

MARTIN HAIRER

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United Kingdom

Born: November 14, 1975
Citizenship: Austria
Civil status: Married, name of spouse: Xue-Mei Li
Languages: Fluent in French, German, and English
Last update of this document: September 30, 2011

Education

November 2001 PHD IN PHYSICS – University of Geneva.
October 1998 MSC IN PHYSICS – University of Geneva.
July 1998 BSC IN MATHEMATICS – University of Geneva.
June 1994 HIGH SCHOOL DIPLOMA – Collège Claparède, Geneva.

Honours and prizes

- Recipient of a 2008 Whitehead prize awarded by the LMS
- Recipient of a 2008 Philip Leverhulme Prize
- Recipient of a 2009 Royal Society Wolfson Research Merit Award
- Associate editor for the journal “Probability Theory and Related Fields” (2008-present)
- Associate editor for the journal “Annals of IHP Ser. B” (2011-present)
- Associate editor for the “Electronic Journal of Probability” (2010-present)
- Associate editor for the journal “NoDea” (2007-present)
- Associate editor for the “Journal of Mathematical Analysis and Applications” (2010-2011)

Employment history

| | |
|-------------------|---|
| From 01/2010 | FULL PROFESSOR The University of Warwick. |
| 01/2009 – 12/2009 | ASSOCIATE PROFESSOR New York University (Courant institute). |
| 09/2007 – 01/2009 | ASSOCIATE PROFESSOR (READER) The University of Warwick. |
| 09/2006 – 09/2007 | ASSOCIATE PROFESSOR The University of Warwick. |
| 10/2004 – 09/2006 | LECTURER The University of Warwick. |
| 10/2003 – 10/2004 | ADVANCED FELLOWSHIP (from the Swiss NSF) Mathematics Research Centre, University of Warwick. |
| 10/2002 – 10/2003 | POSTDOCTORAL FELLOWSHIP (from the Swiss NSF) Mathematics Research Centre, University of Warwick. |
| 01/1999 – 10/2002 | RESEARCH ASSISTANT Département de Physique Théorique, University of Geneva. |
| 09/1997 – 09/1999 | HIGHSCHOOL LABORATORY ASSISTANT (part time) Collège Claparède, Geneva. |

Past and current PhD students

S. Vollmer (PhD started November 2010). Joint supervision with A. Stuart
S. Weber (PhD started November 2010).
D. Kelly (PhD started November 2009).
C. Manson (PhD completed June 2010).
P. Bubak (PhD completed January 2009). Joint supervision with J. Robinson
A. Ohashi (PhD completed October 2006). Joint supervision with P. Ruffino

Supervision of postdoctoral researchers

J. Voß (2007–2009); Joint supervision with A. Stuart
J. Maas (2009)
H. Weber (2010–2011)

Organisation of workshops and seminars

- May 2–3, 2003 *Workshop on fractional Brownian motion*, co-organiser
- August 4–15, 2003 *Workshop on SPDEs and related topics*, co-organiser
- July 9, 2004 *Third East Midlands Stochastic Analysis Seminar*, Warwick, co-organiser
- 2003 – 2007 *Organiser of the Stochastic Analysis Seminar of the University of Warwick*
- July 9–13 2007 *SciCADE07* Co-organiser for two minisymposia
- June 2008 *Easter Probability Meeting*, Warwick, co-organiser
- July 27–31 2009 *SPA 2009* Organiser of a minisymposium
- 2010–present *Co-organiser of the Stochastic Analysis Seminar of the University of Warwick*
- January – July 2010 Organiser of a thematic semester on SPDEs at the Newton Institute (Cambridge)

