

Curriculum Vitae

Valentin Féray

CNRS Junior researcher (Chargé de recherches)

PERSONAL INFORMATION

ID: Valentin Féray, French, born 1984, married, 3 children.

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• EDUCATION

2006 – 2009 PhD at Université Paris-Est Marne-La-Vallée:

Advisor Philippe Biane, senior CNRS researcher;

Title Functions on the set of Young diagrams: characters of symmetric groups and Kerov polynomials.

2003 – 2007 Student at *École Normale Supérieure de la rue d'Ulm* (ranked 2nd at the entrance national competition).

2001 – 2003 Undergraduate studies in *Classes Préparatoires* at *Lycée Louis-Le-Grand (Paris)*.

• EMPLOYMENT HISTORY

2020 – ... CNRS junior researcher at IECL, Nancy, Université de Lorraine (France).

2013 – 2020 Assistant professor for pure Mathematics at the University of Zurich (Switzerland).

2009 – 2013 CNRS junior researcher at LaBRI, Université de Bordeaux (France). On leave from August 2013.

2007 – 2009 PhD fellow and teaching assistant at University Paris-Est Marne-La-Vallée.

• PRIZES AND AWARDS

- 2013: I was invited to give a series of lectures in *Collège de France* by the "Peccot Foundation": this prestigious opportunity is given to one or two French mathematician(s) (or mathematician(s) working in France) under 30 each year.
- 2010-2013: *Prime d'Excellence Scientifique* awarded by Computer Science Institute (INS2I) of CNRS.
- 2008: Best student paper award at FPSAC international conference.

• GRANTS

2020 – 2022 Grant "Future Leader" from the LUE program (Lorraine Université d'Excellence), 80 k€.

2017 – 2019 Principal investigator of the SNSF (Swiss National Science Foundation) grant "Shifted symmetric functions". Approved amount: 309 kCHF (290 k€). Grant nb: 200020_172515.

2017 I was one of the four main organizers of a thematic trimester at *Institut Henri Poincaré*, Paris. Total budget: >250 k€.

2014 – 2017 Principal investigator of the SNSF (Swiss National Science Foundation) grant "Dual combinatorics of Jack polynomials". Approved amount: 242 kCHF (232 k€). Grant nb: SNF-149461.

- SUPERVISION OF GRADUATE STUDENTS AND POSTDOCTORAL STUDENTS

- 2017 – ... Cosupervision with Mathilde Bouvel of a PhD student, Jacopo Borga.
- 2016 – 2020 Supervision of a PhD student, Raúl Penaguião.
- 2014 – 2017 Supervision of a PhD student, Dario De Stavola.
- 2013 – 2017 Cosupervision with Paul-Olivier Dehaye of a PhD student, Helen Riedtmann.
- 2011 – 2014 Cosupervision with Jean Christophe Aval of a PhD student, Omar Tout.
- 2014 – ... Supervision of four postdoctoral students, Per Alexandersson (1 year, 2014), Jehanne Dousse (3 years, 2015-2018), Marko Thiel (3 years, 2015-2018) and Benedikt Stufler (2 years, 2017-2019).

- TEACHING ACTIVITIES

- 2013 – ... Teaching as professor at University in Zurich (courses: representation theory, enumerative combinatorics, random combinatorial structures, complex analysis, analytic combinatorics, introduction to Ising model, martingales and Markov chains; student seminars: combinatorics of permutations, automatic proofs of binomial identities).
- 2007 – 2009 Teaching assistant during my PhD (courses: Analysis I, Algebra I, Programming in C I and II).

- OUTREACH ACTIVITIES

- 2019 Supervising a "Maturaarbeit" on the Probabilistic Method of a high school student from the Junior Euler Society.
- Aug. 2012, Participation to "Mat'les Vacances", a math "summer camp" to convince under-privileged high school students that they can also do long studies in mathematics or other scientific areas.
- 2014, 2016 Participation to the associated book *Maths la Terminale, Ed. Ellipse., 2016*
- Nov. 2013 Talk for first year university students at « Mathematical Park » in Institut Henri Poincaré, Paris.
- May 2009 & I organized and animated a stand for CNRS at "salon de la culture et des jeux mathématiques" (mathematical culture and games show).
- May 2010

- SCIENTIFIC COMMUNITY WORK

- 2020 Program committee member for FPSAC conference.
- 2017 – ... Reviewer for UK, German, Polish and Islandic grant agencies (EPSRC, DFG, NCN, IRF).
- 2008 – ... Referees of more than 50 papers for various journals (Ann. Math., JEMS, J. Alg., Asterisque, JCTA, J. Alg. Comb., J. Comb. Alg., IMRN, Pacific J. Math., J. Math. Soc. Japan, Math. Zeitschrift, SIAM J. Disc. Math., Ann. IHP (B), Ann. Comb., SLC, Method. Comp. Appl. Prob., Adv. Appl. Math., MPRF, PTRF, RSA, Stat. Prob. Letters, Elec. J. Comb., CPC, ALEA, Ann. Appl. Prob., SIGMA) and for FPSAC and AofA conferences.
- 2010 – 2013 I have been a member of four hiring committees for permanent junior teacher-researcher positions (Marne-La-Vallée 2010-2012-2013, Caen 2012).
- 2011 – 2013 Deputy head of the *Combinatorics and Algorithms* research team in LaBRI.

