

CURRICULUM VITÆ

Personal Data

Name: **Cristian Giardinà**

Position: *Full Professor in Mathematical Physics* (2017 –)
Modena & Reggio Emilia University,

Visiting Professor in Probability (2015 – 2020)
Delft University, The Netherlands.

Address: Dipartimento di Scienze Fisiche, Informatiche e Matematiche
via Giuseppe Campi, 213/b
41125 Modena

Phone: +39-347-6515626

E-mail address: cristian.giardina@unimore.it

Homepage: <http://www.ccbss.unimore.it/giardina>

Date of Birth: October 24, 1973

Nationality: Italian

Education

- Ph.D. in Theoretical and Mathematical Physics
09/03/2001, Università di Bologna (Italy).
Thesis Advisor: Prof. S. Graffi.
Thesis Title: “Random and deterministic spin models with glassy behavior”
- Laurea in Physics
19/07/1997, Università di Bologna (Italy).
Grade: 110/110 *cum laude*.
Thesis Advisor: Prof. R. Livi.
Thesis Title: “Dynamical and thermodynamical properties of non-linear oscillators chains”

Positions Held

- 2011 - 2014: *Visiting Professor in Probability*, Radboud Nijmegen University, The Netherlands.
- 2010 - 2016: *Associate Professor in Mathematical Physics*, Modena & Reggio Emilia University, Italy
- 2006 - 2009: *Assistant Professor in Probability*, Department of Mathematics and Computer Science, Eindhoven University, The Netherlands.
- 2005 - 2006: *Post-Doc*, EURANDOM, European Institute for Probability, Statistics, Operational Research, Eindhoven, The Netherlands.
- 2002 - 2004: *Post-Doc*, Department of Mathematics, University of Bologna, Italy.
- 2001 - 2001: *Visiting Scientist*, Physics Department, Brown University, Providence, USA.

Summary of research activity

- Research activity in Statistical Mechanics, Mathematical Physics and Probability Theory: interacting particle systems, non-equilibrium statistical mechanics, spin glasses, random graphs.
- Author of 74 publications (2 monographs, 62 papers published on international refereed journals, 10 submitted).
- Monographs:
 - *Free boundary problems in PDEs and particle systems* with G. Carinci, A. De Masi, E. Presutti, Springer Briefs in Mathematical Physics (2016)
 - *Perspective on spin glasses*, with P. Contucci, ISBN: 9780521763349, Cambridge University Press (2012).
- Invited speaker to about 50 international conferences and 40 invited seminars to universities.

Funded Research Projects

- Co-investigator (PI Frank den Hollander, Co-PI Frank Redig) of the research project “Duality for Interacting Particle Systems”, funded by Dutch research funding agency (NWO). Duration 2018 – 2021.
- Scientific Coordinator of the XXXIV Doctoral Program in Mathematics at Modena and Reggio Emilia University, funded by Italian funding agency (MIUR). Duration 2018 – 2021.
- Scientific Coordinator of the XXXIII Doctoral Program in Mathematics at Modena and Reggio Emilia University, funded by Italian funding agency (MIUR). Duration 2017 – 2020.
- Scientific Coordinator of the XXXII Doctoral Program in Mathematics at Modena and Reggio Emilia University, funded by Italian funding agency (MIUR). Duration 2016 – 2019.
- Principal Investigator of the FIRB-research project “Stochastic processes in interacting particle systems: duality, metastability and their applications”, funded by Italian funding agency (MIUR). Duration 2012 – 2016.
- Principal investigator of the research project “Competitions and cooperation in biological and social systems: the statistical mechanics approach”, funded by Cassa di Risparmio di Modena. Duration 2010 – 2012.
- Dutch coordinator of European COST-Action MP081: “Physics of competition and conflicts”. Duration 2008 – 2013.
- Principal investigator of three research projects funded by Gruppo Nazionale Fisica Matematica (GNFM):
 - 2008: Stability of ordered phase for disordered systems.
 - 2007: Disordered systems and random graphs.
 - 2006: Spin glasses with short-range interactions.
- Participant to other research programs:
 - Phase Transitions and Fluctuation Phenomena for Random Dynamics in Spatially Extended Systems (RDSES), funded by European Science Foundation, coordinator F. den Hollander (2002 – 2007)

- Random Geometry of Large Interacting Systems and Statistical Physics (RGLIS), funded by European Science Foundation, coordinator Vlasov Sidoravichius (2010 – 2015).
- Dynamical systems: classical, quantum, stochastic, funded by Italian research funding agency (MIUR), 3 consecutive 2-year research programs (Cofin), coordinator G. Jona-Lasinio (2004, 2002, 2000).

