

# CURRICULUM VITAE CLÉMENT MOUHOT

## 1. PERSONAL DETAILS

- Name: *Clément Mouhot*
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- E-mail: *C.Mouhot@dpmms.cam.ac.uk*
- URL: *<http://cmouhot.wordpress.com/>*
- Date of birth: *August 19th, 1978*
- Place of birth: *Paris, France*
- Citizenship: *French*

## 2. EDUCATION

- 09/2010: Habilitation thesis, Univ. Paris 6
- 11/2004: PhD, École Normale Supérieure in Lyon (ENS Lyon). Advisor: C. Villani.
- 2001: French “Agrégation de Mathématiques”
- 1998-2002: Student at ENS Lyon

## 3. PROFESSIONAL HISTORY

- 10/2013- : Professor at DPMMS, University of Cambridge
- 01/2012- : Fellow at King’s College, Cambridge
- 10/2010- : Reader at DPMMS, University of Cambridge
- 09/2009- : CNRS Researcher (tenured) at ENS Paris (on leave from sept 2010)
- 09/2005-08/2009: CNRS Researcher (tenured) at Uni Paris-Dauphine
- 09/2001-11/2004: PhD student at UMPA, ENS Lyon

## 4. GRANTS-AWARDS-EDITORIAL WORK

- 2014: Prize de Madame Victor Noury of the french *Académie des Sciences*.
- 2014: Whitehead prize from the *London Mathematical Society*
- 2014- : Associate editor of *Communications in Mathematical Physics*
- 2013: The work “Kac’s Program in Kinetic Theory” with Mischler was the subject of a Séminaire Bourbaki (2013 by Desvillettes)
- 2012- : Co-Editor-in-chief of *ESAIM Proceedings*
- 2011- : Associate editor of *Journal of Statistical Physics*
- 2011- : Associate editor of *Acta Applicandae Mathematicae*
- Oct. 2011- : ERC Starting Grant from the European Union

## 5. RESEARCH

I am interested in various areas of pure and applied mathematics. My research involves analysis and probability, and has been focused so far on partial differential equations and stochastic processes arising from particle systems. I have published around 40 papers in specialized mathematical journals (see my list of publications), as well as several popularisation papers in french.

## 6. STUDENTS

- 09/2014- : PhD thesis Davide Piazzoli, Cambridge (co-supervised with F. Bolley)
- 09/2013- : Postdoc Harsha Hutridurga, Cambridge
- 09/2013- : PhD thesis Helge Dietert, Cambridge (co-supervised with A. Iserles)
- 09/2013- : PhD thesis Tom Holding, Cambridge (secondary supervisor, main supervisor: J. A. Carrillo)
- 09/2011- : PhD thesis Sara Merino, Cambridge (co-supervised with J. Norris)
- 2011-2014: PhD thesis Marc Briant, Cambridge
- 09/2011- : Post-docs Jonathan Ben-Artzi, Chanwoo Kim and Kung-Chien Wu, Cambridge
- 2010-2013: PhD thesis Kleber Carrapatoso, Paris (co-supervised with S. Mischler)
- 2009-2012: PhD thesis of Thomas Rey, Lyon (co-supervised with F. Filbet)
- 2006-2008: Post-Doc José A. Cañizo (co-supervised with S. Mischler)
- 2007-2011: Various undergraduate and graduate projects
- PhD Jury: M. El Safadi (Univ. Orléans), S. Hittmeir (Univ. Vienna, referee), R. Roux (ENPC) and D. Han-Kwan (ÉNS Paris), É. Bouin (ÉNS Lyon)

## 7. TEACHING EXPERIENCE

- 2012-2014: Direction of studies and supervision classes (recitation) at King's College, Cambridge
- 2013-2014 & 2014-2015: Part III course (joint with a companion reading group for students in the Cambridge Center for Analysis) *Analysis of Partial Differential Equations*.
- 2012-2013: Master course at the Cambridge Center for Analysis (doctoral training center) on *Partial Differential Equations*
- 2010-2012: Part III course *Mathematical Topics in Kinetic theory* & Supervision classes (recitation) at King's College, Cambridge
- 2010-2012: L3 (3d year) level short course on "Particle systems and PDEs" together with Vladimir Kazakov at ENS Paris
- 2009-2010: Two graduate courses *Hypoocoercivity* and *Landau damping*, Institut Henri Poincaré and Université Paris-Dauphine
- 2006-2009: Undergraduate course (lecturer) *Introduction to PDE's*, Université Paris-Dauphine
- 2002-2005: Example Classes for several undergraduate courses at ENS Lyon