- ORGANIZATION OF SCIENTIFIC MEETINGS

- June 2019 Co-organizer of the International Conference on "Permutation Patterns" at the University of Zurich (~ 70 participants).
- Jan–Mar 2017 Co-organizer of the thematic quarter "Combinatorics and Interactions" at Institut Henri Poincaré, Paris (~ 200 participants).
- 2014 – 2018 Organizer of a Discrete Math Seminar every second week at the University of Zurich.
- Mar. 2013 Co-organizer of the annual week-long meeting of the ALÉA French research group in CIRM, Marseille (~ 100 participants).

- SELECTED WORKSHOP/CONFERENCE/MINI-COURSES INVITATIONS

- Lecturer of minicourses in international summer schools or workshop:
 - *Summer School in Algebraic Combinatorics*, Kraków (Poland), July 2020 (postponed to July 2021);
 - *Séminaire Lotharingien de Combinatoire*, Bertinoro (Italy), September 2017;
 - *Summer School on probability and mathematical physics*, Lago Maggiore (Italy), September 2017;
 - Workshop on "*Cumulants, concentration and superconcentration*", Osnabrück (Germany), December 2016;
 - Workshop *Probability and representation theory in Edinburgh*, February 2014;
 - *Cours Peccot* in Collège de France, Paris, January/February 2013.
- Invited speaker at major international conferences:
 - AofA (*Analysis of Algorithms*) Conference, Marseille (France), June 2019;
 - FPSAC (*Formal Power Series and Algebraic Combinatorics*), South Korea, July 2015;
 - SPA (*Stochastic Processes and Application*), Invited Session Speaker, 2010 and 2017.
- Participation to invitation-only workshops in prestigious conference centers:
 - Dagstuhl seminar on "Logic and Random Discrete Structures", November 2020 (cancelled);
 - Banff workshops on "Permutations and probability", September, 2020 (cancelled) and on "Asymptotic algebraic combinatorics", March 2019.
 - Oberwolfach workshops on "Enumerative Combinatorics", May 2018 and March 2014;
 - Erwin Schrödinger Institute (Vienna) workshop on "Bialgebras in free probability", 2011.
- Colloquium, University of Fribourg (Switzerland), December 2017.

- MAJOR RESEARCH ACHIEVEMENTS

- A combinatorial framework for the dual approach to symmetric group representations developed in the '90s by the Russian school (Vershik, Kerov, Olshanski, Okounkov, ...). This includes in particular the proofs of two positivity conjectures, due respectively to Kerov and Stanley, and an application to asymptotics of characters.

*This work led to the best student paper award at FPSAC 2008, and to publications, among others, in *Advances in Mathematics* and *Annals of Mathematics*. This collection of results has also been the subject of a presentation at Séminaire Bourbaki (P. Cartier. Exp. No. 1071:373–396, 2013) and, more recently, of a book chapter (Chapter 10 of *Representation Theory of Symmetric Groups*, P.-L. Méliot, CRC Press, 2017).*

- The description of the fluctuations of linear statistics for deformations of the Plancherel measures related to Hecke algebras and Jack polynomials.

*These results were published in *Probability theory and Related Fields* and *Duke Mathematical Journal*, respectively.*

3. The theory of mod- φ convergence to obtain precise probabilistic estimate from a good control of the characteristic function (or of cumulants). This applies to problems in random combinatorial structures, in classical probability theory, in statistical physics, . . .

This work led to the publication of the already largely cited research monograph “Mod φ convergence: Normality zones and precise deviations”. I was also invited to do two mini-courses on the topic.

4. The theory of weighted dependency graphs to prove central limit theorems for statistics in various combinatorial structures.
5. The discovery of a universal Brownian limit object for permutation classes.

*This work led to publications in *Annals of Probability* and *Journal of the European Mathematical Society*; the first paper has also been the subject of two master theses, by students of Miermont and Le Gall.*

Publication list

(In my field, authors are listed in alphabetic order.)

Monographs:

1. *Mod φ convergence: Normality zones and precise deviations*, with Pierre-Loïc Méliot and Ashkan Nikeghbali.
Springer Briefs in Probability and Mathematical Statistics, Springer, 2016.
2. *Approche duale des représentations du groupe symétrique*.
Collection "Les cours Peccot", Spartacus, 2016.