Summary of Teaching Activity

- Since 2006 courses taught at Eindhoven University (The Netherlands), Modena and Reggio Emilia University (Italy), Nijmegen University (The Netherlands).
 - undergraduate courses: Probability and Statistics, Calculus,
 - master and PhD courses in: Stochastic processes, Applied probability theory, Statistical Mechanics, Spin glasses, Interacting Particle Systems
 - Author of lecture notes for a course of “Large deviations and Statistical Mechanics”.
 - In the period 2002-2005: instructions at Bologna University.

Supervision of students and Post-doc’s

Since 2007, I have supervised 10 Masters thesis, 6 Ph.D. thesis, 4 Postdocs. This includes:

- Elena Magnanini, *PhD student* at Modena University 2016 – 2018, co-supervised with C. Giberti. Research topic: Cloning algorithm and large deviations in random graphs.
- Chiara Franceschini, *PhD student* at Modena University 2015 – 2017, 2 joint papers. Research topic: Duality and interacting particle systems.
- Gioia Carinci, *Post-Doc* at Modena University, 2012 – 2016, 7 joint papers. Research topic: Duality theory and its applications.
- Carlos Peres Espigarez, *Post-Doc* at Modena University, 2014 – 2015, 1 joint paper. Topic: Fluctuation Theorems.
- Maria-Luisa Prioriello, *PhD student* at Modena University (double degree at Eindhoven University) 2012 – 2015, co-supervised with R. van der Hofstad and

C. Giberti, 3 joint papers. Research topic: Central limit theorems for Ising model on random graphs.

– Sander Dommers, *PhD student* at Eindhoven Technical University, 2009-2012, co-supervised with R. van der Hofstad, 5 joint papers. Research topic: Ising model on power law random graphs.

– Bauke Conijn, Thijs Laarhoven: supervised 2 master projects at Eindhoven Technical University (2008 – 2009).

– Alessandra Bianchi (2 joint papers), Brenda Pagannone, Daniela Cipolloni, Andrea Cerri: co-supervised 4 Laurea (Master) theses at Bologna University in the period 2002 – 2004.

Organized conferences

- Organizer (with E. Baake, F. Redig) of the conference *Population dynamics and statistical physics in synergy II*, 01 – 03 April (2019), Centro di Ricerca Matematica E. De Giorgi, Pisa, Italy.

Description: an international conference with 15 invited participants. Funded by DFG Priority Program

<http://crm.sns.it/event/443/>

- Organizer (with J.P. Bouchaud, P. Contucci, P. Nolin, V. Sidoravicius, V. Vargas) of the IHP trimester *Disordered systems, random spatial processes and some applications*, 05 January – 03 April (2015), Paris.

Description: A three months program at Institute Henri Poincare, with a pre-school at CIRM (Luminy), three workshops and various mini courses.

www.random15.unibo.it

- Organizer (with A. Greven, F. Den Hollander) of the conference *Population dynamics and statistical physics in synergy*, 25 – 29 August (2014), Eindhoven, The Netherlands.

Description: an international conference with 20 invited participants. Funded by DFG Priority Program

www.eurandom.tue.nl

- Organizer (with P. Contucci, C. Giberti, C. Vernia) of the conference *Disorder in Probability and Statistical Mechanics*, 25 – 29 June (2012), Modena, Italy.

Description: an international conference with 50 invited participants. Funded by ESF (European Science Foundation), FIRB (Italian Ministero Università), NSF (National Science Foundation), Fondazione Cassa di Risparmio Modena.
www.stochastics.unimore.it

- Organizer (with A. Scharnhorst, P. Richmond) of the 3rd annual meeting of the *COST Action MP0801*, 18-20 May (2011), Eindhoven, The Netherlands.

Description: an international conference with 44 invited participants, funded by COST (European coordination in science and technology).

