

VINCENZO MORINELLI | CV



- » **Born:** Torre del Greco, Naples - Italy, January 9, 1989.
- » **Office:** Mathematics Department, "Tor Vergata" University of Rome, via della Ricerca Scientifica, 1 - I-00133 Rome, Italy.
- » **E-mail:** v.morinelli@gmail.com, morinell@mat.uniroma2.it
- » **PEC:** v.morinelli@pec.it.
- » **Webpage:** <https://sites.google.com/view/vincenzo-morinelli>

»»» Employment history

- | | | |
|--|--------------------------------|---|
| Mar '19-Feb '20 | Postdoctoral Researcher | INdAM (Istituto Nazionale di Alta Matematica) |
| <p>» collaboration postdoc fellowship provided by INdAM, the National Institute for High Mathematics. My research project "Operator algebraic aspects of Quantum Field Theory is 2nd ranked on the call. Host Institution: "Tor Vergata" Univ. of Rome</p> | | |
| Mar 16-Feb '19 | Postdoctoral Researcher | "Tor Vergata" Univ. of Rome |
| <p>» postdoc for the Roberto Longo ERC advanced grant "Quantum Algebraic Structures and Models"; from 01/03/2018 supported by the program MIUR FARE R16X5RB55W.</p> | | |

»»» Education

- | | | |
|---|---|-----------------------------|
| Dec 15th, 2015 | Ph.D. in Mathematics | "Tor Vergata" Univ. of Rome |
| <p>» Thesis: "On the Bisognano-Wichmann Property, Nuclearity and Particle Localization", Advisor: Prof. Roberto Longo.</p> | | |
| Jul 18th, 2012 | Master's degree in Mathematics | "Roma Tre" Univ. of Rome |
| <p>» Final Mark: 110/110 cum Laude</p> <p>» Thesis: "The Semilinear Klein-Gordon Equation in two and three space dimensions", Advisor: Prof. Giovanni Mancini.</p> | | |
| Jul 15th, 2010 | Bachelor's degree in Mathematics | "Roma Tre" Univ. of Rome |
| <p>» Final Mark: 110/110 cum Laude</p> | | |

»»» Fields of interests

My main research interest concerns the **Operator Algebraic approach to high and low dimensional Quantum Field Theory (QFT)**. I am mainly interested in the relation between the algebraic structure (in particular the Tomita-Takesaki theory), the geometric structure of models and mathematical/physical quantities.

Further interests are in Operator Algebra theory, in particular von Neumann algebras, subfactors, vertex algebras, tensor categories, noncommutative geometry.

I am also interested in **science communication**. I have attended a school on the topic with lectures given by experts in communicating science for INFN, ASI, CNR, Radio Tre, and chief editors of Zanichelli (see additional information section).

Scientific Contributions:

My research concerns the relation between symmetries and algebraic property in the operator algebraic approach to QFT. The Haag-Kastler axioms describe (continuum) infinite degrees of freedom systems respecting basic quantum and relativistic assumptions. In brief, models are defined axiomatically by algebras of bounded operators (observables) on an infinite dimensional Hilbert space, associated to regions of the Minkowski space-time undergoing a covariant action of the symmetry group (Poincaré). They further commute when they are spacelike separated (locality). There is a very rich relation between algebraic structure and the geometry of the models.

My scientific contributions:

- Solution of a long standing problem on infinite spin representations localization property - with R. Longo (Univ. Tor Vergata) and K.-H. Rehren (Univ. Göttingen)
- An algebraic sufficient condition for the Bisognano-Wichmann property
- Split Property for conformal field theories - with Y. Tanimoto (Univ. Tor Vergata) and M. Weiner (BME).
- Split Property for free massless finite helicity fields - with R. Longo (Univ. Tor Vergata), F. Preta (NYU), K.-H. Rehren (Univ. Göttingen)
- Dilation covariance imply Möbius covariance in 1+1 spacetime dimension - with Y. Tanimoto (Univ. Tor Vergata)
- New constructions in QFT - with K.-H. Rehren (Univ. Göttingen)

Ongoing projects:

