

Sofia TARRICONE

PhD in Mathematics

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Positions

- 1 September 2024 – **Maitresse de Conférences**, IMJ-PRG, Sorbonne Université.
now
- 1 November 2022 – **PostDoc**, Institut de Physique Théorique, CEA, Université Paris-Saclay.
31 August 2024 Mentor : Jérémie BOUTTIER.
- 1 November 2021 – **PostDoc**, Institut de Recherche en Mathématiques et Physique, Université Catholique de
31 October 2022 Louvain-la-Neuve.
Mentor : Tom CLAEYS.

Education

- 2018 – 2021 **PhD in Mathematics**, Cotutelle between LAREMA, Université d'Angers and Department of
Mathematics and Statistics, Concordia University (Montreal).
PhD Thesis "**The Painlevé II hierarchy: geometry and applications**".
Supervisors : Mattia CAFASSO and Marco BERTOLA.
Defense date: 15 October 2021.
- 2016 – 2018 **Master Degree in Mathematics**, Università degli Studi di Trieste.
Master thesis "On the periodic Toda lattice and Theta function integration".
Supervisor : Tamara GRAVA.
Final grade : 110/110 cum laude.
- 2013 – 2016 **Bachelor Degree in Mathematics**, Università degli Studi di Trieste.
Bachelor thesis "On the equilibrium points of the restricted three body problem and possible applica-
tions".
Supervisor : Maura UGHI.
Final grade : 110/110 cum laude.

Teaching experiences

- 2026 **Mathematics for Sciences**, Sorbonne Université.
Lectures for first year students.
- 2025 "**Orientation et Insertion Professionnelle**", Sorbonne Université, Coaching for third year
students.
- 2025 **Combinatorics and Graph Theory**, Sorbonne Université.
Lectures for second year students.
- 2025 **Mathematics for Sciences**, Sorbonne Université.
Lectures for first year students.
- 2024 **Linear and Bilinear Algebra - Combinatorics and Graph Theory**, Sorbonne Université.
Lectures for second year students.
- 2022 **Exercise classes of Complex Analysis**, Université Catholique de Louvain-la-Neuve.
- 2020 – 2021 **Teaching Assistant for Linear Algebra 1 and 2**, Concordia University (online).
- 2020 – 2021 **Math Help Center Tutor**, Concordia University.
- 2019 – 2020 **Mathematics for Biology - Linear Algebra**, Université d'Angers.
Lectures for first and second year students.

- 2018 – 2019 **Analytic Geometry**, *Université d'Angers*.
Lectures for first year students.
- 2017 – 2018 **Tutor for Euclidian Geometry - Linear Algebra**, *Università degli Studi di Trieste*.
Tutor activity for first year students.

Publications and Preprints

- 2025 **"Orthogonal polynomials and discrete Painlevé equations: theory and applications"**,
To appear in *Lecture notes of ASIDE15*, AMS Special Edition.
- 2022 – 2023 **"Jánossy densities and Darboux transformations for the Stark and cylindrical KdV equations"**, with Tom CLAEYS, Gabriel GLESNER, Giulio RUZZA.
Communications in Mathematical Physics, 405 (113), 2024.
- 2022 – 2023 **"On the integrable structure of deformed sine kernel determinants"**, with Tom CLAEYS.
Mathematical Physics, Analysis and Geometry, 27:3, 2024.
- 2021 – 2022 **"Recursion relation for Toeplitz determinants and the discrete Painlevé II hierarchy"**,
with Thomas CHOUTEAU.
SIGMA. 19 (2023) 030. *Special Issue on Evolution Equations, Exactly Solvable Models and Random Matrices in honor of Alexander Its' 70th birthday*.
- 2020 – 2021 **"The Riemann-Hilbert approach to the generating function for the higher order Airy point processes"**, with Mattia CAFASSO.
Recent Trends in Formal and Analytic Solutions of Diff. Equations, Contemporary Mathematics, vol. 782, Amer. Math. Soc., pp. 93-109, 2023.
- 2020 – 2021 **"Stokes manifolds and cluster algebras"**, with Marco BERTOLA.
Communications in Mathematical Physics 390, pp. 1413–1457, 2022.
- 2020 – 2021 **"Momenta spacing distributions in anharmonic oscillators and the higher order finite temperature Airy kernel"**, with Thomas BOTHNER and Mattia CAFASSO.
Annales de l'Institut Henri Poincaré B 58(3), pp. 1505-1546, 2022.
- 2020 – 2021 **"A fully noncommutative Painlevé II hierarchy: Lax pair and solutions related to Fredholm determinants"**.
SIGMA 17 (2021) 002.