- Organizer (with A. Bovier, P. Contucci, F. Den Hollander) of the conference “*Statistical Mechanics of Random Structures*”, 15-20 November (2009), Banff, Canada.

Description: an international conference with 42 invited participants. Funded by BIRS, Banff International Research Station.

- Organizer (with P. Contucci) of the workshop: “*Statistical Mechanics and Applications II*”, Eindhoven, The Netherland, 16 – 28 July 2008.

Description: a research meeting with 15 participants, funded by Bologna University and EURANDOM.

- Organizer (with P. Contucci) of the conference “*YEP V - Young European Probabilists*”, 10 – 14 March 2008, Eindhoven, The Netherlands.

Description: a school (2 minicourses, 5 invited key-note speaker) for 60 participant. Funded by EURANDOM (European Institute for Statistics, Probability, Stochastic Operations Research and their Applications), KNAW (Royal Dutch Academy of Art and Science), NWO (Dutch Organization for Scientific Research), Stieltjes Institute for Mathematics.

Editorial services

- Co-Editor in Chief of *Mathematical Physics, Analysis and Geometry* (2014 –)
- Member of the Editorial Board of *Journal of Statistical Physics* (2013 – 2018).
- Member of the Editorial Board of *Advances in Mathematical Physics* (2011 – 2014).

- Guest Editor of Special Issue of Journal Mathematical Physics: *Statistical Mechanics on Random Structures* (2008).

Peer review/Evaluation experience

- Referee for *Valutazione della Qualità della Ricerca, VQR 2011–2014* (this is the peer-reviewed evaluation of the research results of Italian universities).
- Referee of projects for the call *FIRB 2013 — Futuro in Ricerca* funded by MIUR, Italian Research Funding Agency (this is the most competitive Italian call for excellent young researcher, similar to ERC Starting grant funded by European Research Council).
- Referee of projects for the call *PRIN 2012* funded by MIUR, Italian Research Funding Agency (this is the most competitive Italian call for excellent senior researcher, similar to Advanced grant funded by European Research Council).
- Proposal Reviewer per International Centre for Mathematical Science, Edinburgh (2012).
- Since 2012, referee activity for several international peer-reviewed scientific journals, including: *Advances in Mathematical Physics*, *Annals of Probability*, *Annals of Applied Probability*, *Communication in Mathematical Physics*, *Electronic Communication in Probability*, *Electronic Journal of Probability*, *Far East Journal of Dynamical Systems*, *Internet Mathematics Journal of Mathematical Physics*, *Journal of Physics A*, *Journal of Statistical Physics*, *Physical Review Letters*, *Physical Review B*, *Physical Review E*, *Probability Theory and Related Fields*, *Stochastic processes and applications*.

Academic services

- *Scientific coordinator of the Doctoral Program 2015 – 2018 in Mathematics* at Modena and Reggio Emilia University. The program is run jointly with Parma and Ferrara universities and it is open to students who are interested in a career in academic research and teaching, as well as in the private and public sectors. Doctoral students attend courses in their areas of specialization, perform an extensive period of research in collaboration with their supervisor and finally they

write and defend a doctoral thesis. The Universities of Modena/Reggio Emilia, Parma and Ferrara offer a wide training in mathematics and its applications. About 60 scholars in pure and applied mathematics are member of the PhD board, with a strong expertise in fields as diverse as partial differential equations, probability theory and stochastic processes, geometry and combinatorics, numerical analysis and scientific computation, number theory, mathematical physics.

- Member of *Presidio di Qualità* at Modena e Reggio Emilia University, nominated by the Boards of Director, 2013 – 2016.

- Member of PhD committees
 - Warwick University (2019), thesis defended by F. Sau
 - Warwick University (2018), thesis defended by A. Pizzoferrato
 - Eindhoven University (2017), thesis defended by E. Baroni
 - Eindhoven University (2016), thesis defended by M.L. Prioriello
 - Member of the selection committee for the PhD program of year 2014 for the University of Modena, University of Parma and University of Ferrara.
 - Roma La Sapienza University (2014), thesis defended by D. Tantari
 - Eindhoven University (2013), thesis defended by S. Dommers
 - Delft University (2012), thesis defended by F. Voellering
 - Leiden University (2011), thesis defended by K. Vafayi

Honors and awards

- