CURRICULUM VITAE - TEO BANICA

Born 5/25/1973 at Bucharest
Romanian and French citizen
Professor of Mathematics
University of Cergy-Pontoise

ADDRESS

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University of Cergy-Pontoise
95000 Cergy-Pontoise, France

CONTACT

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EDUCATION

1991-92: First year student, University of Bucharest
1992-94: Student at the Ecole Normale Supérieure, Paris

BA 1993: Memoir "Elliptic curves", advisor F. Sauvageot
MSc 1994: Memoir "Free probability", advisor G. Skandalis

1994-96: PhD student at Paris 7 University
PhD 1996: "Free compact matrix quantum groups", advisor G. Skandalis

EMPLOYMENT

1996-98: CNRS researcher, Institute of Mathematics of Marseille
1998-99: CNRS researcher, Institute of Mathematics of Paris

1999-00: Charles B. Morrey Jr. Assistant Professor, UC Berkeley
2000-04: CNRS researcher, Institute of Mathematics of Paris

2004-09: Professor of Mathematics, University of Toulouse
2009- : Professor of Mathematics, University of Cergy-Pontoise

TEACHING

1994-96: Teaching assistant at Paris 7 University

Mathematics - 1st year (Fall 1994)
Linear algebra - 2nd year (Fall 1995)

1999-00: Assistant professor at UC Berkeley

Abstract algebra - 3rd year (Fall 1999)
Measure theory - 4th year (Fall 1999)
Real analysis - 3rd year (Spring 2000)

2003-04: Lecturer at Paris 7 University

Operator algebras - 5th year (Fall 2003)

2004-09: Professor at the University of Toulouse

Analysis - 2nd year (Fall 2004)
Integral calculus - 3rd year (Fall 2004)

Maple and R - 2nd year (Fall 2005)
Measure theory - 3rd year (Fall 2005)
Integral calculus - 3rd year (Fall 2005)
Quantum groups - 5th year (Fall 2005)

Linear algebra - 2nd year (Fall 2006)
Measure theory - 3rd year (Fall 2006)
Abstract algebra - 2nd year (Spring 2007)
Probability - 3rd year (Spring 2007)

Differential equations - 2nd year (Spring 2008)
Fourier analysis - 3rd year (Spring 2008)

Mathematics - 1st year (Fall 2008)
Linear algebra - 2nd year (Fall 2008)

2009- : Professor at the University of Cergy-Pontoise

Linear algebra - 2nd year (Spring 2010)
Abstract algebra - 4th year (Spring 2010)
Free probability - 5th year (Spring 2010)

Mathematics - 1st year (Fall 2010)
Dynamical systems - 4th year (Fall 2010)
Abstract algebra - 4th year (Spring 2011)
Quantum groups - 5th year (Spring 2011)

Mathematics - 1st year (Fall 2011)
Dynamical systems - 4th year (Fall 2011)
Abstract algebra - 4th year (Spring 2012)
Quantum groups - 5th year (Spring 2012)

Probability - 3rd year (Fall 2012)
Dynamical systems - 4th year (Fall 2012)
Linear algebra - 2nd year (Spring 2013)
Abstract algebra - 4th year (Spring 2013)

Real analysis - 2nd year (Fall 2013)
Dynamical systems - 4th year (Fall 2013)
Linear algebra - 2nd year (Spring 2014)
Probability - 2nd year (Spring 2014)

Mathematics - 1st year (Spring 2015)
Real analysis - 2nd year (Spring 2015)
Functional analysis - 4th year (Spring 2015)
Optimization - 4th year (Spring 2015)

Mathematics - 1st year (Fall 2015)
Linear algebra - 2nd year (Fall 2015)
Real analysis - 2nd year (Spring 2016)
Functional analysis - 4th year (Spring 2016)

Linear algebra - 2nd year (Fall 2016)
Functional analysis - 4th year (Fall 2016)
Real analysis - 2nd year (Spring 2017)
Probability - 5th year (Spring 2017)