## 8. SERVICES

- Organization (with Neshan Wickramasekera) of the "Oxbridge PDE conference 2014", april 2014, CMS, Cambridge.
- Organization (with Francis Filbet) of an international workshop "Mathematical topics in Kinetic Theory", june 2013, CMS, Cambridge.
- Organization (with Mihalis Dafermos) of the "Oxbridge PDE conference 2012", april 2012, CMS, Cambridge.

- Organization (with Eric Carlen, Maria Carvalho and Nicolas Fournier) of two workshops and an international conference Probabilistic methods in kinetic theory, may and july 2011, CIRM, Marseille.
- Organization (with François Bolley, Laurent Desvillettes and Silvia Lorenzani) of an international conference in the memory of Carlo Cercignani, february 2011, IHP, Paris.
- Organization (with François Bolley and Alessio Figalli) of an international conference Kinetic equations, geometry, probability, optimal transport: old and new in the honor of Cédric Villani, Fields medallist 2010, january 2011, ENS Paris.
- Organizer of one of the sessions of the conference Singularity in PDEs at IHES, july 2010.
- Organization (with Stéphane Mischler) of an international conference PDE and biology, Feb. 2010, La Habana, Cuba.
- Organizer of an international conference Around Boltzmann equation, Oct. 2007, Henri Poincaré Institute, Paris.
- Organization of a workshop PDEs for coagulation and fragmentation, Oct. 2006, University Paris-Dauphine.
- Co-organizer of the “PDEs & applications” seminar (2003-2004) at Ecole Normale Supérieure (Lyon), “Analysis-probability” seminar (2006-2007) at University Paris-Dauphine, “Geometric Analysis and PDEs” at DPMMS, Cambridge Univ.
- Referee: about 100 referee reports for about 30 different journals, including top journals in analysis, mathematical physics and modelization, and some generalist journals (Inventiones Mathematicae, Journal of the AMS), reviewer for the Mathscinet database.

## 9. INVITATIONS

### 9.1. Long-term invitations (more than 1 month).

- Université Paris 5 (“professeur invité”)
- University of Cambridge
- IPAM at UCLA
- City University of Hong-Kong
- Academia Sinica (Taipei)
- Brown University
- University of Ferrara
- University of Pavia
- University of Granada
- Stanford University.

9.2. **Short-term invitations.** Courant Institute (NYU), IAS (Princeton), Rutgers Univ., Univ. Maryland (Washington), Georgia Tech (Atlanta), Stanford University, Wien Universität, Universita Autònoma (Barcelona), Academia Sinica, Chalmers University (Göteborg), UT Austin, City University (Hong-Kong), Shanghai Jiao Tong Univ., Trinity College (Dublin), University of Ferrara, Wolfgang Pauli Institute (Wien), University of Granada.

9.3. **Invited seminars.** About 40 invited seminars given in more than 35 departments, including: University of Bath, Georgia Tech, University of Cambridge, Rutgers University, University of Maryland, University of Warwick, ENS Paris, Orsay University, IPAM UCLA, Academia Sinica (Taiwan), ENS Lyon, Chalmers University, UT Austin, Ecole Polytechnique, Collge de France, City University Hong-Kong, Brown University, Wolfgang Pauli Institute (Wien), Université Paris 6, Université Marseille, Université Rennes, Université de Toulouse, University of Sussex.

