Seattle, WA. January 6-9, 2016.
- Co-organizer of 33rd LQP Workshop “Foundations and Constructive Aspects of QFT”, November 14-16, 2013 in Göttingen.
- Writing reviews for Mathematical Reviews (American Mathematical Society).
- Referee for Communications in Mathematical Physics, Duke Mathematical Journal, Symmetry, Integrability and Geometry: Methods and Applications (SIGMA), Mathematical Physics, Analysis and Geometry, Proceedings of the Centre for Mathematics and its Applications.
- Co-organizer of PhD/Postdoc reading seminars at University of Rome “Tor Vergata” from 2010-2012 about subfactors, index theory for subfactors, tensor categories, quantum groups and PhD/Postdoc reading seminars at University of Göttingen 2013.
- Active on mathoverflow.

SELECTED TALKS

- 08/28/2018 *Automorphisms of Lagrangian algebras*, Quantum Algebra & Quantum Topology Seminar at The Ohio State University, Columbus, OH.
- 04/28/2018 *Completely Positive Actions on Local Nets of Observables*, Operators on Hilbert spaces In Ohio (OHIO) Convergence, Columbus, OH.
- 04/15/2018 **Invited Talk:** *Generalized Twisted Orbifold Construction* at Special Session on Advances in Operator Algebras at AMS Sectional Meeting at Vanderbilt University, Nashville, TN.
- 04/13/2018 **Invited Talk:** *Infinite Index Subfactors from Conformal Inclusions* at Subfactor Seminar, Vanderbilt University, Nashville, TN.
- 04/03/2018 **Invited Talk:** *Quantum Symmetries and Conformal Nets* at Mathematical Physics Seminar, Harvard University, Cambridge, MA.
- 03/17/2018 **Invited Talk:** *A Notion of Quantum Symmetry* at Special Session on “Quantum Symmetries” at AMS Sectional Meeting at The Ohio State University, Columbus, OH.
- 11/04/2017 **Invited Talk:** *On Generalized Metaplectic Modular Categories*, Special Session on Tensor Categories: Bridging Algebra, Topology, and Physics. AMS Fall Western Sectional Meeting University of California, Riverside, Riverside, CA.