Linear algebra - 2nd year (Fall 2017)
Functional analysis - 4th year (Fall 2017)
Probability - 5th year (Fall 2017)
Real analysis - 2nd year (Spring 2018)

Linear algebra - 2nd year (Fall 2018)
Functional analysis - 4th year (Fall 2018)
Analysis - 1st year (Spring 2019)
Real analysis - 2nd year (Spring 2019)

Linear algebra - 2nd year (Fall 2019)
Functional analysis - 4th year (Fall 2019)
Analysis - 1st year (Spring 2020)
Real analysis - 2nd year (Spring 2020)

Real analysis - 2nd year (Fall 2020)
Functional analysis - 4th year (Fall 2020)
Abstract analysis - 2nd year (Spring 2021)
Differential geometry - 4th year (Spring 2021)

Real analysis - 2nd year (Fall 2021)

Functional analysis - 4th year (Fall 2021)
Abstract analysis - 2nd year (Spring 2022)
Differential geometry - 4th year (Spring 2022)

Real analysis - 2nd year (Fall 2022)
Functional analysis - 4th year (Fall 2022)
Abstract analysis - 2nd year (Spring 2023)
Differential geometry - 4th year (Spring 2023)

Functional analysis - 4th year (Fall 2023)
Real analysis - 2nd year (Spring 2024)
Abstract analysis - 2nd year (Spring 2024)
Differential geometry - 4th year (Spring 2024)

STUDENTS

2005-06: L. Masserey, M.Sc. Toulouse 3 University, 06/06
Memoir: Compact matrix quantum groups of Kac type

2012-15: L. Pittau, Ph.D. Cergy-Pontoise University, 10/15
Thesis: Free wreath products by quantum automorphism groups

2016-17: D. Özteke, M.Sc. Cergy-Pontoise University, 06/17
Memoir: Isolated complex Hadamard matrices

RESEARCH

I'm interested in theoretical physics. A conjecture there is that at very small scales, between quarks and the Planck scale, with both ends not excluded, geometry is free. Which is rather in tune with other known speculations, on what happens there.

I've been working on this for about 30 years. I think we solved so far 1/2 of the problem, we have now a notion of free geometry which works fine, and is really beautiful.

The remaining 1/2 of the problem is that of building some sort of physics theory, based on the free geometry that we have, and then recovering the known physical theories, such as the Standard Model for particle physics, via suitable thermodynamic limits.

SERVICE

1994-96: Student seminar "Operator algebras" organized at Paris 7
1996-06: Various websites, created and/or maintained
1994- : About 100 conference and seminar talks

2004-06: Seminar "Noncommutative geometry" organized at U. Toulouse
2005-08: Hiring committee for mathematics, U. Toulouse

2006-07: Seminar "Geometry and physics" organized at U. Toulouse

2006-09: Co-PI, ANR grant Galoisint, Clermont - Strasbourg - Toulouse
2007-09: Various conferences organized, with the Galoisint grant
2007-08: Seminar "Free probability" organized at U. Toulouse

2011-12: Seminar "Probability" organized at U. Cergy
2012- : Member of various committees at U. Cergy

2016-18: Associated editor, Advances in Operator Theory
2020- : Math youtube channel, www.youtube.com/@teobanica
2023- : Associated editor, Journal of Operator Theory

AWARDS

1989: Gold medal at the International Mathematics Olympiad, Braunschweig
1990: Gold medal at the International Mathematics Olympiad, Beijing
1991: Gold medal at the International Mathematics Olympiad, Sigtuna

2012: G. de B. Robinson award for the paper "Free Bessel laws"
2015: First class professorship (PR1), awarded by the CNU
2018: Honorary cat, awarded by the cats of Longuesse

PAPERS

[1] T. Banica, On the polar decomposition of circular variables, *Integral Equations Operator Theory* **24** (1996), 372–377.

[2] T. Banica, The representation theory of free orthogonal quantum groups, *C. R. Acad. Sci. Paris Ser. I Math.* **322** (1996), 241–244.