- Algebraic sufficient condition for the Bisognano-Wichmann property, Modular covariance in Quantum Field Theory
- Nuclearity and compactness conditions on superselection sectors of chiral theories.
- Modular covariance for general interacting theories - with W. Dybalski (TU München)
- New constructions for models in Quantum Field theory - with K.-H. Rehren (Univ. Göttingen)
- Scaling limit on lattice Quantum field theory - with A. Stottmeister (Univ. Münster) (Univ. Münster), Gerardo Morsella and Yoh Tanimoto (Univ. Tor Vergata)
- Entropy in QFT and modular theory - with R. Longo (Univ. Tor Vergata) e G. Lechner (Univ. Cardiff)
- Blackhole entropy for Kerr spacetime - with A. Stottmeister (Univ. Münster), N. Pinamonti (Univ. Genova)
- KMS states and Entropy

Publications:

Published:

1. R. Longo, V. Morinelli, K.-H. Rehren, *Where Infinite Spin Particles Are Localizable*, Commun. in Math. Phys., Volume 345, Issue 2, pp 587–614 (2016).
<https://doi.org/10.1007/s00220-015-2475-9>
2. V. Morinelli, *An algebraic condition for the Bisognano-Wichmann Property*, Proceedings of the 14th Marcel Grossmann Meeting - MG14, Rome pp. 3849-3854 (2017)
https://doi.org/10.1142/9789813226609_0509
3. V. Morinelli, Y. Tanimoto, M. Weiner, *Conformal covariance and the split property* Commun. Math. Phys. Volume 357, Issue 1, pp 379–406 (2018).
<https://doi.org/10.1007/s00220-017-2961-3>
4. V. Morinelli, *The Bisognano-Wichmann property on nets of standard subspaces, some sufficient conditions*, Ann. Henri Poincaré, Volume 19, Issue 3, 937–958 (2018).
<https://doi.org/10.1007/s00023-017-0636-4>



5. V. Morinelli, Y. Tanimoto, *Scale and Möbius covariance in two-dimensional Haag-Kastler net*, Commun. in Math. Phys. Online First (2019)
<https://doi.org/10.1007/s00220-019-03410-x>
6. R. Longo, V. Morinelli, F. Preta, K.-H. Rehren, *Split property for free finite helicity fields*, Ann. Henri Poincaré, Volume 20, Issue 8, pp 2555-2258 (2019).
<https://doi.org/10.1007/s00023-019-00820-4>

Preprint:

1. V. Morinelli, K.-H. Rehren, Spacelike deformations: Higher-spin fields from scalar fields arXiv:1905.08714 (2019) (submitted)

In preparation:

1. W. Dybalski, V. Morinelli "Bisognano-Wichmann property for asymptotically complete massless QFT" (expected in 2019)
2. V. Morinelli, G. Morsella, A. Stottmeister, Y. Tanimoto, "Scaling limit and operator-algebraic renormalization" (expected in 2019)

»»» Third party funding:

- June 15th, 2016 - December 15th, 2017: participating in the research project: Ricerca Scientifica di Ateneo, Consolidate the Foundations - *Operator Algebraic Structures in Noncommutative Geometry*.

»»» M.sc. supervision

- Francesco Preta (Univ. Roma Tor Vergata, Advisor: Prof. Roberto Longo), **M. sc.** - Joint paper on Annales Henri Poincaré;
- Francesco Bonesi (Univ. Roma Tor Vergata, Advisor: Prof. Roberto Longo), **M.Sc.** (unofficially)

»»» Services

- **Referee** for Communication in Mathematical Physics, Annales Henri Poincaré, Nuclear Physics B.
- **Reviewer** for Mathematical Reviews of AMS.

»»» Organization of international conferences

- 43rd LQP workshop "Foundations and Constructive aspects of QFT" Galileo Galilei Institute Firenze (Italy) February 20-22, 2019.
Webpage: <https://sites.google.com/view/43-lqp>

»»» Some special events I took part:

1. May 2-8, 2014, spring school: "NCGOA Spring Institute 2014, Subfactors, CFT and VoA", Department of Mathematics, **Vanderbilt University, Nashville, Tennessee, USA**.
2. March, 22-28, 2015, workshop: "Subfactors and Conformal Field Theory", **Oberwolfach**, Germany.
3. July 12-18, 2015 "**14th Marcel Grossmann Meeting**" Rome, Italy.
Invited talk: "Where Infinite Spin Particles Are Localizable" ("QF3 - Operator Algebras and Quantum Field Theory" session)
4. February 8-14, 2017, "Operator Algebras: Subfactors and their Applications" programme, Isaac Newton Institute, **Cambridge**, UK.
Invited talk: "Conformal covariance and the split property".
<http://www.newton.ac.uk/seminar/20170209140015002>
5. June, 17-22, 2019, Participation to the program at **the Simons Center for Geometry and Physics Program: Operator Algebras and Quantum Physics**, State University of **New York, Stony Brook (USA)**.
Invited talk: Scale and Möbius covariance in two-dimensional Haag-Kastler net.
http://scgp.stonybrook.edu/video_portal/video.php?id=4176



