

Gaëtan Borot

French, German.

Born in St. Wendel (Germany), June 14th, 1986.

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Languages:

French (native), English, German (fluent)

Italian (beginner)



CURRICULUM

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|--------------------|---|
| 2014-2021 | <i>W2 Group Leader, MPIM, Bonn.</i> |
| Fall 2013 | <i>Visiting scholar, MIT Maths Department, Cambridge.</i> |
| Spring 2013 | <i>Postdoctorate guest, MPIM, Bonn</i> |
| 2011-2013 | <i>Postdoctoral assistant, Section de Mathématiques, Genève, in the group of Stanislav Smirnov.</i> |
| 2008-2011 | <i>PhD thesis in Theoretical Physics, IPhT, CEA Saclay, under the supervision of Bertrand Eynard.</i> |
| 2005-2009 | <i>Studies at ENS Paris.</i> |

AWARDS

Best paper 2013 Prize in J. Phys. A for *Purity distribution for random Bures mixed states*, with C. Nadal.

GRANT

- **Collaborator** associated to the ERC Synergy Grant "Renew quantum" of J.E. Andersen, B. Eynard, M. Kontsevich and M. Mariño (2019-2025).

OUTREACH

- Participation to the radio broadcast "Trajectoires", on the theme "Combiner" (February 2017).
- Organization of a conference-concert "Music and maths" with Tom Johnson and Jean-Paul Delahaye, IHP Paris (February 2017).
- Organization of a Science Cafe at the social community space Tannenbusch House (Bonn, 5 sessions, 2017-2018).
- Short text for the MPI Jahrbuch "Das Zahlen von Flächen" (translation C. Kaiser), 2019.

SELECTED TALKS

182 talks up to date. The full list is available on my website.

- 2010** ○ *Conf. Random matrix theory and its applications*, MSRI, Berkeley.
- 2011** ○ Selected talk, *Arbeitstagung*, MPIM, Bonn.
 - *Conf. Low-dim. topology and number theory*, Oberwolfach.
- 2013** ○ *Conf. Hamiltonian PDEs, Frobenius mfd. & moduli spaces*, SISSA, Trieste.
 - *Conf. Number Theory and Physics*, Clay Mathematics Institute, Oxford.
 - *Conf. Mirror Symmetry and Physics*, Perimeter Institute, Waterloo.
 - *Conf. Non-equilibrium dynamics and random matrices*, IAS, Princeton.
- 2014** ○ *Conf. Geometry, quantum topology and asymptotics*, Geneva.
- 2015** ○ *Conf. Planar structures in random geometries*, INI, Cambridge.
 - *Conf. Swisssknots*, Geneva.
 - Selected talk, *Arbeitstagung*, MPIM, Bonn
 - *Conf. Recent advances in TQFT, QGM Aarhus*.
- 2016** ○ *String Math*, Collège de France, Paris.
 - *AMS Von Neumann Symposium on Topological recursion*, Charlotte.
- 2017** ○ Séminaire Flajolet, IHP, Paris.
 - Algebraic geometry seminar, IST Austria.
- 2018** ○ Mathematical physics seminar, CMSA, Harvard.
 - Geometry and physics seminar, Tsinghua University.
 - String theory seminar, KIAS, Seoul.
 - Topology seminar, RIMS, Kyoto.
 - *Conf. Free probability*, Oberwolfach.
- 2019** ○ Oberseminar, LMU München
 - Flat surfaces seminar, IHP, Paris.
 - *Conf. String field theory, BV quantization and moduli spaces*, Stony Brook.
 - *Conf. Curve counting and related theories*, University of Leeds.
- 2020** ○ Algebraic geometry seminar, Università la Sapienza, Roma.

