Paul Melotti

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29 y.o.

Career

Jan. 2021 – **Maître de conférence**, *Laboratoire de Mathématiques d'Orsay*, Université Paris-Saclay.

2019 – Dec. 2020 **Postdoc SNF**, *Université de Fribourg*, under the supervision of Ioan Manolescu.

2016 – 2019 **PhD**, *LPSM - Sorbonne Université*, under the supervision of Cédric Boutillier and Béatrice de Tilière.
Title: Integrable spin, vertex and loop models.

2016 **Agrégation de mathématiques**.

2015 – 2016 **Master in mathematics teaching**, *Université Pierre et Marie Curie*, Paris.

2013 – 2015 **Master in probability and random models**, *Université Pierre et Marie Curie*, Paris.

2012 – 2013 **Bachelor in pure mathematics**, *Université Paris Sud*.

2012 – 2016 **Student at the École Normale Supérieure**, *Paris*.

Publications

- P. Melotti, S. Ramassamy and P. Thévenin. "Points and lines configurations of perpendicular bisectors of convex cyclic polygons" 2022, to appear in the Electronic Journal of Combinatorics
- P. Melotti, S. Ramassamy and P. Thévenin. "Cube moves for s-embeddings and α-realizations" 2021, to appear in Annales de l'IHP D
- P. Melotti. "The free-fermion eight-vertex model: couplings, bipartite dimers and Z-invariance". Communications in Mathematical Physics (2020).
- P. Melotti and E. Saias. "On path partitions of the divisor graph". Acta Arithmetica 192 (2020), 329-339.
- P. Melotti. "The free-fermionic $C_2^{(1)}$ loop model, double dimers and Kashaev's recurrence." Journal of Combinatorial Theory, Series A. August 2018.

- T. Bourgeat et al. “New Algorithmic Approaches to Point Constellation Recognition.” In *ICT Systems Security and Privacy Protection*. Springer Berlin Heidelberg, 2014 (pp. 80-90).

Preprints

- N. Affolter, B. de Tilière, P. Melotti. “The Schwarzian octahedron recurrence (dSKP equation) I: explicit solutions”. 2022, preprint. arXiv:2208.00239
- N. Affolter, B. de Tilière, P. Melotti. “The Schwarzian octahedron recurrence (dSKP equation) II: geometric systems”. 2022, preprint. arXiv:2208.00244
- T. Bourgeat, M. Heinrich, P. Melotti, J.-M. Robert. “A probabilistic Hadwiger-Nelson problem.” 2015, preprint. arXiv:1501.02441

Thesis and essays

- P. Melotti, “Integrable spin, vertex and loop models” (*“Modèles intégrables de spins, vertex et boucles”*). June 2019. *PhD thesis*, under the supervision of C. Boutillier and B. de Tilière. Referees: Vincent Beffara, Julien Dubédat.
- P. Melotti, “Combinatorial links between planar Ising models and dimer models” (*“Liens combinatoires entre le modèle d’Ising planaire et un modèle de dimères”*). 2015. *Master’s thesis (in French)*, under the supervision of B. de Tilière.
- P. Melotti and A. Prevost, “A random growth model: the world discoverd by N explorers” (*“Un modèle de croissance aléatoire : le monde découvert par N explorateurs”*). 2013. *Essay for the ENS bachelor (in French)*, under the supervision of P. Bertin.

Supervision

2022 **Jean-Bapiste Stiegler**, *“Discrete holomorphic dynamics”*, M1 internship.

2022 **Yuan Tian**, *“Aspects of the dimer model”*, M1 thesis.

2021 **Alexis Geroux, Nicolas Gressier, Peiheng Tan**, *“Zéros de polynômes aléatoires”*, M1 thesis.

Talks and seminars

September 2022 **TU Wien**, *Discrete geometric structures 2022*, Combinatorics of dSKP and geometric systems.

March 2022 **Orsay**, *Séminaire "Explique-moi"*, Comment dessiner joliment un graphe.

February 2022 **IHP**, *Séminaire MEGA*, The eight-vertex model via dimers.

October 2021 **Université Paris Dauphine**, *Séminaire d'Analyse et Probabilités*, The dSKP equation in statistical mechanics and geometry.

May 2021 **Geneva (remote)**, *Mathematical Physics seminar*, Cube flips in s-embeddings and α-realizations.

May 2021 **Lisbon (remote)**, *IST QM3*, The free-fermion eight-vertex model via dimers.

March 2021 **remote**, *journées ALÉA*, Configurations of points and bisectors.

March 2021 **Orsay**, *Probability seminar*, Combinatorics of discrete integrable systems: the dSKP case.

November 2020 **Fribourg**, *Probability seminar*, Introduction to Markov Chain Monte Carlo methods.

November 2020 **Oberwolfach (remote)**, *Mini-Workshop: Dimers, Ising and Spanning Trees beyond the Critical Isoradial Case*, Cube flips of s-embeddings and alpha-immersions.

September 2020 **Fribourg**, *Oberseminar Geometrie*, Cube moves from statistical mechanics to discrete geometry.

August 2020 **MIT (remote)**, *Seminar from a Safe Distance*, The eight-vertex model via dimers.

May 2020 **Geneva (remote)**, *Mathematical Physics seminar*, The eight-vertex model via dimers.

May 2020 **DIMERS ANR**, *Virtual meeting*, Combinatorics of spatial recurrences: several species of dimers.

March 2020 **Orsay - LMO**, *Probability and Statistics seminar*, Modèle d'Ising et boucles bicolores – Ising model and bicolor loops.

