

# MARTIN HAIRER

Mathematics Department    Phone: ++44 24 765 28335 (professional)  
The University of Warwick    EMail: M.Hairer@Warwick.ac.uk  
CV4 7AL Coventry    Web: <http://www.hairer.org/>  
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: April 28, 2010

## 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”
- Associate editor for the journal “NoDea”
- Associate editor for the “Journal of Mathematical Analysis and Applications”

## 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

D. Kelly (PhD started November 2009).

C. Manson (PhD started November 2006).

P. Bubak (PhD completed January 2009). Joint supervision with J. Robinson

A. Ohashi (PhD completed October 2006). Joint supervision with P. Ruffino

## Organisation of workshops and seminars

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

## Minicourses

- 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 Technical University, Berlin
- December, 2009 Stochastic and Statistical Methods in Multi-Scale Systems, Shanghai, China

## 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)

## 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 Hypocoelliptic 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*, *Stochastic Analysis and Applications* **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 Hypocoelliptic 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*, *Annals of Maths* **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*, *The Annals of Probability* **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*, *The Annals of Probability* **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*, *Annals of Applied Probability* **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.* **68** (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. Theory Rel. Fields* (2010; online first)
- [32] M. Hairer and A. Majda *A simple framework to justify linear response theory*, *Nonlinearity*, 2010

### Proceedings articles

- [1] E. Hairer and M. Hairer, GniCodes - Matlab programs for geometric numerical integration. *Frontiers in Numerical Analysis (Durham 2002)*, Springer, Berlin, 2003.
- [2] M. Hairer, *Coupling stochastic PDEs*, Proceedings of the ICMP, 2003
- [3] D. Blömker and M. Hairer, *Amplitude Equations for SPDEs: Approximate Centre Manifolds and Invariant Measures*, Proceedings of the IMA (2003)

- [4] M. Hairer and C. Manson *Periodic homogenization with an interface*, Proceedings of ISAAC 2009
- [5] M. Hairer *Hypoellipticity in Infinite Dimensions*, Proceedings of ISAAC 2009

### Articles in press

- [1] M. Hairer and J. Mattingly *Yet another look at Harris ergodic theorem for Markov chains*, Preprint (2008)
- [2] M. Hairer and C. Manson *Periodic homogenization with an interface: the one-dimensional case*, Preprint (2009)
- [3] M. Hairer, A. Stuart, and J. Voß *Sampling Conditioned Hypoelliptic Diffusions*, Preprint (2009)

### Submitted articles

- [1] M. Hairer and J. Mattingly *A Theory of Hypoellipticity and Unique Ergodicity for Semilinear Stochastic PDEs*, Preprint (2008)
- [2] M. Hairer and C. Manson *Periodic homogenization with an interface: the multi-dimensional case*, Preprint (2009)
- [3] M. Hairer and N. S. Pillai *Ergodicity of hypoelliptic SDEs driven by fractional Brownian motion*, Preprint (2009)
- [4] M. Hairer *Singular perturbations to semilinear stochastic heat equations*, Preprint (2010)

### Unpublished notes

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

### Theses

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

### Invited talks at conferences and seminars (from 2005)

- 04/03/2005 East Midlands Stochastic Analysis seminar, University of Hull
- 21/03/2005 Institute colloquium, Chinese Academy of Science, Beijing, China
- 24/03/2005 Applied Mathematics seminar, Chinese Academy of Science, Beijing
- 31/03/2005 Miniworkshop on the stochastic Navier-Stokes equations and related topics, Wuhan, China
- 20/04/2005 *Dynamics and Fluctuations in Extended Systems*, IHP Paris. Title of talk: 'Ergodic properties of the 2D Navier-Stokes equations'
- 08/05/2005 Swiss Probability Seminar, Bern
- 25/05/2005 *SIAM Conference on Applications of Dynamical Systems*, Snowbird, USA, Title of talk: 'Ergodicity and Stochastic PDEs'
- 06/08/2005 *New Directions In Probability Theory*, Minneapolis, USA, Title of talk: 'Stochastic modulation equations'
- 22/11/2005 Probability seminar, Cambridge
- 08/12/2005 Probability seminar, Toulouse, France
- 22/12/2005 Colloquium, Institute of Statistics, Bangalore, India
- 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*, Scuola Normale, Pisa, Italy, Title of talk: 'A spectral gap for the stochastic Navier-Stokes equations'
- 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*, Hausdorff Center, 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

## 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.
- 1997–2007 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  $\text{\LaTeX}$  to  $\mathcal{A}\mathcal{M}\mathcal{S}\text{-}\text{\TeX}$  converter for the journal “L’Enseignement Mathématique”.
- 2001 Development of the  $\text{\LaTeX}$  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’.