**9.4. Selected Talks at International Meetings.** About 50 invited talks in conferences in 16 countries, including:

- Jul 2014: Invited speaker HYP 2014, Rio de Janeiro.
- Dec. 2003, 2006, 2010 & 2014: Workshops on many-particle systems, Oberwolfach.
- Oct 2013: Mini-course at GRAVASCO, Institut Henri Poincaré.
- April 2013: Conference “Oxbridge PDE Days”, Oxford.
- May 2013: Lecturer at the 13th school “Mathematical Theory in Fluid Mechanics” Kácov (Czech Republic).
- Apr. 2013: Speaker at the opening conference of the Lebesgue Centre, Rennes.
- Sept. 2012: International conference in kinetic theory in Kyoto.
- Aug. 2012: Abel Symposium, Oslo.
- May 2012: Conference “Geometric fluid dynamics”, CRM, Montreal.
- May 2012: 107th conference Statistical Mechanics, Rutgers.
- Apr. 2012: Mini-course at a spring school on kinetic theory, Lyon.
- Nov. 2011: Speaker at the “Bourbaki seminar” in Paris.
- Nov. 2011: Plenary talk SIAM Conference on Analysis of PDE’s, San Diego.
- June 2011: Conference “Kinetic theory and related fields”, POSTECH, Korea.
- April 2011: Conference “Oxbridge PDE Days”, Oxford.
- Nov-dec. 2010: Conference in the honor of Tai-Ping Lius 65th birthday, Singapore.
- Oct. 2010: Course on Landau damping, Isaac Newton Institute semester, Cambridge.
- July 2010: Workshop Singularity in PDE’s, IHES, Bures-sur-Yvette.
- June 2010: Conference Kinetic and hyperbolic equations, Stanford.
- Oct. 2009: Conference Mathematical challenges of ITER, CIRM, Marseille.
- May 2009: Workshop Hyperbolic and kinetic equations, Shanghai Jiao Tong U.
- March 2009: Workshop and Spring school Kinetic Theory, Academia Sinica, Taipei.
- Aprilmay 2008: Workshop Nonlocal operators and applications, Banff, Canada.
- Feb. 2008: 8th International Conference on Operational Research, La Habana, Cuba.
- Dec. 2007: Fourth Pacific Rim Conf. on Mathematics, City University of Hong-Kong.
- June 2007: Journées Équations aux Dérivées Partielles, Évian (ex- Forges-les-Eaux).
- June 2006: Conference Boltzmann, SISSA Institute, Trieste.
- June 2006: Boltzmann Workshop, Schrödinger Institute, Wien.
- July 2005: France-Taiwan Joint Conference Nonlinear PDEs and Related Topics, Taipei.
- Sept. 2002: 2nd International Workshop on Kinetic Theory & Applications, Karlstad.

## 10. LIST OF PUBLICATIONS

All the papers are available on arXiv or on my website.

## 10.1. Published papers.

1. C. Mouhot and C. Villani, Regularity theory for the spatially homogeneous Boltzmann equation with cut-off. *Archive for Rational Mechanics and Analysis* 173 (2004), 169–212.
2. C. Baranger and C. Mouhot, Explicit spectral gap estimates for the linearized Boltzmann and Landau operators with hard potentials. *Revista Matemática Iberoamericana* 21 (2005), 819–841.
3. L. Desvillettes and C. Mouhot, About  $L_p$  estimates for the spatially homogeneous Boltzmann equation. *Annales I.H.P. Analyse non linéaire* 22 (2005), 127–142.
4. C. Mouhot, Quantitative lower bound for the full Boltzmann equation, Part I: Periodic boundary conditions. *Communications in Partial Differential Equations* 30 (2005), 881–917.
5. S. Mischler, C. Mouhot, and M. Rodriguez Ricard, Cooling process for inelastic Boltzmann equations for hard spheres, Part I: The Cauchy problem. *Journal Statistical Physics* 124 (2006), 655–702.
6. S. Mischler and C. Mouhot, Cooling process for inelastic Boltzmann equations for hard spheres, Part II: Self-similar solutions and tail behavior. *Journal Statistical Physics* 124 (2006), 703–746.
7. C. Mouhot and L. Pareschi, Fast methods for the Boltzmann collision integral. *Comptes-Rendus de l'Académie des Sciences de Paris Série I* 339 (2004), 71–76.
8. C. Mouhot and L. Pareschi, Fast algorithms for computing the Boltzmann collision operator. *Mathematics of Computation* 75 (2006), 1833–1852.
9. C. Mouhot, Rate of convergence to equilibrium for the spatially homogeneous Boltzmann equation with hard potentials. *Communications in Mathematical Physics* 261 (2006), 629–672.
10. C. Mouhot, Explicit coercivity estimates for the linearized Boltzmann and Landau operators. *Communications in Partial Differential Equations* 31 (2006), 1321–1348.
11. F. Filbet, C. Mouhot, and L. Pareschi, Solving the Boltzmann equation in  $N \log_2 N$ . *SIAM Journal in Scientific Computing* 28 (2006), 1029–1053.
12. C. Mouhot, L. Neumann, Quantitative perturbative study of convergence to equilibrium for collisional kinetic models in the torus. *Nonlinearity* 19 (2006), 969–998.
13. C. Mouhot, Quantitative linearized study of the Boltzmann collision operator and applications. *Communications in Mathematical Sciences* 5 (2007), 73–86.
14. C. Mouhot and R. Strain, Spectral gap and coercivity estimates for the linearized Boltzmann collision operator without angular cutoff. *Journal de Mathématiques Pures et Appliquées* 87 (2007), 515–535.
15. L. Desvillettes and C. Mouhot, Large time behavior for the a priori bounds for the solutions to the spatially homogeneous Boltzmann equation with soft potentials. *Asymptotic Analysis* 54 (2007), 235–245.
16. B. Lods, C. Mouhot, and G. Toscani, Relaxation rate, diffusion approximation and Ficks law for inelastic scattering Boltzmann models. *Kinetic and Related Models* 1 (2008), 223–248.