- 11/04/2017 **Invited Talk:** *Quantum Operations on Conformal Nets*, Special Session on Advances in Operator Algebras. AMS Fall Western Sectional Meeting University of California, Riverside, Riverside, CA.
- 09/2017 **Invited Talk (Plenary Speaker):** *Symmetries in Quantum Field Theories Beyond Groups*, Conference: Advances in Mathematics and Theoretical Physics, "Accademia dei Lincei" (the Italian National Academy), Rome, Italy.
- 07/21/2017 **Invited Talk:** *Quantum Symmetries of Conformal Nets*, 07/17/17 - 07/24/17: Quantum Symmetries: Subfactors and Planar Algebras, Maui, HI.
- 06/2017 **Invited Talk:** *Symmetries of conformal nets beyond groups*, Hopf Algebras and Tensor Categories in San Diego - Summer 2017 West Coast Lie Theory Workshop, San Diego, CA.
- 06/2017 **Invited Talk:** (*cancelled for visa reasons*), Workshop: Subfactors, K-theory and Conformal Field Theory, Isaac Newton Institute for Mathematical Sciences, Cambridge, UK.
- 04/2017 **Invited Talk:** *Symmetries in QFT beyond groups (cancelled for visa reasons)*, Concepts, Constructions & Curved Spacetimes, York, UK.
- 04/2017 **Invited Talk:** *Realizability of Tambara-Yamagami Categories by Conformal Nets*, AMS Special Session on "Fusion categories and applications", AMS Sectional Meeting at Indiana University, Bloomington, IN.
- 03/03/2017 **Invited Talk:** *Subfactors and Conformal Nets*, Colloquium, Ohio University, Athens, OH.
- 02/2017 **Invited Talk:** *Defects in Algebraic Quantum Field Theory*, University of California, Davis, CA.
- 02/2017 **Invited Talk:** *Modular Tensor Categories from Conformal Nets and Subfactors*, University of California, San Diego, CA.
- 01/27/2017 **Invited Talk:** *Subfactors, Fusion Categories and Conformal Nets*, Colloquium, Louisiana State University, Baton Rouge, LA.
- 01/2017 **Invited Talk:** *Generalized fixed points of conformal nets*, AMS Special Session on Advances in Operator Algebras, I, Joint Mathematics Meetings 2017, Atlanta, GA.
- 11/2016 **Invited Speaker (3 Lectures):** *TBA*, Berkeley-Tokyo Autumn School - Quantum Field Theory and Subfactors. University of California, Berkeley, CA.
- 11/03/2016 **Invited Talk:** *Generalized orbifold construction for conformal nets*, Noncommutative Geometry Seminar, The Ohio State University, Columbus, OH.
Invited Talk: *Extensions of modular tensor categories and subtheories in conformal field theory*, Quantum Algebra and Quantum Topology Seminar, The Ohio State University, Columbus, OH.
- 09/20/2016 **Invited Talk:** *Generalized Orbifolds in Conformal Field Theory*, Algebra Seminar, Emory University, Atlanta, GA.
Invited Talk: *What is conformal field theory?* Student Seminar, Emory University, Atlanta, GA.
- 07/20/2016 **Invited Talk:** *Defects and Phase boundaries in Algebraic Conformal Quantum Field Theory*, Trimester Seminar, Hausdorff Trimester Program: Von Neumann Algebras, HIM, Bonn, Germany.
- 07/06/2016 **Invited Talk:** *Generalized fixed points of conformal nets and quantum double subfactors*, Workshop "Von Neumann Algebras", HIM, Bonn, Germany.
- 07/28/2016 **Invited Talk:** *Conformal nets, alpha-induction and defects*, Operator Algebras and Quantum Field Theory - Dedicated to the memory of John E. Roberts, INFN - Laboratori Nazionali di Frascati, Italy.
- 05/27/2016 *Generalized Orbifolds in Algebraic Conformal QFT*, 38th LQP Workshop "Foundations and Constructive Aspects of QFT", TU München, Munich, Germany.
- 04/10/2016 **Invited Talk:** *Conformal nets and unitary fusion categories*, Special Session on Fusion Categories and Topological Phases of Matter III, AMS Spring Western Sectional Meeting at the University of Utah, Salt Lake City, UT.
- 03/08/2016 *Subfactors and Defects in Conformal Field Theory*, Functional Analysis Seminar, University of California Los Angeles, CA.
- 12/07/2015 **Invited Talk:** *Conformal Nets, Defects and Realization of Quantum Doubles*, Special Session: Operator Algebras, First joint meeting SBM - SBMAC - RSME, Universidade Federal do Ceará, Fortaleza, Brazil.

