

Curriculum vitæ

Arnaud BROTHIER

Born in Suresnes, France, the 13-th of August 1982

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Work Experience

- September 2024–Present. Associate Professor (tenure) at the University of Trieste, Italy.
- September 2024–Present. Adjunct Senior Lecturer (honorific position) at the University of New South Wales, Sydney.
- July 2020–August 2024. Senior Lecturer (tenure) at the University of New South Wales, Sydney.
- July 2018–June 2020. Lecturer (tenure-track) at the University of New South Wales, Sydney.
- November 2016–June 2018. Research Assistant at University of Roma II, Tor Vergata.
- August 2013–August 2016. Assistant Professor of Mathematics at Vanderbilt University, USA.
- October 2011–July 2013. Postdoctoral researcher at KU Leuven, Belgium.

Education

- September 2008–September 2011. Ph.D. in mathematics supervised by Vaughan Jones and Andrzej Zuk in the University of Paris Diderot and as a guest in UC Berkeley.
– Dissertation title: *Planar algebras and maximal abelian subalgebras in von Neumann algebras*.
- September 2007–July 2008. Master 2 in Pure Mathematics - Non Commutative Geometry in the University of Paris Diderot, (with outstanding honor).
- July 2007. Aggregation of Mathematics.
- 2004. Admission at the École Normale Supérieure (ENS) of Cachan, France.

Awards and honors

- December 2022. Honourable Mention for The Blue Hat Prize for the talk entitled "Forest-skein groups" at the 66th Annual Meeting of The Australian Mathematical Society. This award recompenses the four best non-student talks (over more than 100 talks).
- June 2016. Winner of the Samir Aldroubi and Amira Azhari Prize for Excellence in Postdoctoral Research given every two years at Vanderbilt University.

Fundings *Grant support*

- January 2020–December 2023. First investigator (i.e. lead investigator) for ARC (Australian Research Council) Discovery Project DP200100067: Physical realisation of enriched quantum symmetries joint with Pinhas Grossman, Scott Morrison and James Tener. Total funding: AUD 340,000.
- July 2018–November 2021. University of New South Wales Sydney Starting Grant.

Short stay supports and summer supports

- June–July 2016 (5 weeks). Short stay support sponsored by the Hausdorff Research Institute for Mathematics.
- July–August 2016. NSF summer support sponsored by Vaughan Jones.
- July–August 2015. NSF summer support sponsored by Vaughan Jones.
- July–August 2010 (5 weeks). Short stay support sponsored by the Mathematical Foundation of France for the ICM 2010 in Hyderabad in India.
- March–June 2009 (3 months). Short stay support sponsored by the Mathematical Foundation of Paris for visiting UC Berkeley.

Student scholarship

- September 2008–August 2011. Full grant scholarship, Ph.D. program fellowship of Region Iles de France.
- September 2004–August 2008. Full grant scholarship as a student of ENS Cachan.

Support for organising conferences and workshops

- July 2021. MATRIX Workshop funding for "Cartan subalgebras of C^* -algebras and von Neumann algebras" (cancelled due to Covid).
- February 2019. AMSI Scientific Workshop Funding 2019 for the conference "Subfactors in Sydney" hosted by UNSW Sydney.
- July 2017. Financial support from the American NSF for the conference "Quantum Symmetries: Subfactors and Planar Algebras" in Maui, Hawaii, USA.

- July 2014. Financial support from the American NSF for the conference “Subfactor theory in mathematics and physics” in Maui, Hawaii, USA.

Research interests I mainly work in operator algebras, mathematical foundations of theoretical physics and group theory and their connections with ergodic theory, representation theory, and quantum field theory. I am an expert in Jones’ subfactor theory which connects deeply conformal field theory, low dimensional topology and von Neumann algebras.

Since 2016 I have been mainly focusing on a new and exciting connection that Vaughan Jones made between subfactor theory, quantum field theory, knot theory and Richard Thompson’s groups. I have been particularly interested to connections and applications toward group theory, quantum field theory and operator algebras.