17. C. Mouhot, Quelques résultats d'hypocoercitivité en théorie cinétique collisionnelle. *Séminaire Équations aux Dérivées Partielles, École Polytechniques*, 2007-2008, Exp. No. XVI, 21 pp., Palaiseau, 2009.
18. L. Desvillettes and C. Mouhot, Stability and uniqueness for the spatially homogeneous Boltzmann equation with long-range interactions. *Archive for Rational Mechanics and Analysis* 193 (2009), 227–253.
19. S. Mischler and C. Mouhot, Stability, convergence to self-similarity and elastic limit for the Boltzmann equation for inelastic hard spheres. *Communications in Mathematical Physics* 288 (2009), 431–502.
20. S. Mischler and C. Mouhot, Stability, convergence to the steady state and elastic limit for the Boltzmann equation for diffusively excited inelastic hard spheres. *Discrete and Continuous Dynamical Systems - Series A* 24 (2009), 159–185.
21. N. Fournier and C. Mouhot, On the well-posedness of the spatially homogeneous Boltzmann equation with a moderate angular singularity. *Communications in Mathematical Physics* 298 (2009), 803–824.
22. J. Dolbeault, C. Mouhot, and C. Schmeiser, Hypocoercivity for kinetic equations with linear relaxation terms. *Comptes-Rendus de l'Académie des Sciences de Paris Série I* 347 (2009), 511–516.
23. J. A. Cañizo, S. Mischler, and C. Mouhot, Rate of convergence to self-similarity for Smoluchowskis coagulation equation with constant coefficients. *SIAM Journal of Mathematical Analysis* 41 (2010), 2283–2314.
24. C. Mouhot and C. Villani, Landau damping. *Journal of Mathematical Physics* 51 (2010), 015214.
25. A. Mellet, S. Mischler, and C. Mouhot, Fractional diffusion limit for collisional kinetic equations. *Archive for Rational Mechanics and Analysis* 199 (2011), 493–525.
26. F. Filbet and C. Mouhot, Analysis of spectral methods for the homogeneous Boltzmann equation. *Transactions of the American Mathematical Society* 363 (2011), 1947–1980.
27. C. Mouhot, E. Russ, and Y. Sire, Fractional Poincaré inequalities for general measures. *Journal de Mathématiques Pures et Appliquées* 95 (2011), 72–84.
28. C. Mouhot, Enlarging the functional space of decay estimates on semi-groups. *Proceedings of ISAAC 2009, Progress in Analysis and Applications*, pp. 505–511, World Scientific.
29. L. Desvillettes, C. Mouhot, and C. Villani, Celebrating Cercignani's conjecture for the Boltzmann equation. *Kinetic Related Models* 4 (2011), 277–294.
30. C. Mouhot, C. Villani, On Landau damping. *Acta Mathematica* 207 (2011), 29–201.
31. J. Dolbeault, C. Mouhot, and C. Schmeiser, Hypocoercivity for linear kinetic equations conserving mass. To appear in *Transactions of the American Mathematical Society* 2011 (21 pages).
32. X. Lu, C. Mouhot, On Measure Solutions of the Boltzmann Equation part I: Moment Production and Stability Estimates. *Journal of Differential Equations* 252 (2012), 3305–3363.
33. A. Arnold, I. M. Gamba, M. P. Gualdani, S. Mischler and C. Sparber, The Wigner-Fokker-Planck equation: stationary states and large time behavior. To appear in *Math. Models and Methods in Appl. Sci.* 22 (2012), no. 11, 1250034, 31 pp.

34. C. Mouhot, Stabilité orbitale pour le système de Vlasov-Poisson gravitationnel, d'après Lemou-Mhats-Raphal, Guo, Lin, Rein et al. [in french] Text of the Bourbaki seminar 1044, Novembre 2011, to appear in *Astérisque* (45 pages).
35. R. Alonso, J. Cañizo, I. Gamba, C. Mouhot, A new approach to the creation and propagation of exponential moments in the Boltzmann equation. *Comm. in Partial Differential Equations* 38 (2013), no. 1, 155–169.
36. J. Dolbeault, A. Klar, C. Schmeiser, Exponential rate of convergence to equilibrium for a model describing fiber lay-down processes. *Applied Mathematics Research eXpress* 2013, no. 2, 165–175.
37. C. Mouhot, L. Pareschi and T. Rey, Convolutional decomposition and fast summation methods for discrete-velocity approximations of the Boltzmann equation. *Mathematical Modelling and Numerical Analysis* 47 (2013), no. 5, 1515–1531.
38. S. Mischler, C. Mouhot, Kac's program in kinetic theory. *Invent. Math.* 193 (2013), no. 1, 1–147.
39. S. Mischler, C. Mouhot, B. Wennberg, A new method for the quantitative chaos propagation of drift, diffusion and jump processes. *Probability Theory and Related Fields* (published online 2013, 45 pages).
40. T. Bodineau, J. Lebowitz, C. Mouhot, and C. Villani, Lyapunov functionals for boundary-driven nonlinear drift-diffusion processes. To appear in *Nonlinearity* (27 pages).
41. X. Lu and C. Mouhot, On measure solutions to the Boltzmann equation, Part II: Rate of convergence to equilibrium. To appear in *Journal of Diff. Eq.* (57 pages).
42. F. Golse, C. Mouhot, and V. Ricci, Empirical measures and Vlasov hierarchies. To appear in *Kinetic Theory and Related Fields* (24 pages).

#### 10.2. Preprints.

43. M. P. Gualdani, S. Mischler, and C. Mouhot, Factorization for non-symmetric operators and exponential H-theorem. Preprint 2013 (118 pages).
44. J. Bedrossian, N. Masmoudi, and C. Mouhot, Landau damping: paraproducts and Gevrey regularity. Preprint 2013 (53 pages).
45. E. Carlen, J. Lebowitz and C. Mouhot, Exponential approach to, and properties of, a non-equilibrium steady state in a dilute gas. Preprint 2014 (17 pages).

#### 10.3. Thesis.

- PhD Thesis Nov. 2004: Mathematical Study of Some Collisional Kinetic Equations (465 pages). Contains papers from 1 to 10 above.
- Habilitation Thesis Sept. 2010: Contributions to the Study of Partial Differential Equations for Particle Systems (synthesis manuscript, 67 pages).

#### 10.4. Popularisation papers (in french).

- Les équations de l'irréversibilité. *Dossiers de Pour la Science*, january 2012 (french edition of the *Scientific American*).
- Stabilité non-linéaire pour l'équation de Vlasov-Poisson et amortissement Landau, *Gazette des Mathématiciens* 130 (2011), 7-18.
- Pourquoi les plasmas sont stables. Interview in *La Recherche*, january 2011.
- Les surprenantes propriétés des plasmas. In the website *Images des mathématiques*, 2011.
- Cédric Villani reçoit la médaille Fields, *Gazette des Mathématiciens* 126 (2010), 85–87.
- Prix Henri Poincaré : Cédric Villani. [in french] *Matapli* No. 90 (2009), 49–57.