[3] T. Banica, The free unitary compact quantum group, *Comm. Math. Phys.* **190** (1997), 143–172.

[4] T. Banica, Hopf algebras and subfactors associated to vertex models, *J. Funct. Anal.* **159** (1998), 243–266.

[5] T. Banica, Representations of compact quantum groups and subfactors, *J. Reine Angew. Math.* **509** (1999), 167–198.

[6] T. Banica, Fusion rules for representations of compact quantum groups, *Exposition. Math.* **17** (1999), 313–337.

[7] T. Banica, Symmetries of a generic coaction, *Math. Ann.* **314** (1999), 763–780.

[8] T. Banica, Compact Kac algebras and commuting squares, *J. Funct. Anal.* **176** (2000), 80–99.

[9] T. Banica, Subfactors associated to compact Kac algebras, *Integral Equations Operator Theory* **39** (2001), 1–14.

[10] T. Banica, Quantum groups and Fuss-Catalan algebras, *Comm. Math. Phys.* **226** (2002), 221–232.

[11] T. Banica, The planar algebra of a coaction, *J. Operator Theory* **53** (2005), 119–158.

[12] T. Banica, Quantum automorphism groups of small metric spaces, *Pacific J. Math.* **219** (2005), 27–51.

[13] T. Banica, Quantum automorphism groups of homogeneous graphs, *J. Funct. Anal.* **224** (2005), 243–280.

[14] T. Banica and S. Moroianu, On the structure of quantum permutation groups, *Proc. Amer. Math. Soc.* **135** (2007), 21–29.

[15] T. Banica and J. Bichon, Free product formulae for quantum permutation groups, *J. Inst. Math. Jussieu* **6** (2007), 381–414.

[16] T. Banica and B. Collins, Integration over compact quantum groups, *Publ. Res. Inst. Math. Sci.* **43** (2007), 277–302.

[17] T. Banica and J. Bichon, Quantum automorphism groups of vertex-transitive graphs of order ≤ 11, *J. Algebraic Combin.* **26** (2007), 83–105.

[18] T. Banica and D. Bisch, Spectral measures of small index principal graphs, *Comm. Math. Phys.* **269** (2007), 259–281.

[19] T. Banica, J. Bichon and G. Chenevier, Graphs having no quantum symmetry, *Ann. Inst. Fourier* **57** (2007), 955–971.

[20] T. Banica and B. Collins, Integration over quantum permutation groups, *J. Funct. Anal.* **242** (2007), 641–657.

[21] T. Banica and R. Nicoara, Quantum groups and Hadamard matrices, *Panamer. Math. J.* **17** (2007), 1–24.

[22] T. Banica, J. Bichon and B. Collins, Quantum permutation groups: a survey, *Banach Center Publ.* **78** (2007), 13–34.

[23] T. Banica, J. Bichon and B. Collins, The hyperoctahedral quantum group, *J. Ramanujan Math. Soc.* **22** (2007), 345–384.

[24] T. Banica and B. Collins, Integration over the Pauli quantum group, *J. Geom. Phys.* **58** (2008), 942–961.

[25] T. Banica, A note on free quantum groups, *Ann. Math. Blaise Pascal* **15** (2008), 135–146.

[26] T. Banica and R. Vergnioux, Growth estimates for discrete quantum groups, *Infin. Dimens. Anal. Quantum Probab. Relat. Top.* **12** (2009), 321–340.

[27] T. Banica and J. Bichon, Quantum groups acting on 4 points, *J. Reine Angew. Math.* **626** (2009), 74–114.

[28] T. Banica, Cyclotomic expansion of exceptional spectral measures, *Internat. J. Math.* **20** (2009), 275–297.

[29] T. Banica and R. Vergnioux, Fusion rules for quantum reflection groups, *J. Noncommut. Geom.* **3** (2009), 327–359.

[30] T. Banica and R. Speicher, Liberation of orthogonal Lie groups, *Adv. Math.* **222** (2009), 1461–1501.