Minicourses held

- March 1–2, 2007 Winter intensive course: *Hypoellipticity : Analysis & Stochastic Analysis*, Imperial College, London
- July, 2007 Chinese Probability Summerschool, Wuhan, China
- July 7–11, 2008 LMS Short Course Programme: *Stochastic Partial Differential Equations*, Imperial College, London
- December, 2008 Necas Seminar on Continuum Mechanics, Prague
- July, 2009 BMS Invited professor, Technical University, Berlin
- December, 2009 Stochastic and Statistical Methods in Multi-Scale Systems, Shanghai, China
- May, 2010 Evolution equations and Functional Inequalities, Hammamet, Tunisia
- July, 2010 Young Researchers Workshop, Warwick, United Kingdom
- October, 2010 Oberwolfach Seminar, Oberwolfach, Germany
- June, 2011 Spectral properties of non-selfadjoint operators, Rennes, France

Fellowships awarded

- 10/2006 5-year EPSRC Advanced Research Fellowship EP/E002269/1. (£413k)
- 10/2004 2-year Advanced research fellowship of the Swiss National Science Foundation (CHF 96k could not be taken up because it clashed with the position in Warwick).
- 10/2003 1-year Advanced research fellowship of the Swiss National Science Foundation. (CHF 48k)
- 10/2002 1-year Research fellowship of the Swiss National Science Foundation. (CHF 39k)

Grants awarded

- 10/2006 EPSRC Grant EP/E002269/1 (funding for a 3 year postoc position; joint with A. Stuart) (£267k)
10/2007 EPSRC Grant EP/F029950/1 (funding for a 1 week meeting; joint with W. Kendall (PI) and J. Warren) (£20k)
01/2011 EPSRC Grant EP/I014829/1 (funding for a 1 year symposium; joint with N. O’Connell (PI), J. Warren, and B. Hambly) (£200k)

Visiting professorships with honorarium

- December 2006 Université Paul Sabatier, Toulouse, invited professor (1 month)
July 2009 Technical University, Berlin, invited professor (1 month)

Publications and Preprints

Refereed articles

- [1] J.-P. Eckmann and M. Hairer, *Non-Equilibrium Statistical Mechanics of Strongly Anharmonic Chains of Oscillators*, Commun. Math. Phys. **212** (2000), no 1, pp. 105–164
- [2] J.-P. Eckmann and M. Hairer, *Invariant Measures for Stochastic PDE’s in Unbounded Domains*, Nonlinearity **14** (2001), pp. 133–151
- [3] J.-P. Eckmann and M. Hairer, *Uniqueness of the Invariant Measure for a Stochastic PDE Driven by Degenerate Noise*, Commun. Math. Phys. **219** (2001), no 3, pp. 523–565
- [4] M. Hairer, *Exponential Mixing for a Stochastic PDE Driven by Degenerate Noise*, Nonlinearity **15** (2002), pp. 271–279
- [5] M. Hairer, *Exponential Mixing Properties of Stochastic PDEs Through Asymptotic Coupling*, Probab. Theory Relat. Fields **124** (2002), no 3, pp. 345–380
- [6] J.-P. Eckmann and M. Hairer, *Spectral Properties of Hypoelliptic Operators*, Commun. Math. Phys. **235** (2003), no 2, pp. 233–253
- [7] D. Blömker and M. Hairer, *Stationary Solutions for a Model of Amorphous Thin-Film Growth*, Stoch. Anal. Appl. **22** (2004), no 4, pp. 903–922
- [8] D. Blömker and M. Hairer, *Multiscale expansion of invariant measures for SPDEs*, Commun. Math. Phys. **251** (2004), pp. 515–555
- [9] M. Hairer and G. Pavliotis, *Periodic Homogenization for Hypoelliptic Diffusions*, J. Stat. Phys. **117** (2004), no. 1/2, pp. 261–279
- [10] M. Hairer and J. Mattingly, *Ergodicity of the 2D Navier-Stokes Equations with Degenerate Stochastic Forcing*, Ann. of Math. **164** (2006), no 3, pp. 993–1032
- [11] D. Blömker, M. Hairer, and G. Pavliotis, *Modulation Equations: Stochastic Bifurcation in Large Domains*, Commun. Math. Phys. (258) (2005), no 2, pp. 479–512