SERVICE

- **PhD advisor** for Elba Garcia-Failde (2014-2018, with Don Zagier), Alessandro Giacchetto (2018-expected 2021)
- **Postdoc mentor** for Petr Dunin-Barkowski (2014-2016), Boulos el-Hilany (2017-2018) Danilo Lewański (2017-2019), Séverin Charbonnier (2018-2020), Reinier Kramer (2019-2021), Rémi Avohou Cocou (2019-2021 for his Georg-Forster fellowship), Nitin K. Chidambaram (2020-2022).
- **PhD thesis reviewer** for Alexandr Popolitov (Amsterdam, 2017), Viet Ahn Nguyen (Angers, 2017), Linxiao Chen (Orsay, 2018).
- **Research habilitation reviewer** for Olivier Marchal (St-Etienne/Lyon, 2017).
- **Reviewer** for *Annales Henri Poincaré*, *Annals of Probability*, *Annals of Applied Probability*, *Canadian Journal of Mathematics*, *Communications in Mathematical Physics*, *Communications in Number Theory and Physics*, *Compositio Mathematica*, *Electronic Journal of Combinatorics*, *FPSAC*, *International Journal of Mathematics*, *Journal of the AMS*, *Journal of Mathematical Physics*, *Journal of Physics A: Mathematical and Theoretical*, *Journal of Statistical Physics*, *Letters in Mathematical Physics*, *Mathematische*

Annalen, Probability Theory and Related Fields, Transactions of the AMS, SIGMA, Wiki-Journal of Science, for a book in the series Progress in Mathematical Physics (Birkhäuser).

- **Reviewer** for an ERC Starting Grant.
- **Editor** for the MPIM preprints.
- **Editor** for a special issue of SIGMA in honor of Motohico Mulase's on his 65th birthday.

TEACHING

- **Master course**

- ★ *Random matrix theory* (30 hours), Bonn Universität, Fall 2014.
- *Random matrix theory* (6 hours), National University of Mongolia, August 2015.

- **Mini-course, research level**

- *Theory of loop equations* (8 hours), MIT, Fall 2013.
- *Topological recursion and geometry*, (4 hours), IMT Toulouse, May 2017.
- *Topological recursion and applications*, (9 hours), Melbourne University, February 2018.
- *Topological expansions*, (3 hours), ENS Lyon, June 2018.
- *Topological and geometric recursion*, (4 hours), Confucius Institute, Geneva, July 2018.
- *Topological and geometric recursion*, (4 hours), CRM Montréal, May 2019.

- **Graduate lectures**

- *Topological recursion*, Berkeley (4.5 hours), March 2015.
- *Integrable systems*, Hannover (6 hours), July 2015.
- *Topological and geometric recursion*, (4.5 hours), Tübingen Universität, August 2018.
- *Topological and geometric recursion*, (6h), Lecce, September 2020.

As an assistant: **Physics**, Orsay (2009-2011), **Mathematics**, Geneva (2011-2013)

EVENT ORGANIZATION

★ **Occasional organizer** (in replacement of Y. Manin) for the Algebra, Geometry and Physics seminar, MPIM Bonn (16 talks since 2014).

★ **Workshop**, *Geometric quantization and topological recursion*, MPIM Bonn, 24-28 Nov. 2014, with P. Teichner and D. Zagier.

★ **Workshop**, *Asymptotic analysis in strongly coupled systems*, HCM, Bonn, 11-15 Jan. 2016, with M. Disertori and P. Ferrari.

• **Workshop**, *Topological recursion and TQFTs*, Oberwolfach, 14-20 Feb. 2016, with L.O. Chekhov, B. Eynard and K. Wendland.

• **Thematic trimester**, *Combinatorics and interactions: mathematical physics, representation theory and probability*, IHP, Paris, Jan.-Mar. 2017, with M. Albenque, G. Chapuy, and

V. Féray.

- **Conference**, *Enumerative geometry within the trimester*, 13-17 Mar. 2017, with A. Chiodo.
- ★ **Reading group**, *Rational Cherednik algebras, Hilbert schemes and torus knots*, 30 May-1 June 2017, with E. Norton.
- ★ **Workshop**, *Young researchers in string mathematics*, 27-30 Nov. 2017, with M. Alim.
- ★ **Summer school**, *Log-correlated fields*, University of Bonn, 11-14 June 2018, with A. Bovier, M. Disertori and P. Ferrari.
- **Workshop**, *Geometric and categorical aspects of CFTs*, BIRS Oaxaca, 24-28 Sept. 2018, with J.E. Andersen, D. Ridout and A. Ros Camacho.
- **Workshop**, *Mathematical aspects of the quantum Hall effect*, Mittag-Leffler Institute, Stockholm, 1-5 July 2019, with R. Berman, S. Klevtsov, S. Serfaty and P. Wiegmann.
- ★ **Conference**, *Integrability, geometry and moduli*, in honor of Motohico Mulase's 65th birthday, MPIM Bonn, 1-5 Aug. 2019, with O. Dumitrescu, S. Rayan and D. Zagier.
- ★ **Reading group**, *Integer points in polyhedra*, MPIM Bonn, Fall 2019, with A. Giacchetto.
- ★ **Online reading group**, *Stability conditions, DT invariants and their geometry*, Spring 2020.
- **Workshop**, *Non-commutative geometry meets topological recursion*, BIRS Hangzhou, 27 Sept.-2 Oct. 2020, with M. Khalkhali, H. Markwig and R. Wulkenhaar.
- **Workshop**, *Enumerative geometry of surfaces*, Oberwolfach, 14-18 June 2021, with S. Grushevsky and M. Möller.

PUBLICATIONS

- 1 *A matrix model for simple Hurwitz numbers, and topological recursion*
with B. Eynard, M. Mulase, B. Safnuk.
J. Geom. Phys. **61**, 26, 522-540 (2010), [math-ph/0906.1206](#)
- 2 *Enumeration of maps with self avoiding loops and the $O(n)$ model on random lattices of all topologies*, with B. Eynard.
J. Stat. Mech. P01010 (2011), [math-ph/0910.5696](#)
- 3 *Large deviations of the maximal eigenvalue of random matrices*
with B. Eynard, S.N. Majumdar, C. Nadal.
J. Stat. Mech. P11024 (2011), [math-ph/1009.1945](#)
- 4 *Tracy-Widom GUE law and symplectic invariants*
with B. Eynard.
[nlin.SI/1011.1418](#), preprint.
- 5 *A recursive approach to the $O(n)$ model on random maps via nested loops*
with J. Bouttier, E. Guitter.
J. Phys. A: Math Theor, **45** (2012), [math-ph/1106.0153](#)
- 6 *Asymptotic expansion of β matrix models in the one-cut regime*
with A. Guionnet.
Commun. Math. Phys., **317** 2, 447-483 (2013), [math-PR/1107.1167](#)
- 7 *Geometry of spectral curves and all order dispersive integrable system*
with B. Eynard.
SIGMA **8** 100, (2012), [math-ph/1110.4936](#)

- 8 *Purity distribution for random Bures mixed states*
with C. Nadal.
J. Phys A: Math Theor, **45** (2012), [cond.mat-stat.mech/1110.3838](#)
- 9 *Right tail asymptotic expansion of Tracy–Widom beta laws*
with C. Nadal.
Random matrices: Theory Appl. (2012), [math-ph/1111.2761](#)
- 10 *More on the $O(n)$ model on random maps via nested loops: loops with bending energy*
with J. Bouttier and E. Guitter.
J. Phys. A: Math. Theor. **45** (2012) 275206, [math-ph/1202.5521](#)
- 11 *All-order asymptotics of hyperbolic knot invariants from non-perturbative topological recursion of A -polynomials*, with B. Eynard.
Quantum Topology **6** (2015) 39–138, [math-ph/1205.2261](#)
- 12 *Loop models on random maps via nested loops: case of domain symmetry breaking and application to the Potts model*, with J. Bouttier and E. Guitter.
J. Phys. A, special issue in honor of F. Wu (2012), [math-ph/1207.4878](#)
- 13 *Resolvent methods for steady premixed flame shapes governed by the Zhdanov–Trubnikov equation*, with B. Denet and G. Joulin.
J. Stat. Mech. (2012), P10023, [cond-mat.stat-mech/1207.5416](#)
- 14 *Asymptotic expansion of β matrix models in the multi-cut regime*
with A. Guionnet.
[math-ph/1303.1045](#), preprint.
- 15 *Abstract loop equations, topological recursion, and applications*
with B. Eynard and N. Orantin.
Commun. Numb. Th. Phys. **9** 1 (2015), [math-ph/1303.5808](#)
- 16 *Formal multidimensional integrals, stuffed maps, and topological recursion.*
AIHP Comb. Phys. Interact. **1** (2014) 225–264, [math-ph/1307.4957](#)
- 17 *Rational differential systems, loop equations, and application to the q -th reductions of KP*
with M.C. Bergère and B. Eynard.
Ann. Henri Poincaré **16** 12 (2015) 2713–2782, [math-ph/1312.4237](#)
- 18 *Large- N asymptotic expansion for mean field models with Coulomb gas interaction*
with A. Guionnet and K.K. Kozłowski.
IRMN (2015), [math-ph/1312.6664](#)
- 19 *Root systems, spectral curves, and analysis of a Chern–Simons matrix model for Seifert fibered spaces*, with B. Eynard and A. Weiße.
Selecta Mathematica New Series 1-111 (2016), [math-ph/1407.4500](#)
- 20 *Asymptotic expansion of a partition function related to the sinh-model*
with A. Guionnet and K.K. Kozłowski
Mathematical Physics Studies, Springer (2017), [math-ph/1412.7721](#)
- 21 *Blobbed topological recursion: properties and applications*,
with S. Shadrin.
Math. Proc. Cam. Phil. Soc. **162** 1 39–87 (2017), [math-ph/1502.00981](#)