[31] T. Banica, B. Collins and P. Zinn-Justin, Spectral analysis of the free orthogonal matrix, *Int. Math. Res. Not.* **17** (2009), 3286–3309.

[32] T. Banica, J. Bichon and J.-M. Schlenker, Representations of quantum permutation algebras, *J. Funct. Anal.* **257** (2009), 2864–2910.

[33] T. Banica and J. Bichon, Hopf images and inner faithful representations, *Glasg. Math. J.* **52** (2010), 677–703.

[34] T. Banica, B. Collins and J.-M. Schlenker, On orthogonal matrices maximizing the 1-norm, *Indiana Univ. Math. J.* **59** (2010), 839–856.

[35] T. Banica and R. Vergnioux, Invariants of the half-liberated orthogonal group, *Ann. Inst. Fourier* **60** (2010), 2137–2164.

[36] T. Banica and D. Goswami, Quantum isometries and noncommutative spheres, *Comm. Math. Phys.* **298** (2010), 343–356.

[37] T. Banica, S. Curran and R. Speicher, Classification results for easy quantum groups, *Pacific J. Math.* **247** (2010), 1–26.

[38] T. Banica, The orthogonal Weingarten formula in compact form, *Lett. Math. Phys.* **91** (2010), 105–118.

[39] T. Banica and S. Curran, Decomposition results for Gram matrix determinants, *J. Math. Phys.* **51** (2010), 1–14.

[40] T. Banica, S.T. Belinschi, M. Capitaine and B. Collins, Free Bessel laws, *Canad. J. Math.* **63** (2011), 3–37.

[41] T. Banica, S. Curran and R. Speicher, Stochastic aspects of easy quantum groups, *Probab. Theory Related Fields* **149** (2011), 435–462.

[42] T. Banica, B. Collins and J.-M. Schlenker, On polynomial integrals over the orthogonal group, *J. Combin. Theory Ser. A* **118** (2011), 778–795.

[43] T. Banica, J. Bichon and S. Curran, Quantum automorphisms of twisted group algebras and free hypergeometric laws, *Proc. Amer. Math. Soc.* **139** (2011), 3961–3971.

[44] T. Banica and A. Skalski, Two-parameter families of quantum symmetry groups, *J. Funct. Anal.* **260** (2011), 3252–3282.

[45] T. Banica and J.-M. Schlenker, Combinatorial aspects of orthogonal group integrals, *Internat. J. Math.* **22** (2011), 1611–1646.

[46] T. Banica, S. Curran and R. Speicher, De Finetti theorems for easy quantum groups, *Ann. Probab.* **40** (2012), 401–435.

[47] T. Banica and A. Skalski, Quantum isometry groups of duals of free powers of cyclic groups, *Int. Math. Res. Not.* **9** (2012), 2094–2122.

[48] T. Banica, J. Bichon and S. Natale, Finite quantum groups and quantum permutation groups, *Adv. Math.* **229** (2012), 3320–3338.

[49] T. Banica, Quantum permutations, Hadamard matrices, and the search for matrix models, *Banach Center Publ.* **98** (2012), 11–42.

[50] T. Banica, A. Skalski and P.M. Sołtan, Noncommutative homogeneous spaces: the matrix case, *J. Geom. Phys.* **62** (2012), 1451–1466.

[51] T. Banica, U. Franz and A. Skalski, Idempotent states and the inner linearity property, *Bull. Pol. Acad. Sci. Math.* **60** (2012), 123–132.

[52] T. Banica, J. Bhowmick and K. De Commer, Quantum isometries and group dual subgroups, *Ann. Math. Blaise Pascal* **19** (2012), 17–43.

[53] T. Banica, I. Nechita and K. Życzkowski, Almost Hadamard matrices: general theory and examples, *Open Syst. Inf. Dyn.* **19** (2012), 1–26.

[54] T. Banica and I. Nechita, Asymptotic eigenvalue distributions of block-transposed Wishart matrices, *J. Theoret. Probab.* **26** (2013), 855–869.