- [12] M. Hairer, J. Mattingly, and E. Pardoux, *Malliavin calculus for highly degenerate 2D stochastic Navier-Stokes equations*, C. R. Acad. Sci. Paris, Ser. I **339** (2004), no. 11, pp. 793–796
- [13] M. Hairer and J. Mattingly, *Ergodic properties of highly degenerate 2D stochastic Navier-Stokes equations*, C. R. Acad. Sci. Paris, Ser. I **339** (2004), no. 12, pp. 879–882
- [14] M. Hairer, *Ergodicity of stochastic differential equations driven by fractional Brownian motion*, Ann. Probab. **33** (2005), no 3, pp. 703–758
- [15] M. Hairer, A. M. Stuart, J. Voß, and P. Wiberg, *Analysis of SPDEs Arising in Path Sampling Part I: The Gaussian Case*, Comm. Math. Sci. **3** (2005), no 4, pp. 587–603
- [16] A. Apte, M. Hairer, A. M. Stuart, and J. Voß, *A Bayesian approach to data assimilation*, Physica D **230** (2007), pp. 50–64
- [17] M. Hairer and A. Ohashi, *Ergodic theory for SDEs with extrinsic memory*, Ann. Probab. **35** (2007), no 5, pp. 1950–1977
- [18] F. Baudoin and M. Hairer, *Hörmander’s theorem for fractional Brownian motion*, Probab. Theory Rel. Fields **139** (2007), no 3/4, pp. 373–395
- [19] D. Blömker, M. Hairer, and G. Pavliotis, *Multiscale Analysis for SPDEs with Quadratic Nonlinearities*, Nonlinearity **20** (2007), no 7, pp. 1721–1744
- [20] M. Hairer, A. M. Stuart, and J. Voß, *Analysis of SPDEs Arising in Path Sampling Part II: The Nonlinear Case*, Ann. Appl. Probab. **17** (2007), no 5/6, pp. 1657–1706
- [21] F. Flandoli, M. Gubinelli, M. Hairer, and M. Romito, *Remarks on the K41 scaling law in turbulent fluids*, Commun. Math. Phys. **278** (2008), no 1, pp. 1–29
- [22] M. Hairer and G. Pavliotis, *From ballistic to diffusive behavior in periodic potentials*, J. Stat. Phys. **131** (2008), no 1, pp. 175–202
- [23] F. Baudoin, M. Hairer, and J. Teichmann *Ornstein-Uhlenbeck processes on Lie groups*, J. Func. Anal. **255** (2008), no 4, pp. 877–890
- [24] M. Hairer and E. Pardoux *Homogenization of periodic linear degenerate PDEs*, J. Func. Anal. **255** (2008), no 9, pp. 2462–2487
- [25] M. Hairer and J. Mattingly, *Spectral gaps in Wasserstein distances and the 2D stochastic Navier-Stokes equations*, The Annals of Probability **36** (2008), no 6, pp. 2050–2091
- [26] M. Hairer, *Ergodic properties of a class of non-Markovian processes*, ‘Trends in Stochastic Analysis’, LMS Lecture Notes Series 353
- [27] M. Hairer, A. Stuart and J. Voß, *Sampling conditioned diffusions*, ‘Trends in Stochastic Analysis’, LMS Lecture Notes Series 353