Journals papers:

1. *Graphons, permutons and the Thoma simplex: three mod-Gaussian moduli spaces*, with Pierre-Loïc Méliot and Ashkan Nikeghbali.
Proceedings of the London Mathematical Society, **121** (3), pp. 876–926, 2020,.
2. *A decorated tree approach to random permutations in substitution-closed classes*, with Jacopo Borga, Mathilde Bouvel, and Benedikt Stufler.
Electronic Journal of Probability, **25**, paper no. 67, pp. 1-52, 2020.
3. *Two first-order logics of permutations*, with Michael Albert and Mathilde Bouvel.
Journal of Combinatorial Theory Series A, **171**, paper no. 105158, 2020.
4. *Central limit theorems for patterns in multiset permutations and set partitions*.
Annals of Applied Probability, **30** (1), pp. 287-323, 2020.
5. *Universal limits of substitution-closed permutation classes*, with Frédérique Bassino, Mathilde Bouvel, Lucas Gerin, Mickaël Maazoun and Adeline Pierrot.
Journal of European Mathematical Society, to appear.
6. *On the central limit theorem for the two-sided descent statistics in Coxeter groups*.
Electronic Communications in Probability, **25**, paper no. 28, pp. 1–6, 2020.
7. *Asymptotics for skew standard Young tableaux via bounds for characters*, with Jehanne Dousse.
Proceedings of the AMS, **147**: 4189–4203, 2019.
8. *Weighted dependency graphs and the Ising model*, with Jehanne Dousse.
Annales de l'IHP D: Combinatorics, Physics and their Interactions, **6** (4): 533–571, 2019.
9. *Trajectories in random minimal transposition factorizations*, with Igor Kortchemski.
Latin American Journal of Probability and Mathematical Statistics, **16**: 759–785, 2019.
10. *Mod- ϕ convergence II: Estimates on the speed of convergence*, with Pierre-Loïc Méliot and Ashkan Nikeghbali.
Séminaire de Probabilités, L, vol 2252 of Lecture Notes in Mathematics Series, pp. 405-477, 2019.
11. *The geometry of random minimal factorizations of a long cycle via biconditioned bitype random trees*, with Igor Kortchemski.
Annales Henri Lebesgue, **1**, pp. 149-226, 2018.
12. *Weighted dependency graphs*.
Electronic Journal of Probability, **23**, paper no. 93, 65 pp, 2018.

13. *The Brownian limit of separable permutations*, with Frédérique Bassino, Mathilde Bouvel, Lucas Gerin and Adeline Pierrot.
Annals of Probability **46** (4), pp. 2134-2189, 2018.
14. *Shifted symmetric functions and multirectangular coordinates of Young diagrams*, with Per Alexandersson.
Journal of Algebra, **483**, pp. 262-305, 2017.
15. *Cumulants of Jack symmetric functions and b-conjecture*, with Maciej Dołęga.
Transactions of the AMS, **369** (12), pp. 9014-9039, 2017
16. *Gaussian fluctuations of Young diagrams and structure constants of Jack characters*, with Maciej Dołęga.
Duke Mathematical Journal, **165** (7), pp. 1193-1282, 2016.
17. *Cyclic inclusion-exclusion*, SIAM J. Discrete Math, 29 (4), pp. 2284-2311, 2015.
18. *On products of long cycles: short cycle dependence and separation probabilities*, with Amarpreet Rattan.
Journal of Algebraic Combinatorics, **42**, (1) pp. 183-224, 2015.
19. *Quasi-symmetric functions as polynomial functions on Young diagrams*, with Jean-Christophe Aval, Jean-Christophe Novelli and Jean-Yves Thibon.
Journal of Algebraic Combinatorics, **41** (3), pp. 669-706, 2015.
20. *Jack polynomials and orientability generating series of maps*, with Maciej Dołęga and Piotr Śniady.
Séminaire Lotharingien de Combinatoire, **B70j**, 50 pp (electronic), 2014.
21. *An edge-weighted hook formula for labelled trees*, with I. P. Goulden and Alain Lascoux.
Journal of Combinatorics, **5** (2), pp. 245-269, 2014.
22. *A simple model of trees for unicellular maps*, with Guillaume Chapuy and Éric Fusy.
Journal of Combinatorial Theory Series A, **120**, pp. 2064–2092, 2013.
23. *Asymptotics of some statistics in Ewens random permutations*.
Electronic Journal of Probability, **18** (76), pp. 1-32, 2013.
24. *A multivariate hook formula for labelled trees*, with I. P. Goulden.
Journal of Combinatorial Theory Series A, **120**, pp. 944-959, 2013.
25. *P-partitions revisited*, with Victor Reiner.
Journal of Commutative Algebra, **4** (1), pp. 101-152, 2012.
26. *Linear extension sums as valuations of cones*, with Adrien Boussicault, Alain Lascoux and Victor Reiner.
Journal of Algebraic Combinatorics, **35** (4), pp. 573-610, 2012.
27. *On complete functions in Jucys-Murphy elements*.
Annals of Combinatorics, **16** (4), pp. 677-707, 2012.
28. *Bijjective enumeration of some colored permutations given by the product of two long cycles*, with Ekatarina Vassilieva.
Discrete Mathematics, **312** (2), pp. 279-292, 2012.
29. *Partial Jucys-Murphy elements and star factorizations*.
European Journal of Combinatorics **33**, pp. 189-198, 2012.
30. *Asymptotics of q-Plancherel measures*, with Pierre-Loïc Méliot.
Probability Theory and Related Fields, **152** (3-4), pp. 589-624, 2012.