Publications and preprints *Accepted articles*

- (22) (*Joint with Dilshan Wijesena*). Irreducible representations of R. Thompson’s groups and of the Cuntz algebra, **Advances in Mathematics**, Vol. 454 (2024), available at arXiv:2306.01256
- (21) (*Joint with Dilshan Wijesena*). Jones’ representations of R. Thompson’s groups not induced by finite dimensional ones, to appear in **Annales de l’institut Fourier**, available at arXiv:2211.08555.
- (20) Forest-skein groups II: construction from homogeneously presented monoids, **International Journal of Mathematics**, Vol. 34, Issue 8, 2350042, 2023, available at arXiv:2212.01993.
- (19) Haagerup property for wreath products constructed with Thompson’s groups, **Groups, Geometry, and Dynamics**, Vol. 17, Issue 2, pp. 671–718 (2023), available at arXiv:1906.03789.
- (18) Classification of Thompson related groups arising from Jones technology I, **International Mathematics Research Notice**, Vol. 2023, Issue 7, pp. 5974–6044, available at arXiv:2010.03765.
- (17) Classification of Thompson related groups arising from Jones technology II, **Bulletin de la Société Mathématiques de France**, Vol. 149, Issue 4 (2021) pp. 663-725, available at arXiv:2011.13124.
- (16) On Jones’ connections between subfactors, conformal field theory, Thompson’s groups and knots, **Celebratio Mathematica**, Published in the volume dedicated to Vaughan F. R. Jones , available at arXiv:1912.07140.
- (15) (*Joint with Alexander Stottmeister*). Operator-algebraic construction of gauge theories and Jones’ actions of Thompson’s groups, **Communication in Mathematical Physics**, Vol. 376 (2020) pp. 841–891, available at arXiv:1901.04940.
- (14) (*Joint with Valeriano Aiello and Roberto Conti*). Jones representations of Thompson’s group F arising from Temperley-Lieb-Jones algebras, **International Mathematics Research Notices**, Vol. 15 (2021) pp. 11209-11245, available at arXiv:1901.10597.
- (13) (*Joint with Vaughan Jones*). On the Haagerup and Kazhdan properties of R. Thompson’s groups, **Journal of Group Theory**, Vol. 22, Issue 5 (2019) pp. 795-807, available at arXiv:1805.02177
- (12) (*Joint with Vaughan Jones*). Pythagorean representations of Thompson’s groups, **Journal of Functional Analysis**, Vol. 277 (2019) 2442-2469, available at arXiv:1807.06215
- (11) (*Joint with Tobe Deprez and Stefaan Vaes*). Rigidity for von Neumann algebras given by locally compact groups and their crossed products, **Communications in Mathematical Physics**, Vol. 361 (2018), pp. 81-125, available at arXiv:1703.09092.
- (10) (*Joint with Rémi Boutonnet*). Crossed-products by locally compact groups: Intermediate subfactors, **Journal of Operator Theory**, Vol. 79, Issue 1 (2018) pp. 101-137, available at arXiv:1611.10121.
- (9) On fixed point planar algebras, **Journal of Mathematical Physics**, Vol. 57 (2016) pp. 111703, available at arXiv:1603.01205.
- (8) (*Joint with Chenxu Wen*). The cup subalgebra has the absorbing amenability property, **International Journal of Mathematics**, Vol. 27, No. 2 (2016) pp. 1650013, available at arXiv:1510.06075.
- (7) (*Joint with Vaughan Jones*). Hilbert modules over a planar algebra and the Haagerup property, **Journal of Functional Analysis**, Vol. 269 (2015) pp. 3634-3644, available at arXiv:1503.02708.
- (6) Weak amenability for subfactors, **International Journal of Mathematics**, Vol. 26, No. 5 (2015) pp. 1550048, available at arXiv:1410.2875.
- (5) (*Joint with Stefaan Vaes*). Families of hyperfinite subfactors with the same standard invariant and prescribed fundamental group, **Journal of Noncommutative Geometry**, Vol. 9 (2015) pp. 775-796, available at arXiv:1309.5354.
- (4) The cup subalgebra of a II_1 factor given by a subfactor planar algebra is maximal amenable, **Pacific Journal of Mathematics**, Vol. 269 (2014), No. 1, pp. 19-29, available at arXiv:1210.8091.
- (3) (*Joint with Michael Hartglass and David Penneys*). Rigid C^* -tensor categories of bimodules over interpolated free group factors, **Journal of Mathematical Physics**, Vol. 53 (2012) pp. 123525, available at arXiv:1208.5505.
- (2) The Takesaki equivalence relation for maximal abelian subalgebras, **Münster Journal of Mathematics**, Vol. 5 (2012) pp. 59-72, available at arXiv:1111.6846.
- (1) Unshaded planar algebras and their associated II_1 factors, **Journal of Functional Analysis**, Vol. 262, Issue 9 (2012) pp. 3839–3871, available at arXiv:1202.1298.