Some events I took part:

Past events:

1. December 17-19, 2012, workshop: "*NGAP - Noncommutative geometry and application to physics*" Milan, Italy.
2. January 29-February 2, 2013, workshop: "*Trails in quantum mechanics and surroundings*" Frascati, Italy.
3. June 17-28, 2013, summer school: "*Rigidité et actions de groupes*" at Institut Mathématiques de Jussieu, at Paris Diderot University, Paris, France.
4. July 8-12, 2013 workshop: "*Mathematics and Quantum Physics*" Accademia dei Lincei, Rome, Italy.
5. September 1-8, 2013, workshop: "*Noncommutative Geometry and Applications*" organized by Stoilow Institute of Mathematics of the Romanian Academy, Poiana Brasov, Romania.
6. November 14-16, 2013, workshop: 33rd Workshop "*Foundations and Constructive Aspects of QFT*", Göttingen, Germany,
7. June 16-21, 2014, workshop: "*Noncommutative Geometry and Applications*"; Villa Mondragone, Frascati, Italy.
8. February 11-13, 2015, workshop: "*New trends in algebraic quantum field theory*", LNF-INFN, Frascati, Italy
9. April 20-24, 2015, conference: "*Advances in Noncommutative Geometry*", Paris, France;
Invited talk: "The Bisognano-Wichmann Theorem and Particle Localization"
10. May 29-30, 2015, workshop: "*36th, Local Quantum Physics*", Leipzig, Germany.
Title of the talk: "On Localization of Infinite Spin Particles"
11. May 17-25, 2016, "*NCGOA Spring Institute 2016*", Bonn, Germany.
12. June 23, 2016, "*Ph.D. Colloquium*", Uni. Tor Vergata, Rome, Italy.
Invited talk: "Particle Localization and Infinite Spin"
13. December 20, 2016, "*Department's day*", Uni. Tor Vergata, Rome, Italy.
Invited talk: "Conformal covariance and the split property".
14. June 6-September 30, 2016, "*Intensive trimester Mathematics and Physics at the Crossroads*" LNF, Frascati and INdAM, Rome, Italy.
15. February 26- March 3, 2017, workshop: "*Noncommutative Geometry and Applications*", ICTP - Trieste, Italy.
Invited talk: "Conformal covariance and the split property".
16. June 23-24, 2017, *LQP 40 Foundations and Constructive Aspects of Quantum Field Theory*, Max-Planck institute for Mathematics in the Sciences, Leipzig (Germany).
17. September 19-22, 2017, "Advances in Mathematics and Theoretical Physics" accademia dei Lincei, Rome.
18. December 8-10, 2017, workshop "Quantum Physics meets Mathematics", Hamburg, Germany.
19. February 2-3, 2018, workshop: "*41st, Local Quantum Physics*", Leipzig, Germany.
Title of the talk: "A sufficient condition for the Bisognano-Wichmann property"
20. February 15-16, 2018, workshop "*Quantum Information and Operator Algebras*", INdAM, Rome (Italy)
21. June 4-8, 2018, conference "Algebraic Quantum Field Theory: where Operator Algebra meets Microlocal Analysis", INdAM meeting, Cortona (Italy).
Title of the Talk: "A sufficient condition for the Bisognano-Wichmann property".
22. February 20-22, 2019, 43rd LQP workshop "Foundations and Constructive aspects of QFT" Galileo Galilei Institute Firenze (Italy). **I am part of the organizing committee.**
23. April 16-18, 2019, "Algebraic and geometric aspects in Quantum Field Theory", Universität Freiburg, (Germany),
Invited talk: Bisognano-Wichmann property for asymptotically complete massless theories.



»» Visiting periods

Next Visits

1. 21-26 July 2019, visiting K.-H. Neeb, Department Mathematik, FAU Erlangen-Nürnberg, (Germany).
Invited Seminar talk: On the Bisognano-Wichmann property for one-particle nets.

