

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

Books and Monographs

- (1) M. Bischoff, Y. Kawahigashi, R. Longo, K.-H. Rehren: *Tensor categories of endomorphisms of von Neumann algebras (with applications to Quantum Field Theory)*, Springer Briefs in Mathematical Physics, Vol 3., ISBN: 978-3-319-14301-9, (arXiv: 1407.4793).

Articles

- (2) 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).
- (3) 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).

- (4) 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).
- (5) 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).
- (6) 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).
- (7) 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).
- (8) 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).
- (9) 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

- (10) M. Bischoff, *Conformal Net Realizability of Tambara-Yamagami Categories and Generalized Metaplectic Modular Categories*, (arXiv: 1803.04949)

Proceedings

- (11) M. Bischoff, K.-H. Rehren: *The Hypergroupoid Of Boundary Conditions for Local Quantum Observables*, To Appear in Proceedings of MSJ-SI held at Sendai, (arXiv: 1612.02972).
- (12) M. Bischoff: *The Relation between Subfactors arising from Conformal Nets and the Realization of Quantum Doubles*, Proc. Centre Math. Appl., Proceedings of the 2014 Maui and 2015 Qinhuangdao Conferences in Honour of Vaughan F.R. Jones’ 60th Birthday. Scott Morrison and David Pennys, eds. Proceedings of the Centre for Mathematics and its Applications, v. 46. 15 - 24. 2017. <https://projecteuclid.org/euclid.pcma/1487646023>(open access), (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"> • 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 *OHIO Conference*, Columbus, OH. 04/28/2018.
- Co-organizer *Analysis Seminar*, Fall 2017, Ohio University.
- Co-organizer *Subfactor Seminar*, Spring 2016, Vanderbilt University.
- Co-organizer and proposal co-writer of “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

- 04/03/2018 **Invited Talk:** *Quantum Symmetries and Conformal Nets*, Mathematical Physics Seminar, Harvard University, Cambridge, MA.
- 03/17/2018 **Invited Talk:** *A Notion of Quantum Symmetry*, Special Session on "Quantum Symmetries". 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, Quinhuangdao, 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