

# CV of Yoh Tanimoto

## Contact

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## Education

March 2006	B.Sc.(Physics) Department of Physics, University of Tokyo
March 2008	M.Sc.(Mathematical Sciences) Graduate School of Mathematical Sciences, University of Tokyo
November 2011	Ph.D.(Mathematics) Dipartimento di Matematica, Università di Roma “Tor Vergata”

## Positions

November 2011 - August 2012	DAAD scholarship for postdoctoral researchers
September 2012 - December 2012	Hausdorff Institute for Mathematics, invited for Junior Trimester Program
January 2013 - March 2013	Alexander von Humboldt foundation postdoctoral fellow
April 2013 - - March 2016	JSPS SPD postdoctoral fellow
April 2016 - - February 2017	JSPS fellow for research abroad
February 2017 - February 2020	Ricercatore di tipo b (tenure-track assistant professor) funded through the Rita Levi Montalcini grant by MIUR
February 2020 - October 2023	Associate professor at University of Rome “Tor Vergata”
November 2023 -	Full professor at University of Rome “Tor Vergata”

## Scholarships, Awards, Grants

June 2008	(based on the date of decision) INdAM scholarship for foreign students (declined)
June 2008	Scholarship for Ph.D. Students, Università di Roma “Tor Vergata”
April 2011	DAAD scholarship for postdoctoral researchers
July 2012	Alexander von Humboldt Foundation postdoctoral fellowship
August 2012	JSPS postdoctoral fellowship for research abroad (declined)
December 2012	Premio Cuzzo
January 2013	JSPS postdoctoral fellowship SPD
September 2013	Takebe encouragement prize, Mathematical society of Japan
July 2015	INdAM-COFUND incoming fellowship, ranked 2nd (declined)
August 2015	JSPS postdoctoral fellowship for research abroad
June 2016	Rita Levi Montalcini grant (An Italian tenure-track program with research grant €196,573)
March 2017	Simons fellow for visiting the Isaac Newton Institute

## Teaching activities

2007-2008 (Summer semester)	Tutorial in Computer Science 1 for Department of Mathematics, University of Tokyo
2010-2011 (First semester)	Tutorial in Calculus 1 for Department of Physics, Università di Roma "Tor Vergata"
2010-2011 (First semester)	Tutorial in Calculus 1 for Department of Media Science, Università di Roma "Tor Vergata"
2017-2018 (First semester)	Lecture "Mathematical Analysis II" for Bachelor in Engineering Sciences, Università di Roma "Tor Vergata" (with G.Morsella)
2018-2019 (First semester)	Lecture "Mathematical Analysis II" for Bachelor in Engineering Sciences, Università di Roma "Tor Vergata" (with G.Morsella)
2019 (Second semester)	Lecture "Fondamenti di Analisi Matematica" for Bachelor in Physics, Università di Roma "Tor Vergata" (with G.Morsella)
2019-2020 (First semester)	Lecture "Analisi Matematica I" for Ingegneria dell'Edilizia and Ingegneria edile-architettura, Università di Roma "Tor Vergata" (with P.Roselli)
2019-2020 (First semester)	Lecture "Mathematical Analysis II" for Bachelor in Engineering Sciences, Università di Roma "Tor Vergata" (with O.Butterley)
2020-2021 (First semester)	Lecture "Mathematical Analysis I" for Bachelor in Engineering Sciences, Università di Roma "Tor Vergata"
2021-2022 (First semester)	Lecture "Mathematical Analysis I" for Bachelor in Engineering Sciences, Università di Roma "Tor Vergata"
2022-2023 (First semester)	Lecture "Mathematical Analysis I" for Bachelor in Engineering Sciences, Università di Roma "Tor Vergata"

## Intensive courses

1. Introduction to Algebraic Quantum Field Theory, Nagoya University, 15-19 May 2023 (90 minutes  $\times$  6 lectures)

## Research theme

(numbers correspond to those of the publication list)

- Positive cones of von Neumann algebras ([1]),
- Representation theory of infinite dimensional Lie algebras ([2,3])
- Thermal states of conformal QFT ([5,9,20])
- Scattering theory in conformal QFT ([4,6,7,11,15])
- Construction of two-dimensional QFT models ([8,10,12,13,14,16,17,22,24])
- General operator-algebraic study of 2d CFT, such as the split property, entropy ([21,23])

## Organized programs

September 2012 | Hausdorff Institute for Mathematics, Junior Trimester Program  
- December 2012 | in mathematical physics “Local gauge invariance in AQFT”

## Organized workshops

25-26 September 2012 | “Algebraic Quantum Field Theory and Local Symmetries”  
Hausdorff Institute for Mathematics, Bonn  
15-16 February 2018 | “Quantum Information and Operator Algebras”  
INdAM, Rome  
21-23 June 2023 | Workshop “Where Mathematics Meets Quantum Physics”  
Enrico Fermi Research Center, Rome