- 11/06/2015 *Generalized Orbifold Construction for Conformal Nets*, Subfactor Seminar, Vanderbilt University, Nashville, TN.
- 10/17/2015 **Invited Talk:** *Quantum Doubles and Conformal Field Theory*, Special Session on von Neumann Algebras, II, AMS Sectional Meeting at the University of Memphis in Memphis, TN.
- 07/08/2015 **Invited Talk (FMPS Lecture):** *Conformal Field Theory, Subfactors and Planar Algebras*, University of Tokyo, Japan
- 05/26/2015 *A planar algebraic description of defect lines in conformal field theory*, GPOTS 2015, Purdue University, West Lafayette, IN.
- 03/28/2015 **Invited Talk:** *An Algebraic Conformal Quantum Field Theory Approach to Defects*, Oberwolfach Workshop 1513 "Subfactors and Conformal Field Theory", Mathematisches Forschungsinstitut Oberwolfach, Germany.
- 01/12/2015 **Invited Talk:** *Subfactors and Topological Defects in Conformal Quantum Field Theory*, AMS Special Session on Classification Problems in Operator Algebras, II Joint Mathematics Meeting, San Antonio, TX.
- 10/31/2014 Explanatory Talk: *Realizing representation categories of compact groups in higher dimensional quantum field theories (after Doplicher, Piacitelli)*, Subfactor Seminar, Vanderbilt University, Nashville, TN.
- 09/05/2014 *A center construction for braided subfactors and defects of conformal nets*, Subfactor Seminar, Vanderbilt University.
- 07/21/2014 *VOA approach to CQFT*, QFT Seminar, University of Göttingen.
- 05/14/2014 *(Re-)constructing VOAs from Conformal Nets*, University of California, Berkeley, CA.
- 05/08/2014 **Invited Talk:** *Topological Defects and Phase Boundaries in Algebraic Conformal Quantum Field Theory*, NCGOA Spring Institute 2014 - Subfactors, CFT, and VOA, Vanderbilt University, Nashville, TN.
- 03/20/2014 *Phase Boundaries in Algebraic Conformal QFT*, DPG Spring Meeting, Berlin, Germany.
- 05/31/2013 *Characterization of rational conformal QFTs and their boundary conditions*, 32nd Workshop "Foundations and Constructive Aspects of QFT", Bergische Universität Wuppertal, Germany.
- 04/26/2013 *Braided Subfactors and CFT in the Higher Structures seminar*, University of Göttingen, Germany.
- 01/30/2013 **Invited Talk:** *Construction of models in low dimensional QFT using operator algebraic methods*, Miniworkshop on Operator Algebras III, Graduate School of Mathematical Sciences, University of Tokyo.
- 12/12/2012 **Invited Talk:** *Characterization of 2D conformal quantum, field theories and their boundary conditions*, Mathematical Physics Trimester at Hausdorff Research Institute for Mathematics, Bonn, Germany.
- 08/01/2012 *Construction of models in 2D QFT and Longo-Witten endomorphisms*, Mathematical Aspects of Quantum Field Theory and Quantum Statistical Mechanics, Hamburg, Germany.
- 02/06/2012 *Construction of two-dimensional QFTs by Longo-Witten endomorphisms of chiral QFTs*, Quantum Field Theory seminar of the Institute of Theoretical Physics, University of Göttingen.
- 11/18/2011 *Longo-Witten Endomorphisms and Construction of Wedge-Local Nets*, 29th Workshop "Foundations and Constructive Aspects of QFT", MPI for Mathematics in the Sciences, Leipzig.
- 06/01/2011 *Semigroup elements associated to conformal nets and boundary quantum field theory*, Meeting of GDRE GREFI-GENCO Paris Institut Henri Poincaré, Paris, France.
- 04/29/2011 *Local nets on Minkowski half-plane associated to lattices*, EU - NCG 4th Annual Meeting in Bucharest, Romania.
- 03/31/2011 *Construction of Models in Boundary Quantum Field Theory*, DPG Spring Conference, Karlsruhe, Germany.
- 08/21/2010 Explanatory talk: *Modularity of the category of representations of a conformal net (Part 2)*, Workshop: Operator Algebras and Conformal Field Theory, University of Oregon, Eugene OR.
- 03/12/2009 *Pole structure of higher correlation functions in 4D globally conformal invariant quantum field theory*, DPG (German Physical Society) Spring conference, Munich, Germany.
- 01/26/2009 *Pole structures of higher correlation functions in 4D globally conformal invariant QFT*, Quantum Field Theory seminar - Institute for Theoretical Physics Göttingen, Germany.

11/19/2007 *Partial wave expansion in CFT in 4 dimensions*, Quantum Field Theory seminar - Institute for Theoretical Physics Göttingen, Germany.