Visiting

- 2022 **Bristol University**.
(4-7 May 2022) Visiting Prof. Thomas Bothner.
- 2020 **Study in SISSA program, SISSA, Trieste**.
(April – June) I was supposed to stay at SISSA for the period April – June 2020, but unfortunately due to the pandemic situation the visiting program was suspended. I have participated only to online activities (seminars, lectures).

Research Interest

My research focuses on the interactions between the following areas: **Integrable systems**, Painlevé equations and hierarchies (continuous and discrete), Korteweg-de Vries type equations and hierarchies, lattice equations. **Integrable probability**, random matrix theory and determinantal point processes, orthogonal polynomials, random partitions models, **combinatorics** of maps. **Riemann-Hilbert problems**, isomonodromic deformations, cluster algebras, symplectic geometry and Hamiltonian equations.

Talks given

Introductory talks

- October 2024 **Journée de rentrée IMJ-PRG**, *IMJ-PRG, Sophie Germain, Paris*.
"Systèmes Intégrables dans des problèmes combinatoires".
- March 2024 **Pi-Day**, *CPES, Lycée Louis Le Grand, Paris*.
"Le diamant Aztèque et son cercle artique".

- January 2023 **Quantum working group**, *IPhT, CEA*.
"Introduction to quantum mechanics, summary of Chapter 2 of Nielsen and Chuang's book Quantum Information and Quantum Computation".
- February 2021 **Solitons seminar series**, *SISSA, Trieste (online)*.
"An introduction to the KdV hierarchy".
- 2018 – 2020 **General seminars**, *LAREMA, Université d'Angers*.
 - "An Introduction to isomonodromy deformations of linear ODEs: the Fuchsian case",
 - "Airy solutions of the Painlevé II equation and orthogonal polynomials".
- Research talks**
- January 2026 **Web-seminar on Painlevé equations and related topics**, (*Zoom*).
"Discrete Painlevé equations for maps and partitions".
- September 2025 **ÖMG-DMV 2025 Meeting**, *Johannes Kepler University, Linz*.
"Integrability of finite temperature sine and Airy kernels and beyond".
- June 2025 **Summer School ASIDE15 (Mini-course)**, *Università degli Studi di Milano*.
"Orthogonal polynomials and discrete Painlevé equations: theory and applications".
- June 2025 **V PIICQ meeting "Random matrices, Integrability and All That"**, *ENS Lyon*.
"Distance in planar maps and orthogonal polynomials".
- June 2025 **IV Congrès de la SMF**, *Université Bourgogne-Europe, Dijon*.
"Integrability of finite temperature Airy and sine kernels".
- May 2025 **Conference "L'esprit des cartes - en l'honneur d'Emmanuel Guitter"**, *IPhT, CEA Saclay*.
"Distance in planar maps via orthogonal polynomials".
- April 2025 **Séminaire Flajolet**, *IHP, Paris*.
"Discrete Painlevé equations for maps and partitions".
- March 2025 **Séminaire Darboux**, *LPTHE, Sorbonne Université*.
"Integrability of the finite temperature Airy and sine kernels (and beyond)".
- February 2025 **Workshop "Enumerative combinatorics and effective aspects of differential equations" (Mini-course)**, *CIRM, Marseille*.
"Random permutations and partitions and Painlevé equations".
- December 2024 **Masterclass Centre Henri Lebesgue (Mini-course)**, *LAREMA, Université d'Angers*.
"Introduction to random permutations" (with Mattia Cafasso).
- November 2024 **Journée Cartes**, *ENS Lyon*.
"Distance in planar maps via orthogonal polynomials".
- November 2024 **Séminaire MEGA**, *IHP, Paris*.
"Integrability of finite temperature Airy and sine kernels".
- October 2024 **Rencontres de Probabilités Intégrables**, *IHP, Paris*.
"Integrability in random partitions models".
- August 2024 **Workshop "Topologically Recursive behaviours"**, *Les Diablerets*.
"Recursion for Toeplitz determinants in random partitions".
- July 2024 **Séminaire 2PMA**, *LAREMA, Université d'Angers*.
"Counting planar maps via orthogonal polynomials".
- June 2024 **Conference "4th Italian Meeting on Probability and Mathematical Statistics"**, *Sapienza, Università di Roma*.
"The finite temperature Airy and sine determinantal point processes".
- June 2024 **Conference "Integrable systems: geometrical and analytical approaches"**, *SISSA, Trieste*.
"Discrete Painlevé equations in random partitions and planar maps".
- April 2024 **Les probas du vendredi**, *LPSM, Jussieu - Sorbonne Université*.
"Integrability of the finite temperature sine and Airy kernels".