[55] T. Banica, J. Bichon, B. Collins and S. Curran, A maximality result for orthogonal quantum groups, *Comm. Algebra* **41** (2013), 656–665.

[56] T. Banica and A. Skalski, Quantum symmetry groups of C*-algebras equipped with orthogonal filtrations, *Proc. Lond. Math. Soc.* **106** (2013), 980–1004.

[57] T. Banica, The defect of generalized Fourier matrices, *Linear Algebra Appl.* **438** (2013), 3667–3688.

[58] T. Banica and I. Nechita, Almost Hadamard matrices: the case of arbitrary exponents, *Discrete Appl. Math.* **161** (2013), 2367–2379.

[59] T. Banica, I. Nechita, J.-M. Schlenker, Analytic aspects of the circulant Hadamard conjecture, *Ann. Math. Blaise Pascal* **21** (2014), 25–59.

[60] T. Banica, First order deformations of the Fourier matrix, *J. Math. Phys.* **55** (2014), 1–22.

[61] T. Banica, I. Nechita and J.-M. Schlenker, Submatrices of Hadamard matrices: complementation results, *Electron. J. Linear Algebra* **27** (2014), 197–212.

[62] T. Banica, Counting results for thin Butson matrices, *Electron. J. Combin.* **21** (2014), 1–14.

[63] T. Banica, Truncation and duality results for Hopf image algebras, *Bull. Pol. Acad. Sci. Math.* **62** (2014), 161–179.

[64] T. Banica and I. Nechita, Block-modified Wishart matrices and free Poisson laws, *Houston J. Math.* **41** (2015), 113–134.

[65] T. Banica and A. Skalski, The quantum algebra of partial Hadamard matrices, *Linear Algebra Appl.* **469** (2015), 364–380.

[66] T. Banica and J. Bichon, Random walk questions for linear quantum groups, *Int. Math. Res. Not.* **24** (2015), 13406–13436.

[67] T. Banica, The glow of Fourier matrices: universality and fluctuations, *Oper. Matrices* **9** (2015), 457–474.

[68] T. Banica, Liberations and twists of real and complex spheres, *J. Geom. Phys.* **96** (2015), 1–25.

[69] T. Banica, Quantum isometries of noncommutative polygonal spheres, *Münster J. Math.* **8** (2015), 253–284.

[70] T. Banica and S. Mészáros, Uniqueness results for noncommutative spheres and projective spaces, *Illinois J. Math.* **59** (2015), 219–233.

[71] T. Banica, The algebraic structure of quantum partial isometries, *Infin. Dimens. Anal. Quantum Probab. Relat. Top.* **19** (2016), 1–36.

[72] T. Banica, A duality principle for noncommutative cubes and spheres, *J. Noncommut. Geom.* **10** (2016), 1043–1081.

[73] T. Banica, Half-liberated manifolds, and their quantum isometries, *Glasg. Math. J.* **59** (2017), 463–492.

[74] T. Banica, Liberation theory for noncommutative homogeneous spaces, *Ann. Fac. Sci. Toulouse Math.* **26** (2017), 127–156.

[75] T. Banica, Quantum isometries, noncommutative spheres, and related integrals, *Banach Center Publ.* **111** (2017), 101–144.

[76] T. Banica and I. Nechita, Flat matrix models for quantum permutation groups, *Adv. Appl. Math.* **83** (2017), 24–46.

[77] T. Banica and I. Patri, Maximal torus theory for compact quantum groups, *Illinois J. Math.* **61** (2017), 151–170.

[78] T. Banica, Deformed Fourier models with formal parameters, *Studia Math.* **239** (2017), 201–224.

[79] T. Banica, Quantum groups from stationary matrix models, *Colloq. Math.* **148** (2017), 247–267.

[80] T. Banica, Weingarten integration over noncommutative homogeneous spaces, *Ann. Math. Blaise Pascal* **24** (2017), 195–224.