CONFERENCE INVITATIONS/INVITED RESEARCH VISITS/SCHOOLS

06/12/2017 - 06/16/2017 Workshop: Subfactors, K-theory and Conformal Field Theory, Isaac Newton Institute for Mathematical Sciences, Cambridge, UK. (cancelled)
01/04/2017 - 01/07/2017 Joint Mathematics Meetings 2017, Atlanta, GA.
11/14/2016 - 11/23/2016 Berkeley-Tokyo Autumn School - Quantum Field Theory and Subfactors. UC Berkeley, CA.
10/08/2016 - 10/10/2016 Workshop on Subfactors, Quantum Field Theory and Quantum Information, Harvard University, Cambridge, MA.
10/01/2016 - 10/02/2016 East Coast Operator Algebras Symposium 2016, Loyola University, Chicago, IL.
09/20/2016 - 09/20/2016 Visiting: Emory University, Atlanta, GA.
07/24/2016 - 07/30/2016 Oberwolfach Workshop 1630 "Recent Mathematical Developments in Quantum Field Theory", Mathematisches Forschungsinstitut Oberwolfach, Germany.
07/04/2016 - 07/08/2016 Workshop "Von Neumann Algebras", HIM, Bonn, Germany.
06/27/2016 - 06/29/2016 Operator Algebras and Quantum Field Theory - Dedicated to the memory of John E. Roberts, INFN, Frascati, Italy.
06/27/2016 - 07/01/2016 Mathematics and Physics at the Crossroad, INFN, Frascati, Italy.
05/27/2016 - 05/28/2016 38th LQP Workshop "Foundations and Constructive Aspects of QFT", TU München, Munich, Germany.
05/17/2016 - 05/25/2016 NCGOA Spring Institute 2016, HIM, Bonn, Germany.
05/08/2016 - 05/26/2016, 07/01/2016 - 07/24/2016 Hausdorff Trimester Program: Von Neumann Algebras, HIM Bonn, Germany.
04/09/2016 - 04/10/2016 AMS Spring Western Sectional Meeting University of Utah, Salt Lake City, UT.
03/07/2016 - 03/11/2015 Visiting: University of California Los Angeles.
12/07/2015 - 12/10/2015 First joint meeting SBM - SBMAC - RSME, Universidade Federal do Ceará, Fortaleza, Brazil.
10/17/2015 - 10/18/2015 AMS Sectional Meeting at the University of Memphis in Memphis, TN.
05/26/2015 - 05/30/2015 GPOTS 2015, Purdue University, West Lafayette, IN.
07/13/2015 - 07/17/2015 International Conference On Subfactor Theory in Mathematics and Physics, Quinhuaodao, China.
07/07/2015 - 07/12/2015 Visiting University of Tokyo, Japan.
05/26/2015 - 05/30/2015 GPOTS 2015, Purdue University, West Lafayette, IN.
05/01/2015 - 05/07/2015 NCGOA Spring Institute 2015 - Operator Algebras and Approximation Properties of Groups, Department of Mathematics - Vanderbilt University, Nashville TN.
03/22/2015 - 03/28/2015 Oberwolfach Workshop 1513 "Subfactors and Conformal Field Theory", Mathematisches Forschungsinstitut Oberwolfach, Germany.
01/10/2015 - 01/13/2015 Joint Mathematics Meeting, San Antonio, TX.
05/19/2014 - 05/23/2014 Algebraic Quantum Field Theory - Its status and its future, ESI - Vienna.
05/11/2014 - 05/16/2014 University of California Berkeley, Department of Mathematics, Berkeley, CA.
05/02/2014 - 05/08/2014 NCGOA Spring Institute 2014 - Subfactors, CFT, and VOA, Department of Mathematics - Vanderbilt University.
12/01/2013 - 12/04/2013 Visit: Fachbereich Mathematik, University of Hamburg.
10/07/2013 - 10/10/2013 Second Erlangen Fall School on Quantum Geometry, University of Erlangen-Nuremberg.
01/18/2013 - 02/01/2013 Visit: Graduate School of Mathematical Sciences, University of Tokyo.
05/04/2012 - 05/10/2012 NCGOA Spring Institute 2012 - Conformal Field Theory and von Neumann Algebras, Vanderbilt University.
08/16/2010 - 08/21/2010 Workshop: Operator Algebras and Conformal Field Theory, University of Oregon, Eugene OR.

LANGUAGES

German	native speaker
English	proficient
Italian	fluent
Spanish	A2
French	basic knowledge
Programming:	C, PHP, Basic, Fortran, Java, C++, SQL
Computer Algebra:	Mathematica, Maple, MATLAB, GAP, Sage