## Long-term research visits

September 2008 | Erwin Schrödinger Institute,  
- December 2008 | program “Operator Algebras and Conformal Field Theory”  
September 2012 | Hausdorff Institute for Mathematics, Junior Trimester Program  
- December 2012 | in mathematical physics “Local gauge invariance in AQFT”  
May 2017 | Isaac Newton Institute,  
- June 2017 | program “Operator algebras: subfactors and their applications”  
March-May 2021 | Mathematisches Forschungsinstitut Oberwolfach (research in pairs)  
April-June 2022 | The University of Tokyo (visiting scholar)  
March-June 2023 | The University of Tokyo (visiting scholar)

## PI of research projects

December 2019 | Program “beyond borders” of Tor Vergata university  
- May 2021 | project “Interaction of Operator Algebras with Quantum Physics  
and Noncommutative Structure” (10,000 Euro)  
March 2022 | University funding of Tor Vergata university  
- February 2024 | project “Operator algebras and quantum mathematics” (16,000 euro)

## Highlights

- 14 papers in *Comm. Math. Phys.*, and the highest number of publications therein (7 papers) during the year 2010-2014. Press release by Tor Vergata University.
- 2 papers in *Forum of Mathematics, Sigma*.
- Invited addresses at *International Congress on Mathematical Physics 2012* and other international conferences.
- Invited contributions to a special volume of *Comm. Math. Phys.* dedicated to Rudolf Haag.

## Descriptions of Prizes, Awards and Distinctions

- Il Premio Cuozzo:  
Best Ph.D. thesis in mathematics at Italian universities among applications defended in academic year 2011-2012.  
<https://www.mat.uniroma2.it/%7Edott/cuozzo.html>
- Postdoctoral fellowship SPD, Japan Society for Promotion of Science:  
Two best postdoctoral researchers in physical and mathematical sciences among applicants in academic year 2013-2014 with a research grant of 2,400,000 Yen per year.  
<https://www.jsps.go.jp/english/e-pd/pddc.htm>

- Takebe encouragement prize, Mathematical Society of Japan:  
Around 5 best mathematicians under 30 years old upon recommendation in academic year 2013-2014.  
<http://mathsoc.jp/en/publicity/takebe2013-en.html>
- INdAM-COFUND incoming fellowship, ranked 2nd:  
A fellowship for non-Italian postdoctoral mathematicians.  
<https://cofund.altamatematica.it/2012/main/website?page=call-2>
- Rita Levi Montalcini grant, among four mathematicians.  
An Italian programme to create tenure-track positions with research grant.  
<http://cervelli.cineca.it/vincitori.php?parte=5>
- Simons Fellowship for visiting the Isaac Newton Institute, Cambridge  
I am among 5 participants of the OAS programme. The fellowship description:  
<https://www.newton.ac.uk/about/fellowships/simons-foundation/>

## Invited presentations in international conferences and workshops

1. Thermal states in conformal CFT,  
EU-NCG 4th Annual Meeting, Institute of Mathematics of the Romanian Academy, Bucharest, 25-30 April 2011.
2. Longo-Witten endomorphisms and two-dimensional interacting models,  
Mathematical physics workshop, Aarhus University, 1-2 December 2011.
3. Construction of wedge-local nets through Longo-Witten endomorphisms,  
Conference on von Neumann Algebras and Related Topics, Kyoto University, RIMS, 9-13 January 2012.
4. Construction of wedge-local QFT through Longo-Witten endomorphisms,  
the XVII International Congress on Mathematical Physics, Aalborg, 6-11 August 2012.
5. Operator algebraic construction of two-dimensional quantum field models,  
Conference “Mathematics and Quantum Physics”, Accademia Nazionale dei Lincei, Roma, 8-12 July 2013.
6. Operator-algebraic construction of two-dimensional quantum field models,  
Mathematical physics workshop, Institute for Theoretical Physics, ETH Zurich, 28-29 November 2013.
7. Wedge-local fields in integrable models with bound states,  
Workshop “Algebraic quantum field theory: its status and its future”, Erwin Schrödinger Institut, Vienna, 19-23 May 2014.
8. Wedge-local fields in integrable QFT with bound states,  
Workshop “New Trends in Algebraic Quantum Field Theory 2015”, INFN Frascati, Rome, 11-13 February 2015.
9. Operator algebraic construction of two-dimensional quantum field models,  
Workshop “Subfactors and Conformal Field Theory”, Mathematical Research Institute of Oberwolfach, 22-28 March 2015.
10. Operator algebraic construction of two-dimensional quantum field models,  
14th Marcel Grossmann Meeting, University of Rome “La Sapienza”, 12-18 July 2015.
11. Operator-algebraic construction of integrable QFT,  
Workshop “Recent Developments in Operator Algebras”, RIMS, Kyoto, 19-21 August 2015.
12. Wedge-local fields in integrable QFT with bound states,  
Satellite Conference to the XVIII International Congress on Mathematical Physics “Operator algebras and Quantum Physics”, University of São Paulo, 17-23 July 2015.
13. Bound state operators in integrable QFT,  
Workshop “Quantum Field Theory: Infrared problems and constructive aspects”, Technical University of Munich, 8-9 October 2015.