[81] T. Banica and J. Bichon, Matrix models for noncommutative algebraic manifolds, *J. Lond. Math. Soc.* **95** (2017), 519–540.

[82] T. Banica and J. Bichon, Complex analogues of the half-classical geometry, *Münster J. Math.* **10** (2017), 457–483.

[83] T. Banica and A. Chirvasitu, Thoma type results for discrete quantum groups, *Internat. J. Math.* **28** (2017), 1–23.

[84] T. Banica, The planar algebra of a fixed point subfactor, *Ann. Math. Blaise Pascal* **25** (2018), 247–264.

[85] T. Banica and I. Nechita, Almost Hadamard matrices with complex entries, *Adv. Oper. Theory* **3** (2018), 149–189.

[86] T. Banica and A. Freslon, Modelling questions for quantum permutations, *Infin. Dimens. Anal. Quantum Probab. Relat. Top.* **21** (2018), 1–26.

[87] T. Banica, Complex Hadamard matrices with noncommutative entries, *Ann. Funct. Anal.* **9** (2018), 354–368.

[88] T. Banica, Super-easy quantum groups: definition and examples, *Bull. Pol. Acad. Sci. Math.* **66** (2018), 57–68.

[89] T. Banica, D. Özteke and L. Pittau, Isolated partial Hadamard matrices, and related topics, *Open Syst. Inf. Dyn.* **25** (2018), 1–27.

[90] T. Banica, Tannakian duality for affine homogeneous spaces, *Canad. Math. Bull.* **61** (2018), 483–494.

[91] T. Banica, Unitary easy quantum groups: geometric aspects, *J. Geom. Phys.* **126** (2018), 127–147.

[92] T. Banica and A. Chirvasitu, Quasi-flat representations of uniform groups and quantum groups, *J. Algebra Appl.* **18** (2019), 1–27.

[93] T. Banica, Higher transitive quantum groups: theory and models, *Colloq. Math.* **156** (2019), 1–14.

[94] T. Banica, Quantum groups, from a functional analysis perspective, *Adv. Oper. Theory* **4** (2019), 164–196.

[95] T. Banica, Higher orbitals of quizzy quantum group actions, *Adv. Appl. Math.* **109** (2019), 1–37.

[96] T. Banica, Quantum groups under very strong axioms, *Bull. Pol. Acad. Sci. Math.* **67** (2019), 83–99.

[97] T. Banica, Block-modified Wishart matrices: the easy case, *Indiana Univ. Math. J.* **69** (2020), 1–34.

[98] T. Banica, Homogeneous quantum groups and their easiness level, *Kyoto J. Math.* **61** (2021), 171–205.

[99] T. Banica and J.P. McCarthy, The Frucht property in the quantum group setting, *Glasg. Math. J.* **64** (2022), 603–633.

BOOKS

[1] T. Banica, Calculus and applications (2024), 400 pp.

[2] T. Banica, Linear algebra and group theory (2023), 400 pp.

[3] T. Banica, Invitation to Hadamard matrices (2023), 400 pp.

[4] T. Banica, Introduction to quantum groups, Springer (2023), 435 pp.

[5] T. Banica, Quantum permutation groups (2023), 400 pp.

[6] T. Banica, Easy quantum groups (2023), 400 pp.

[7] T. Banica, Principles of operator algebras (2023), 400 pp.

[8] T. Banica, Affine noncommutative geometry (2023), 400 pp.
[9] T. Banica, Methods of free probability (2023), 400 pp.

DRAFTS

[1] T. Banica, Graphs and their symmetries (2024), 300^+ pp.
[2] T. Banica, Lectures on measure theory (2024), 200^+ pp.
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[20] T. Banica, Planar algebra basics (2024), 100^+ pp.
[21] T. Banica, Quantum graphs illustrated (2024), 50^+ pp.
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[24] T. Banica, Dynamics of magnetic fluids (2024), 50^+ pp.
[25] T. Banica, Exotic matter and neutron stars (2024), 50^+ pp.

.. and there will be 6 more books, for a total of 40. Details at my webpage.