- March 2024 **Séminaire de Probabilités**, *IRMAR, Université de Rennes*.
"The sine and Airy determinantal point processes".
- March 2024 **Séminaire de Physique Mathématique**, *Université de Lyon 1*.
"The finite temperature sine and Airy kernels".
- February 2024 **Séminaire de Combinatoire**, *Université de Lyon 1*.
"Équations discrètes de Painlevé dans des problèmes de partitions aléatoires et cartes planaires".
- February 2024 **Séminaire de Probabilités**, *Université de Poitiers*.
"The finite temperature Airy vs sine determinantal point processes".
- February 2024 **Séminaire de Probabilités**, *Université de Toulouse 3*.
"The finite temperature Airy vs sine determinantal point processes".
- November 2023 **Rencontre Combinatoire Elliptique**, *Institut d'études Scientifiques de Cargèse*.
"Distance in planar maps via orthogonal polynomials".
- September 2023 **Summer School in Topological Recursion and Integrability**, *Università degli Studi di Trieste*.
"Integrable features of sine and Airy kernels at finite temperature".
- September 2023 **Congresso Unione Matematica Italiana 2023**, *Università e SNS di Pisa*.
"Integrabilità delle densità di Janossy del processo puntuale di Airy thinned".
- July 2023 **Conference Stochastic Processes and Applications 2023**, *University of Lisbon*.
"Determinantal point processes via Riemann–Hilbert problems".
- July 2023 **Workshop CORTIPOM**, *CIRM, Marseille*.
"Toeplitz determinants related to the discrete Painlevé II hierarchy".
- July 2023 **Séminaire de Physique Théorique**, *ENS de Lyon*.
"Solutions of the cylindrical Korteg-de-Vries equation related to the Airy determinantal point process".
- June 2023 **Journée Combinatoire et Proba**, *Université de Paris Nord*.
"La distribution de Tracy-Widom pour GUE et ses généralisations".
- May 2023 **PIICQ Third Workshop**, *Université d'Angers*.
"Integrability of deformed sine kernel determinants".
- May 2023 **Edinburgh Mathematical Physics Group Seminar**, *University of Edinburgh*.
"Solutions of the cylindrical Korteg-de-Vries equation related to the Airy determinantal point process".
- March 2023 **Journées ALEA**, *CIRM, Marseille*.
"Toeplitz determinants in random partitions and the discrete Painlevé II hierarchy".
- March 2023 **Séminaire de Physique-Mathématique**, *Institut de Mathématiques de Bourgogne*.
"Solutions and applications of two analogues of the Painlevé II hierarchy".
- February 2023 **Séminaire d'Images, Optimisation et Probabilités**, *Institut de Mathématiques de Bordeaux*.
"Sur les densités de Janossy du processus ponctuel déterminantal d'Airy aminci".
- November 2022 **Mathematical Physics Seminar**, *IPhT, CEA*.
"On the integrability of the Airy kernel and beyond".
- November 2022 **Non-Hermitian Random Matrices Workshop**, *University of Bristol*.
"From the Fredholm determinant of the finite temperature Airy kernel to the Janossy densities of the thinned Airy dpp".
- October 2022 **UCL-KUL Classical Analysis Seminar**, *UCLouvain*.
"Toeplitz determinants related to a discrete Painlevé II hierarchy".
- May 2022 **Excursion in Integrability**, *SISSA, Trieste*.
"Janossy densities of the thinned Airy pp: the Schrödinger and KdV equations".
- May 2022 **Mathematical Physics Seminar**, *Bristol University*.
"Janossy densities of the thinned Airy pp: the Schrödinger and KdV equations".
- April 2022 **Classical Analysis Seminars**, *KU Leuven*.
"On the relation between Janossy densities of the thinned shifted Airy pp and the Schrödinger and KdV equations"