- [28] M. Hairer and J. Mattingly, *Slow energy dissipation in anharmonic oscillator chains*, Commun. Pure Appl. Math. **62** (2009), no 8, pp. 999–1032
- [29] M. Hairer, *How hot can a heat bath get?*, Commun. Math. Phys. **292** (2009), no 1, pp. 131–177
- [30] R. F. Bass, K. Burdzy, Z.-Q. Zheng, and M. Hairer, *Stationary distributions for diffusions with inert drift*, Probab. Theo. Rel. Fields **146** (2010), no 1, pp. 1–47
- [31] M. Hairer, J. Mattingly, and M. Scheutzow, *Asymptotic coupling and a weak form of Harris’ theorem with applications to stochastic delay equations*, Probab. Theo. Rel. Fields **149** (2010), no 1–2, pp. 223–259
- [32] M. Hairer and A. Majda *A simple framework to justify linear response theory*, Nonlinearity **23** (2010), no 4, pp. 909–922
- [33] M. Hairer and C. Manson *Periodic homogenization with an interface: the one-dimensional case*, Stoch. Proc. Appl. **120** (2010), no 8, pp. 1589–1605
- [34] M. Hairer, A. Stuart, and J. Voß *Sampling Conditioned Hypocoelliptic Diffusions*, Ann. Appl. Probab. **21** (2010), no 2, pp. 669–698
- [35] M. Hairer and C. Manson *Periodic homogenization with an interface: the multi-dimensional case*, Ann. Probab. **39** (2011), no 2, pp. 648–682
- [36] M. Hairer *Singular perturbations to semilinear stochastic heat equations*, Probab. Theo. Rel. Fields (2011; online first)
- [37] M. Hairer and J. Mattingly *Yet another look at Harris’ ergodic theorem for Markov chains*, Ascona proceedings, (2008)
- [38] M. Hairer and N. S. Pillai *Ergodicity of hypoelliptic SDEs driven by fractional Brownian motion*, Annals IHP, Ser B. (2010)
- [39] M. Hairer and J. Mattingly *A Theory of Hypocoellipticity and Unique Ergodicity for Semilinear Stochastic PDEs*, Electron. J. Probab, **16** (2011), pp. 658–738
- [40] M. Hairer and J. Voss *Approximations to the Stochastic Burgers Equation*, Journ. Nonlin. Sci. (2011; online first)
- [41] M. Allman, V. Betz, and M. Hairer *A chain of interacting particles under strain*, Stoch. Proc. Appl. **121** (2011), no 9, pp. 2014–2042
- [42] M. Hairer *Rough stochastic PDEs*, Commun. Pure Appl. Math. **64** (2011), no 11, pp. 1547–1585

Proceedings articles

- [43] E. Hairer and M. Hairer, *GniCodes - Matlab programs for geometric numerical integration. Frontiers in Numerical Analysis (Durham 2002)*, Springer, Berlin, 2003.
- [44] M. Hairer, *Coupling stochastic PDEs*, Proceedings of the ICMP, 2003

- [45] D. Blömker and M. Hairer, *Amplitude Equations for SPDEs: Approximate Centre Manifolds and Invariant Measures*, Proceedings of the IMA (2003)
- [46] M. Hairer and C. Manson *Periodic homogenization with an interface*, Proceedings of ISAAC 2009
- [47] M. Hairer *Hypoellipticity in Infinite Dimensions*, Proceedings of ISAAC 2009

Articles in press

- [48] M. Hairer and J. Maas *A spatial version of the Itô-Stratonovich correction*, Ann. Probab. (2011), to appear
- [49] M. Hairer *On Malliavin's proof of Hörmander's theorem*, Bull. Sci. Math. (2011), to appear
- [50] M. Hairer and H. Weber *Rough Burgers-like equations with multiplicative noise*, Probab. Theo. Rel. Fields (2011), to appear

Submitted articles

- [51] N. Bou-Rabee and M. Hairer *Non-asymptotic mixing of the MALA algorithm*, Preprint (2010)
- [52] M. Hairer and N. S. Pillai *Regularity of Laws and Ergodicity of Hypoelliptic SDEs Driven by Rough Paths*, Preprint (2011)
- [53] M. Hairer *Solving the KPZ equation*, Preprint (2011)

Unpublished notes

- [54] M. Hairer, *A probabilistic argument for the controllability of conservative systems*, Unpublished note (2007).
- [55] M. Hairer, *Ergodic properties of Markov processes*, Unpublished lecture notes (2005).
- [56] M. Hairer, *Ergodic Theory for Stochastic PDEs*, Unpublished lecture notes (2008).
- [57] M. Hairer, *Introduction to Stochastic PDEs*, Unpublished lecture notes (2009).

