

Sofia TARRICONE

PhD in Mathematics

3 rue du Temple
75004, Paris
France

✉ sofia.tarricone@ipt.fr
<https://starricone.netlify.app>



Positions

- 1 November 2022 – **PostDoc**, *Institut de Physique Théorique, CEA, Université Paris-Saclay*.
Mentor : Jérémie BOUTTIER.
- 1 November 2021 – **PostDoc**, *Institut de Recherche en Mathématiques et Physique, Université Catholique de Louvain-la-Neuve*.
31 October 2022
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 applications".
Supervisor : Maura UGHI.
Final grade : 110/110 cum laude.

Teaching experiences

- 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 and 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 and Linear Algebra**, *Università degli Studi di Trieste*.
Tutor activity for first year students.

Publications and Preprints

- 2022 – 2023 **"On the integrable structure of deformed sine kernel determinants"**, with Tom CLAEYS.
Mathematical Physics, Analysis and Geometry, 27:3, 2024.
- 2022 – 2023 **"Jánossy densities and Darboux transformations for the Stark and cylindrical KdV equations"**, with Tom CLAEYS, Gabriel GLESNER, Giulio RUZZA.
Preprint. Submitted.

- 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

- 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

- Février 2024 **Séminaire de Combinatoire, Université de Lyon 1**.
 "Équations discrètes de Painlevé dans des problèmes de partitions aléatoires et cartes planaires".
- Février 2024 **Séminaire de Probabilités, Université de Poitiers**.
 "The finite temperature Airy vs sine determinantal point processes".
- Février 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

- 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

- June 2023 **4th Italian Meeting on Probability and Mathematical Statistics**, *Sapienza Università di Roma*.

Past events

- 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 2023 **ANR JCJC RESYST**, *member of the scientific team.*
- From 2021 **INSMI International Research Project PIICQ**, *member.*

Scientific Divulagation

- 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.*
- November 2019 **Rencontres Doctorales**, *Centre Henri Lebesgue, Nantes, (Organizer).*
- November 2018 **Rencontres Doctorales**, *Centre Henri Lebesgue, Brest.*

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 for **Mathematical Reviews, Journal of the Physical Society of Japan**, *from 2023.*
- Referee for **Nonlinearity, Journal of Physics A: Mathematical and Theoretical**, *from 2022.*
- Referee for **Physica D: Nonlinear Phenomena**, *from 2021.*

Other information

- Session MCF 2023 **Shortlisted for Maitre de Conférences position at IMB Dijon**, *(classified 2nd).*
- Session MCF 2023 **Shortlisted for Maitre de Conférences position at CEREMADE, Paris Dauphine**, *(classified 5th).*
- 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