- March 2022 **Integrable Systems and Random Matrix Theory Seminars**, *Michigan University (online)*.
"Finite-temperature higher order Airy kernels and an integro-differential Painlevé II hierarchy".
- December 2021 **Algebraic Geometry seminars**, *LAREMA, Angers*.
"The cluster algebras structures in the monodromy manifolds with an irregular singular point".
- November 2021 **Virtual Integrable Systems Seminars**, *ICMS, Edinburgh (online)*.
"Hastings-McLeod type solutions of an integro-differential Painlevé II hierarchy and their Tracy-Widom formula".
- June 2021 **Random Matrices and Integrable Systems**, *University of Bristol (online)*.
"Finite-temperature higher order Airy kernels and an integro-differential Painlevé II hierarchy".
- June 2021 **FASnet21**, *University of Alcalá (online)*.
"The generating function for the higher order Airy point processes and a vector-valued Painlevé II hierarchy".
- June 2021 **Integrability and Combinatorics at Finite Temperature 2021**, *Matrix Institute, Melbourne (online)*.
"Finite-temperature higher order Airy kernels and an integro-differential Painlevé II hierarchy: a Riemann-Hilbert approach".
- March 2021 **Classical analysis and Integrable systems seminars**, *KU Leuven and UC Louvain-la-Neuve (online)*.
"Finite-temperature higher order Airy kernels and an integro-differential Painlevé II hierarchy".
- September 2020 **Integrable Systems around the world**, *SISSA, Trieste (online)*.
"A fully noncommutative Painlevé II hierarchy: Lax pair and solutions related to Fredholm determinants".

Poster Sessions

- May 2024 **IV PIICQ meeting "ARNO - celebration of Arno Kuijlaars"**, *KU Leuven*.
"Distance in planar maps via orthogonal polynomials".
- December 2022 **XVIII Brunel-Bielefeld Workshop on Random Matrix Theory**, *Brunel University*.
"Toeplitz determinants, multicritical random partitions and a discrete Painlevé II hierarchy".
- September 2022 **The charm of Integrability**, *University of Bristol*.
"Janossy densities of the thinned Airy pp: the Schrödinger and KdV equations".
- June 2022 **DPP and Fermions 22**, *ENS de Lyon*.
"Janossy densities of the thinned Airy pp: the Schrödinger and KdV equations".
- July 2021 **Integrable Systems in Geometry and Mathematical Physics**, *SISSA, Trieste (online)*.
"Stokes manifolds and cluster algebras".

Conferences and Research Schools

Future events

- April 2026 **Workshop "Women in Mathematical Physics 3"**, *University of Edinburgh*.
- June 2026 **Summer School IMJ-PRG "Integrable Combinatorics"**, *Sorbonne Université, Paris*.

Past events

- September 2025 **Conference "Annual meeting of ÖMG-DMV"**, *University Johannes Kepler, Linz*.
- June 2025 **Summer School ASIDE15 (Mini-course)**, *Università degli Studi di Milano*.
- June 2025 **V PIICQ meeting "Random matrices, Integrability and All That"**, *ENS Lyon*.
- June 2025 **IV Congrès de la SMF**, *Université Bourgogne-Europe, Dijon*.
- May 2025 **Conference "L'esprit des cartes - en l'honneur d'Emmanuel Guitter"**, *IPhT, CEA Saclay*.
- February 2025 **Workshop "Enumerative combinatorics and effective aspects of differential equations" (Mini-course)**, *CIRM, Marseille*.
- December 2024 **Masterclass Centre Henri Lebesgue (Mini-course)**, *LAREMA, Université d'Angers*.
- October 2024 **Rencontres de Probabilités Integrables**, *IHP, Paris*.