- 22 *Chern–Simons theory on spherical Seifert manifolds, topological strings and integrable systems*, with A. Brini.
Adv. Theor. Math. Phys. 2 (2018), [hep-th/1506.06887](#).
- 23 *Modular functors, cohomological field theories and topological recursion*, with J.E. Andersen and N. Orantin.
in “Topological recursion and its influence in analysis, geometry and topology”, editors C.C.M. Liu and M. Mulase, Proceedings of Symposia in Pure Mathematics 100, 1–59 (2018), [math-ph/1509.01387](#).
- 24 *Nesting statistics in the $O(n)$ loop model on random maps* with B. Duplantier and J. Bouttier.
[math-ph/1605.02239](#), submitted.
- 25 *Nesting statistics in the $O(n)$ loop model on random maps of arbitrary topologies* with E. Garcia-Failde.
[math-ph/1609.02074](#), submitted.
- 26 *The ABCD of topological recursion* with J.E. Andersen, L.O. Chekhov and N. Orantin.
[math-ph/1703.03307](#), submitted.
- 27 *Special cases of the orbifold version of Zvonkine’s r -ELSV formula* with R. Kramer, D. Lewański, A. Popolitov and S. Shadrin.
to appear in Mich. J. Math. (2020), [math.AG/1705.10811](#)
- 28 *Lecture notes for an introductory course on random matrix theory* Mong. J. Math. (2017), [math.PR/1710.10792](#)
- 29 *Simple maps, Hurwitz numbers and topological recursion* with E. Garcia-Failde.
[math-ph/1710.07851](#), submitted.
- 30 *Geometric recursion* with J.E. Andersen and N. Orantin.
[math.GT/1711.04729](#), preprint.
- 31 *Higher Airy structures, W -algebras and topological recursion* with V. Bouchard, N.K. Chidambaram, T. Creutzig and D. Noshchenko.
[math-ph/1812.08738](#), submitted.
- 32 *Relating ordinary and fully simple maps via monotone Hurwitz numbers* with S. Charbonnier, N. Do and E. Garcia-Failde.
Elect. J. Comb. 26 3, 2019, [math.CO/1904.02267](#)
- 33 *Loop equations and Gromov–Witten invariants of \mathbb{P}^1* with P. Norbury.
SIGMA 15 061, 2019, [math.AG/1905.01890](#)
- 34 *Topological recursion for Masur–Veech volumes* with J.E. Andersen, S. Charbonnier, V. Delecroix, A. Giacchetto, D. Lewański and C. Wheeler.
[math.GT/1905.10352](#), preprint.

- 35** *A second topological recursion for Masur–Veech volumes*
Appendix to “Masur–Veech volumes and intersection theory: principal strata of quadratic differential” by D. Chen, M. Möller and A. Sauvaget.
with A. Giacchetto and D. Lewański.
[math.AG/1912.02267](#), preprint.
- 36** *Double Hurwitz numbers: polynomiality, topological recursion and intersection theory*
with N. Do, M. Karev, D. Lewański and E. Moskowsky.
[math-ph/2002.00900](#), preprint.
- X1** *On the Kontsevich geometry of the combinatorial Teichmüller space*
with J.E. Andersen, S. Charbonnier, A. Giacchetto, D. Lewański and C. Wheeler.
In preparation.
- X2** *On the Thurston volume of combinatorial unit ball of measured foliations*
with S. Charbonnier, V. Delecroix, A. Giacchetto and C. Wheeler.
In preparation.
- X3** *Fluctuations for multi-cut discrete β ensembles and application to random tilings*
with V. Gorin and A. Guionnet.
In preparation.