Submitted articles and preprints

- (7) (*Joint with Ryan Seelig*) Forest-skein groups IV: dynamics, Preprint 2024, available at arXiv:2411.12569.
- (6) (*Joint with Dilshan Wijesena*). A tensor product for representations of the Cuntz algebra and of the R. Thompson groups, available at arXiv:2408.12051.
- (5) (*Joint with Ryan Seelig*). Forest-skein groups III: simplicity, Preprint 2024, available at arXiv:2406.09718.
- (4) (*Joint with Dilshan Wijesena*). Atomic representations of R. Thompson's group and Cuntz's algebra, Preprint 2024, available at arXiv:2406.02967.
- (3) (*Joint with Dilshan Wijesena*). Decomposition of Pythagorean representations of R. Thompson's groups, Preprint 2023, available at arXiv:2302.04458.
- (2) Forest-skein groups I: between Jones' subfactors and R. Thompson's groups, Preprint 2022, available at arXiv:2207.03100.
- (1) (*Joint with Alexander Stottmeister*). Canonical quantization of 1+1-dimensional Yang-Mills theory: An operator-algebraic approach, Preprint 2019, available at arXiv:1907.05549.

Co-organized conferences

- (13) June 2024. Diagrammatic calculus, mini-conference at UNSW Sydney.
- (12) December 2022. The 66-th annual meeting of the Australian Mathematical Society (coordinator of all special sessions), UNSW Sydney.
- (11) Juillet 2021. (Canceled due to Covid) Cartan subalgebras of C*-algebras and von Neumann algebras, MATRIX, Australia.
- (10) February 2021. (Canceled due to Covid) Annual meeting of ANZAMP (Australian and New Zealand Association for Mathematical Physics), Adelaide, Australia.
- (9) February 2019. Subfactors in Sydney, UNSW Sydney, Australia.
- (8) July 2017. Quantum Symmetries: Subfactors and Planar Algebras, Maui, Hawaii, USA.
- (7) July 2015. Subfactor theory in mathematics and physics, Qinhuangdao, China.
- (6) January 2015. National AMS meeting special session, Classification problems in operator algebras, San Antonio, Texas, USA.
- (5) July 2014. Subfactor theory in mathematics and physics, Maui, Hawaii, USA.
- (4) March 2014. AMS meeting special session, Von Neumann algebras and free probability, Knoxville, Tennessee, USA.
- (3) July 2013. Subfactors in Maui, Maui, Hawaii, USA.
- (2) April 2011. Automata groups and non commutative geometry, Paris Diderot, France.
- (1) December 2009. Geometry and Analysis, Paris Diderot, France.

Co-organized seminars

- March 2020–December 2021 and Feb. 2023–Present. Pure Math Seminar at UNSW.
- January–May 2016. Subfactors seminar, Vanderbilt University, USA

Presentations I have given more than 100 talks in conferences, seminars, and colloquia in 15 different countries on four continents.

Teaching experience

- Since July 2018 I am lecturing two courses per year at UNSW Sydney. I have lectured first year Calculus, second year (Higher) Complex Analysis, and fourth year Functional Analysis.
- From August 2013 until June 2016 I have lectured two courses per year at Vanderbilt University, USA. I have lectured first year Calculus, second year Linear Algebra, and third year Introduction to Analysis.
- From February to June 2012 I lectured the fourth year course Geometric Group Theory at KU Leuven, Belgium.

Supervision

- I am currently the primary supervisor of three PhD students that are Christian de Nicola Larsen, Ryan Seelig, and Dilshan Wijesena.
- I have supervised five honours thesis (the equivalent of a Master II thesis).

Language skills

- French (native speaker)
- English (fluent)
- Italian (intermediate)
- German (basic knowledge)

General services

- 2021–Present. Assessor for the Australian Research Council.
- April 2020–December 2023. Co-editor of the magazine Parabola published by the School of Mathematics and Statistics of UNSW (first as a Problem Editor until March 2022 and then as Assistant Chief Editor).
- January 2020–December 2020. Member of the Australian and New Zealand Association of Mathematical Physics.
- July 2018–February 2022. Member of the Publicity committee at UNSW.

- Reviewer for scientific journals, e.g. Bulletin of the London Mathematical Society, Communication in Mathematical Physics, Journal of Combinatorial Algebra, Proceeding of Mathematical Sciences, Physical Review Letters, Bulletin of the Australian Mathematical Society, Journal of Mathematical Physics, Bulletin des sciences mathematiques, Quantum, Annales Scientifiques de l'Ecole Normale superieure, Physical Review Letters.
- Wrote reviews for MathSciNet.