Theses

- [58] M. Hairer, *Systèmes Mécaniques Couplés à des Bains Thermiques de Températures Différentes*, Diploma Thesis, University of Geneva, 1998
- [59] M. Hairer, *Comportement Asymptotique d'Équations à Dérivées Partielles Stochastiques*, PhD Thesis, University of Geneva, 2001

Invited talks at conferences and seminars (from 2006)

- 13/01/2006 Bonn Stochastic Days 2006, Bonn
- 25/01/2006 Probability seminar, ETH Zurich
- 03/03/2006 Probability seminar, Bath
- 04/04/2006 *Stochastic Partial Differential Equations*, Pisa
- 24/04/2006 Stochastic Analysis seminar, Oxford
- 26/04/2006 East Midlands Stochastic Analysis seminar, York
- 18/05/2006 Stochastic Analysis seminar, Imperial College London
- 13/06/2006 Probability Seminar, Toulouse, France
- 17/07/2006 *Stochastic Processes and Applications*, Paris V
- 26/07/2006 *Stochastic Fluid Mechanics and SPDEs*, Scuola Normale, Pisa
- 19/09/2006 *Computational Aspects of SPDEs*, Salzburg
- 31/10/2006 SFB-Seminar, Bonn
- 15/12/2006 Numerical analysis seminar, Berlin
- 24/01/2007 *Dynamics and statistics of non-equilibrium phenomena*, IHP Paris
- 15/02/2007 Stochastic analysis seminar, Loughborough
- 24/02/2007 *Multiscale Analysis and Computations in Stochastic Differential Equation Modelling*, Sussex
- 26/03/2007 *Stochastic Dynamical Systems and Control*, MSRI Berkeley
- 21/04/2007 *Stochastic Analysis, Stochastic Differential Geometry and Applications*, Swansea
- 22/05/2007 *Partial differential equations and fluid mechanics*, Warwick
- 06/06/2007 *Functional inequalities: Probabilities and PDEs*, Paris
- 20/06/2007 *Stochastic Analysis and Related Fields*, Toulouse
- 22/06/2007 *Séminaire Hypatie*, Marseille
- 03/07/2007 *Recent Developments in Random Walks*, Durham
- 11/08/2007 *EquaDiff*, Vienna (**Plenary Talk**)
- 11/09/2007 *Stochastic Partial Differential Equations*, Mittag-Leffler institute
- 20/09/2007 Seminar, Mittag-Leffler institute
- 22/10/2007 Stochastic Analysis seminar, Oxford
- 24/10/2007 Applied mathematics seminar, ETH Zurich
- 26/10/2007 Theoretical Physics seminar, Geneva
- 12/11/2007 *Particle systems, nonlinear diffusions, and equilibration*, Bonn
- 28/11/2007 Applied mathematics seminar, Courant Institute, New York
- 29/11/2007 Dynamical systems seminar, Courant Institute, New York
- 26/03/2008 *British Mathematical Colloquium* (splinter session), York
- 14/04/2008 Mathematical Physics Seminar, Geneva
- 18/04/2008 Berlin Leipzig Seminar, Analysis / Probability Theory, Leipzig
- 16/06/2008 Analysis Seminar, Reims
- 15/07/2008 *European Congress of Mathematics*, Amsterdam
- 22/08/2008 Stochastic Analysis seminar, Campinas
- 27/08/2008 *Workshop on Stochastic Modelling*, Ribeirão Preto
- 09/09/2008 Analysis seminar, Campinas
- 20/11/2008 Stochastic Analysis seminar, Sheffield
- 08/12/2008 Continuum mechanics seminar, NCMM Prague