Past Visits

1. May 30-June 6, 2015 visiting Prof. K.-H. Rehren at Institut für Theoretische Physik, Göttingen, Germany.
2. January 23-28, 2017, Visiting Prof. Mihaly Weiner at Department of Mathematical Analysis, Budapest University of Technology and Economics (BME)
3. August 21-25, 2017, visiting Dr. Wojciech Dybalski, Technische Universität München, München (Germany)
Invited Seminar talk: "An algebraic condition for the Bisognano-Wichmann property"
4. December 3-8, 2017 visiting Prof. K.-H. Rehren at Institut für Theoretische Physik, Göttingen, Germany.
Invited Seminar talk: "An algebraic condition for the Bisognano-Wichmann property".
5. March 11-16, 2018, visiting Dr. Wojciech Dybalski, Technische Universität München, München (Germany)
Invited Seminar talk: "Comments on the Split property for conformal theories in 3+1 dimensional spacetime"
6. November 5-10, 2018, visiting Dr. Wojciech Dybalski, Technische Universität München, München (Germany)
Invited Seminar talk: "Scale and Möbius covariance in two-dimensional Haag-Kastler net"
7. January 27 - February 2, 2019, visiting Prof. Gandalf Lechner, Univ. Cardiff, School of Mathematics (United Kingdom)
Invited Seminar talk: "Scale and Möbius covariance in two-dimensional Haag-Kastler net"
8. April 8-12, 2019, Visiting Prof. Claudio Dappiaggi, Univ. Pavia. (Italy).
Invited Seminar talk: Split property for free massless finite helicity fields.
9. May, 2019, visiting Dr. Daniela Cadamuro, Institute of Theoretical Physics, Leipzig (Germany).
Invited Seminar talk: Split property for free massless finite helicity fields.

»» Teaching:

- Teaching assistance at University of Rome "Tor Vergata":
 - **a.y. 2018/2019** Course: "Matematica Generale" at Economy and Finance department, Tor Vergata University.
 - **a.y. 2017/2018** Course: "Matematica Generale" at Economy and Finance department, Tor Vergata University.
 - **a.y. 2016/2017** Course: "Matematica Generale" at Economy and Finance department, Tor Vergata University.
 - **a.y. 2015/2016** Course: "Matematica Generale" at Economy department, Tor Vergata University.
 - **a.y. 2012/2013** Teaching assistance for the Bachelor/Master degree courses in Mathematics.
- Teaching assistance at University of Rome "Roma Tre":
 - **from a.y 2010/11 to a.y. 2011/12** Course of Mathematical Analysis: "AM210 - Analisi Matematica 3" at Mathematics Department.
 - **a.y. 2011/12** Course of Mathematical Analysis: "AM120 - Analisi Matematica 2" at Mathematics Department.
 - **a.y 2009/10** Course of Mathematical Analysis: "AM2 - Analisi Matematica 2" at Mathematics Department.
 - **a.y. 2009/10** Course of Mathematical Analysis: "AM3 - Analisi Matematica 3" at Mathematics Department.



►► For Recommendation Information

- **Prof. Roberto Longo**, Univ. of Rome Tor Vergata, longo@mat.uniroma2.it
- **Prof. Karl-Henning Rehren**, Univ. of Göttingen, rehren@theorie.physik.uni-goettingen.de
- **Prof. Mihaly Weiner**, Univ. Budapest of Technology and Economics, mweiner@math.bme.hu.
- **Dr. Yoh Tanimoto**, Univ. Rome Tor Vergata, hoyt@mat.uniroma2.it

►► Additional information:

- 2016-2017, attending the "Scuola Sperimentale di Comunicazione della Scienza" ("Sperimental school of Science Communication"), Rome, Italy.
<http://maddmaths.simai.eu/news-2/scuola-sperimentale-di-comunicazione-della-scienza-201617/>
- Programming Languages/Mathematics Software: C, Mathematica.
- Languages: Italian (native language), English (second language), French (beginner)
- September, 2007, Grant by Roma Tre University for first year students of Bachelor's courses of Mathematics.
- May, 2011, 14th placement to the mathematical national contest organized by INdAM

Le dichiarazioni rese nel presente curriculum sono da ritenersi rilasciate ai sensi degli artt. 46 e 47 del D.P.R. 445/2000.

Rome, 16/07/2019


Vincenzo Morinelli