31. *Asymptotics of characters of symmetric groups related to Stanley character formula*, with Piotr Śniady.
Annals of Mathematics, **173** (2), 887-906, 2011.
32. *Zonal polynomials via Stanley's coordinates and free cumulants*, with Piotr Śniady.
Journal of Algebra, **334**, pp. 338-373, 2011.
33. *Explicit combinatorial interpretation of Kerov character polynomials as numbers of permutation factorizations*, with Maciej Dołęga and Piotr Śniady.
Advances in Mathematics, **225** (1), pp. 81- 120, 2010.
34. *Stanley's Formula for Characters of the Symmetric Group*.
Annals of Combinatorics, **13** (4), pp. 453 - 461, 2010.
35. *Combinatorial interpretation and positivity of Kerov's character polynomials*.
Journal of Algebraic Combinatorics, **29** (4), pp. 473-507, 2009.
36. *Application of graph combinatorics to rational identities of type A*, with Adrien Boussicault.
Electronic Journal of Combinatorics, **16** (1), R145, 2009.

Conference papers:

(These conference papers are extended abstracts of 12 pages of some of the journal publications above; FPSAC is the major annual conference in algebraic combinatorics; around 150 extended abstracts are usually submitted, among which 25 are accepted as talks and 60 as posters.)

1. *Cyclic inclusion-exclusion*.
Talk, FPSAC 2016. Vancouver (Canada), DMTCS proc. BC, 515–526, 2016.
2. *Cumulants of Jack symmetric functions and b-conjecture*, with Maciej Dołęga.
Poster, FPSAC 2016, Vancouver (Canada), DMTCS proc. BC, 395–406, 2016.
3. *Super quasi-symmetric functions via Young diagrams*, with Jean-Christophe Aval, Jean-Christophe Novelli and Jean-Yves Thibon.
Poster, FPSAC 2014, Chicago (USA), DMTCS proc. AT, 169-180, 2014.
4. *On Kerov polynomials for Jack characters*, with Maciej Dołęga.
Poster, FPSAC 2013, Paris (France), DMTCS proc. AS, 569-580, 2013.
5. *A simple tree model for unicellular maps*, with Guillaume Chapuy and Éric Fusy.
Talk, FPSAC 2012, Nagoya (Japan), DMTCS proc. AR, 215–226, 2012.
6. *Asymptotics of some statistics in Ewens random permutations*.
Talk, AofA 2012, Montréal (Canada), DMTCS proc. AQ, 43–54, 2012.
7. *Dual combinatorics of zonal polynomials*, with Piotr Śniady.
Talk, FPSAC 2011, Reykyavik (Iceland), DMTCS proc. AO, 317-328, 2011.
8. *Linear coefficients of Kerov's polynomials: bijective proof and refinement of Zagier's result*, with Ekaterina Vassilieva.
Poster, FPSAC 2010, San Francisco (États-Unis), DMTCS proc. AN, 713-724, 2010.
9. *Application of graph combinatorics to rational identities of type A*, with Adrien Boussicault.
Poster, FPSAC 2009, Hagenberg (Austria), DMTCS proc. AK, 229 - 240, 2009.
10. *Explicit combinatorial interpretation of Kerov character polynomials as numbers of permutation factorizations*, with Maciej Dołęga et Piotr Śniady.
Talk, FPSAC 2009, Hagenberg (Austria), DMTCS proc. AK, 337-348, 2009.

11. *Combinatorial interpretation and positivity of Kerov's character polynomials.*
Talk, FPSAC 2008, Viña del Mar (Chile), DMTCS proc. AJ, 93-104, 2008. "best paper from a student" award.

Participation to a collaborative outreach monograph:

1. Maths la Terminale S, collective book, Edn Ellipse, 2016 (in French).
Intended for motivated high school students, who want to discover in an original way some more advanced mathematical notions.