- August 2024 **Workshop "Topologically Recursive behaviours"**, *Les Diablerets*.
"Recursion for Toeplitz determinants in random partitions".
- June 2024 **Conference "4th Italian Meeting on Probability and Mathematical Statistics"**, *Sapienza, Università di Roma*.
- June 2024 **Conference "Integrable systems: geometrical and analytical approaches"**, *SISSA, Trieste*.
- May 2024 **IV PIICQ meeting "ARNO - celebration of Arno Kuijlaars"**, *KULeuven*.
- November 2023 **Rencontre "Combinatoire Elliptique"**, *Institut d'études scientifiques de Cargèse*.
- September 2023 **Summer School "Topological Recursion and Integrability"**, *Università degli Studi di Trieste*.
- September 2023 **Congresso dell'Unione Matematica Italiana 2023**, *Università e SNS di Pisa*.
- July 2023 **Conference "Stochastic Processes and Applications 2023"**, *University of Lisbon*.
- July 2023 **"CORTIPOM Workshop"**, *CIRM, Marseille*.
- May 2023 **"PIICQ Third Workshop"**, *Université d'Angers*.
- March 2023 **"Journées ALEA"**, *CIRM, Marseille*.
- December 2022 **"XVIII Brunel–Bielefeld Workshop on Random Matrix Theory"**, *Brunel University*.
- November 2022 **Workshop "Non-Hermitian Random Matrices"**, *Bristol University*.
- September 2022 **Conference "The charm of Integrability"**, *Bristol University*.
- June 2022 **Atelier "DPP and Fermions 22"**, *ENS de Lyon*.
- May 2022 **Conference "Excursion in Integrability"**, *SISSA, Trieste*.
- July 2021 **Conference "Integrable Systems in Geometry and Mathematical Physics"**, *SISSA, Trieste (online)*.
- June 2021 **Workshop "Random Matrices and Integrable Systems"**, *University of Bristol (online)*.
- June 2021 **Workshop "FASnet21"**, *University of Alcalá (online)*.
- June 2021 **Conference "Integrability and Combinatorics at Finite Temperature 2021"**, *Matrix Institute, Melbourne (online)*.
- January 2021 **Conference "Challenges and Recent Advances in Mathematical Physics"**, *University of Bristol (online)*.
- September 2020 **Conference "Integrable systems around the world"**, *SISSA, Trieste (online)*.
- September 2019 **Conference "Quantum and Classical Integrability"**, *IMB, Dijon*.
- June 2019 **Summer School "Foliations and Algebraic Geometry"**, *Institut Fourier, Grenoble*.
- April 2019 **Conference "Integrability and Randomness in Mathematical Physics and Geometry"**, *CIRM, Marseille*.
- March 2019 **Research School "Coulomb gas, Integrability and Painlevé equations"**, *CIRM, Marseille*.

Scientific Projects

- From 2025 **WoMap3 Research Group "Integrable Randomness"** **WoMap3**, leader together with *Manuela Girotti (Emory University)*.
- From 2023 **ANR JCJC RESYST**, member of the scientific team.
- From 2021 **INSMI International Research Project PIICQ**, member.

Scientific Divulgateion

- March 2024 **π -Day**, *CPES, Lycée Louis Le Grand, Paris*.
- January 2021 **Orientation meeting for Bachelor students**, *Université d'Angers*.
- 2019 **Mathematics' Day**, *Lycée Joachim du Bellay, Angers*.
- 16 December Presentation of what is a PhD in mathematics to high school students and introduction to complex numbers.

December 2019 **Orientation meeting for Bachelor students**, *Université d'Angers*.

Awards

January 2022 **"Best Student" prize**, CRM PhysMath Lab, *Montréal*.

January 2014 **"Best freshmen" prize**, Università degli Studi di Trieste, *Dipartimento di Matematica e Geoscienze*.

Service

Referee **FPSAC 2026**.

Organizer **Journée Cartes à Jussieu**, (17 Novembre 2025).

Co-supervisor **PhD candidate Maena Quemener**, IMJ-PRG, Sorbonne Université, from September 2025.

Supervisor **Stage d'initiation à la recherche en mathématiques (L2) Daryna SAVONIK**, IMJ-PRG, Sorbonne Université, June 2025.

Organizer **École d'été IMJ-PRG "Integrable Combinatorics"**, IMJ-PRG, Sorbonne Université, To happen in June 2026.

Referee **"Mathematical Physics, Analysis and Geometry"**, from 2025.

Organizer **"Combinatorics, Optimization and Interactions" Seminar**, IMJ-PRG, Sorbonne Université, from 2025.

CSI member **PhD candidate Juan Esaul GONZÁLEZ RANGEL**, Université d'Angers, (supervisors : Killian Raschel, Pierre Tarrago), from 2024.

Organizer **PIICQ online seminar**, from 2024.

PostDoc's **Conseil du Laboratoire**, IPhT, CEA Saclay, 2024.

Representative

Referee **"Mathematical Reviews"**, "Journal of the Physical Society of Japan", from 2023.

Referee **"Nonlinearity"**, "Journal of Physics A: Mathematical and Theoretical", from 2022.

Referee **"Physica D: Nonlinear Phenomena"**, from 2021.

Organizer **Rencontres Doctorales**, Centre Henri Lebesgue, Nantes, November 2019.

Other information

From 2022 **Qualification Section 25 CNU**, (French requirement for Associate Professorship in Mathematics).

From 2022 **Qualification Section 26 CNU**, (French requirement for Associate Professorship in Applied Mathematics).

Languages

Italian Native

French Fluent

English TOEFL iBT (2019) 103/120