10/12/2008 *Workshop on Mathematical Analysis of Fluid Models*, NCMM
Prague

16/12/2008 PDE seminar, Prague

02/03/2009 Dynamical Systems seminar, Courant Institute, New York

05/03/2009 Colloquium, University of Connecticut

03/04/2009 Probability seminar, Courant Institute, New York

10/04/2009 Probability seminar, Rochester University

28/04/2009 Mathematics colloquium, Brown University

01/05/2009 *Princeton - Columbia probability day*, New York

13/05/2009 Analysis seminar, Institute of Advanced Studies, Princeton

29/05/2009 *East Midlands Stochastic Analysis Seminar*, York

10/06/2009 *Workshop on Random Dynamical Systems*, Tianjing

20/06/2009 *Conference on Scientific Computing*, Geneva

15/07/2009 *ISAAC 2009*, Imperial College London

29/07/2009 *Stochastic Processes and Applications*, Berlin

06/10/2009 Probability Seminar, Brown

13/10/2009 ORFE Seminar, Princeton

05/11/2009 Mathematics colloquium, Kansas

08/12/2009 *SIAM conference on analysis of PDEs*, Miami

05/01/2010 *Stochastic Partial Differential Equations*, Cambridge

20/01/2010 Stochastic analysis seminar, Warwick

02/03/2010 *GOCS 2010*, Leipzig

26/03/2010 *GAMM 2010*, Karlsruhe (**Plenary Talk**)

07/04/2010 *Rough Paths, SPDEs and Related Topics*, Cambridge

11/06/2010 *Rough paths in interaction*, IHP Paris

16/06/2010 *Coherent structures in evolutionary equations*, Leiden

22/06/2010 *COCO 2010*, Madrid

13/08/2010 *ICM Satellite conference in Probability and Stochastic Processes*,
Bangalore

09/09/2010 *SPA 2010*, Osaka (**Plenary Talk**)

05/10/2010 *Probability and Geometry*, Dijon

02/11/2010 *Dissipative systems*, TU Wien

10/11/2010 Mathematics colloquium, Osnabrück

18/11/2010 Mathematics colloquium, Bordeaux

23/11/2010 Mathematics colloquium, Augsburg

02/02/2011 *Random Media: Homogenization and Beyond*, Los Angeles

02/02/2011 *Congress RSME-2011*, Avila

09/03/2011 *Mathematical challenges in molecular dynamics*, Imperial College

11/03/2011 Probability theory seminar, Bath

20/03/2011 *International Conference on Malliavin Calculus and Stochastic
Analysis*, Lawrence

07/04/2011 *Workshop on the Fourier Law and Related Topics*, Toronto

25/05/2011 *Seventh Seminar of Stochastic Analysis, Random Fields and Appli-
cations*, Ascona (**Plenary Talk**)

20/06/2011 *SPA 2011*, Oaxaca

29/06/2011 *Coarse-graining of many-body systems: analysis, computations
and applications*, Heraklion

29/07/2011 *Stochastic Analysis: A UK-China Workshop*, Loughborough

09/09/2011 *ICSAA 2011*, Bonn (**Plenary Talk**)

13/09/2011 *Stochastic Partial Differential Equations*, ETH Zurich

19/09/2011 *Foundations of Stochastic Analysis*, Banff

Awards and achievements outside of academia

- 1989 Distinction “Very Good” for the work “REDO: Résolution d’Équations Différentielles Ordinaires” at the Swiss national contest for young scientists.
- 1990 Distinction “Excellent” for the work “ElectroSim: Simulation de circuits électriques sur Macintosh” at the Swiss national contest for young scientists. This work was selected to represent Switzerland at the European Community Contest for Young Scientistst.
- 1991 The program “ElectroSim” is distinguished with the “COMETT Award” at the third European Community Contest for Young Scientistst in Zürich.
- 1994 Distinction “Excellent” for the work “Amadeus: traitement et analyse de sons sur Macintosh” at the Swiss national contest for young scientists.
- 1997– present Development of the Macintosh sharewares “Amadeus II” and “Amadeus Pro”. These popular sound editors are used by more than 50’000 private and professional registered users worldwide, including many schools and universities.
- 2000 Development of a \LaTeX to $\mathcal{A}\mathcal{M}\mathcal{S}\text{-}\text{\TeX}$ converter for the journal “L’Enseignement Mathématique”.
- 2001 Development of the \LaTeX document class file `ensmath.cls` that is used by the journal “L’Enseignement Mathématique”.
- 2007 The software “Amadeus Pro” obtains the “MacWorld Editor’s Choice Award”.