14. KMS states on chiral components of conformal field theory,  
Workshop “Gauge Theory, Strings and Holography”, INFN Frascati, 13-15 June 2016.
15. KMS states with respect to conformal Hamiltonian  
MSJ-SI “Operator Algebras and Mathematical Physics”, Tohoku university, 1-12 August 2016.
16. Free products in AQFT,  
Workshop “Noncommutative Geometry and Applications”, ICTP Trieste, 27 February-3 March 2017.
17. Construction of two-dimensional quantum field models through Longo-Witten endomorphisms,  
The XXVth International Conference on Integrable Systems and Quantum symmetries, Prague, 6-10 June 2017, slides
18. Half-sided modular inclusions (and free products in AQFT),  
Workshop “Reflection positivity”, Mathematical Research Institute of Oberwolfach, 26 November-2 December 2017.
19. Operator-algebraic construction of integrable QFT and CFT,  
The 22nd UK Meeting on Integrable and Conformal Field Theory and Related Topics, Cardiff University, 1-2 June 2018.
20. Construction of Haag-Kastler nets for factorizing S-matrices with poles, Workshop “Algebraic Quantum Field Theory: Where Operator Algebra meets Microlocal Analysis”, Palazzone della SNS, Cortona, 4-8 June 2018.
21. Free products in AQFT, The 27th International Conference in Operator Theory, the West University of Timisoara, 2-6 July 2018.
22. Construction of Haag-Kastler nets for factorizing S-matrices with poles, workshop “Physics and Mathematics of Quantum Field Theory”, BIRS, 30 July-3 August 2018.
23. Strong locality beyond linear energy bounds, workshop “Subfactors and Applications”, Mathematical Research Institute of Oberwolfach, 27 October - 02 November 2019.
24. Strong locality beyond linear energy bounds, workshop “Operator Algebras in Quantum Field Theory and Quantum Probability”, Università di Roma “Tor Vergata”, 04 - 07 December 2019.
25. Unitary modules and conformal nets associated with the  $W_3$ -algebra with  $c \geq 2$ , Special Session Quantum Groups and Algebraic Quantum Field Theory” in IWOTA Lancaster UK 2021, online, 16–20 August 2021
26. Unitary vertex algebras and Wightman conformal field theories, Conference Ypatia 2022 (postponed from 2022), École française de Rome, 08 - 10 June 2022.
27. Scaling limits of lattice quantum fields by wavelets, Conference FAATNA 20>22, Università degli studi della Basilicata Matera, 05 - 09 July 2022.

In total, I have delivered 84 presentations including local workshops and seminars.

### **Intensive courses**

1. Introduction to Algebraic Quantum Field Theory, Nagoya University, 15-19 May 2023 (90 minutes  $\times$  6 lectures)

## Referee services, evaluation committees

- Peer reviewed journals: Ann. Henri Poincaré, Ann. Math., Axioms, Dissertationes Math, Commun. Math. Phys., J. AMS, J. EMS, J. Math. Phys., Mem. AMS.
- Peer reviewed proceedings of conferences: Nagoya Winter Workshop 2015: Reality and Measurement in Algebraic Quantum Theory.
- Referee for Ph.D. Thesis: Vincenzo Morinelli (University of Rome “Tor Vergata”, December 2015), Lorenzo Panebianco (“La Sapienza” University of Rome, November 2021), Jonas Schober (University of Erlangen-Nürnberg, June 2023).
- Ph.D. committee: Simone Del Vecchio (Rome “Tor Vergata”, April 2017).
- postdoc committee for a position funded by the ERC grant “QUEST” (Rome “Tor Vergata”, January 2020).
- postdoc committee for a position funded by the Italian Excellence department grant (Rome “Tor Vergata”, December 2021).
- postdoc committee for a position funded by the Polish NAN grant (Poznań Univeristy, November 2020).
- postdoc committee for a position funded by the Polish NAN grant (Poznań Univeristy, July 2021).

## Ph.D. supervision

- Benedikt Wegener (unofficial, officially supervised by R. Longo, Rome): modular operators on the null planes (1 joint paper)
- Yul Otani (unofficial, officially supervised by Y. Kawahigashi, Tokyo, March 2017): Entanglement entropy in algebraic quantum field theory (1 joint paper)
- Stefano Iovieno (unofficial, officially supervised by C. Pinzari, Rome, January 2019): Positive energy representations of Sobolev diffeomorphism groups and soliton representations in CFT (2 joint papers)

## Postdoc supervision

- Tiziano Gaudio: vertex operator algebras and conformal nets

## Languages

English (fluent), German (fluent), Italian (fluent), Japanese (mother tongue), Portuguese (elementary)