February 2020 **Les Diablerets**, *Workshop on Mathematical Physics*, From the Ising model star-triangle move to a bicolor loop model.

January 2020 **TU Berlin**, *Discretization in Geometry and Dynamics seminar*, Cube flips in statistical mechanics and in planar geometry.

November 2019 **BIRS, Banff**, *Workshop Dimers, Ising Model, and their Interactions*, The eight-vertex model via dimers.

September 2019 **ENS Lyon**, *LIP, MC2 team seminar*, Introduction aux transformations triangle-étoile – Introduction to star-triangle relations.

June 2019 **Dourdan**, *Journées de probabilités*, Modèles vertex via les dimères – Vertex models via dimers.

May 2019 **Institut Mathématique de Bordeaux**, *Journées Inter'Actions*, Le modèle à huit sommets en mécanique statistique – The eight-vertex model in statistical mechanics.

April 2019 **Université Paris Diderot**, *Rencontres master doctorants – Master - PhD meeting*, Mineurs principaux et modèles de boucles – Principal minors and loop models.

March 2019 **ENS Lyon**, *Meeting of the ANR DIMERS*, Autour des transformations triangle-étoile – Around star-triangle transformations.

November 2018 **IHES**, *Séminaire de probabilités et physique statistique*, Kashaev's relation for the Ising model, and a loop model.

October 2018 **Université Paris Est Créteil**, *Sémnaire des thésards*, From spatial recurrences to limit shapes.

June 2018 **Université Paris Diderot**, *Groupe de travail des thésards*, Triangle, étoile, intégrabilité – Star, triangle, integrability.

May 2018 **Institut Mathématique de Bordeaux**, *Séminaire des thésards*, Relations de Plücker et cercle arctique – Plücker relation and arctic circle.

November 2017 **IHP**, *J-PSI (Working group of young researchers in statistical mechanics and interactions)*, Variational principle of the dimer model.

October 2017 **Isfahan University of Technology**, The dimers' urban renewal and applications.

June 2017 **Saint-Flour**, *Probability summer school*, Limit shapes of Kashev's recurrence.

May 2017 **IHES**, *Les probabilités de demain*, Spatial recurrences, associated models, limit shapes.

January 2017 **CIRM**, *Winter school: Combinatorics and interactions*, Poster: combinatorial interpretation of spatial recurrences.

October 2016 **Sorbonne Université**, *Groupe de travail des thésards*, Récurrences spatiales et formes limites.

Research stays

January 2020 **TU Berlin**, *Discretization in Geometry and Dynamics group*, Invited by Niklas Affolter, Alexander Bobenko, Boris Springborn, one week.
On interpretations in discrete geometry of star-triangle transformations, cluster algebras and combinatorics.

September 2019 **ENS Lyon**, *LIP, MC2 group*, Invited by Silvère Gangloff, one week.
On the Bethe Ansatz for the eight-vertex model and computational aspects of physical integrability.

October 2017 **Isfahan Institute of Technology**, Invited by Amir Hashemi, two weeks.
On algebraic aspects of tiling problems.

Financial support

2019 – 2023 **Member of the ANR DIMERS**, *Project led by Cédric Boutillier and Jérémie Bouttier*, ANR-18-CE40-0033.

Conference organization

July 2023 **DIMERS Closing conference**, co-organized with Cédric Boutillier, Béatrice de Tilière, Thierry Lévy.

Responsibilities

2022- **Orsay**, Member of the CCUPS commission.

2021- **Orsay**, Co-organizer of the "Pizzamath" seminar.

2019 – 2020 **Unifr**, Organizer of the probability seminar.

2019 – 2020 **Fribourg**, Math teacher for refugees in the association La Red, various levels.

2017-2018 **LPSM**, Co-organizer of the PhD's seminar (weekly).

Teaching

2022 – 2023 **Cours accéléré Probabilités**, *Master 2nd year*, M2MDA00a, Orsay.
courses. 30h

Projet, *Bachelor 3rd year*, MEU359, Orsay.
projects supervision. 23h

MAO Probabilités-Statistiques, *Master 1st year*, M1MF18, Orsay.
courses, exercises, exams. 62.5h

Martingales, *Master 1st year*, M1MA11, ENSTA.
exercises. 15h

Probabilités 1, *Bachelor 2nd year*, MEU254, Orsay.
exercises. 24h

Algèbre et Géométrie, *Bachelor 1st year*, MEU102, Orsay.
exercises. 24h

Projet TER, *Master 1st year*, Orsay.
1st year master thesis direction.

2021 – 2022 **Cours accéléré Probabilités**.
MAO Probabilités-Statistiques.
Martingales.
Probabilités 1.

2020 – 2021 **MAO Probabilités-Statistiques**.
Probabilités 1.
Projet TER.

2019 – 2020 **Analysis I and II**, *Bachelor 1st year*, Université de Fribourg.
exercises.

2017 – 2019 **Elementary probabilities; Intensive probabilities**, *Bachelor 2nd year*, Sorbonne Université.
exercices. 64h/year

2016 – 2017 **Series, integrals and linear algebra**, *Bachelor 1st year*, Sorbonne Université.
exercices. 64h/year

2013 – 2014 **Tutor in computer science**, *Preparatory classes*, Caml and general computer science, Lycée Condorcet, Paris.

Skills

Computer	Python, Ruby, C++, OCaml; Sage, Scilab, Matlab; LaTeX, Linux.
French	mother tongue
English	fluent
Spanish	good
Italian, Japanese	notions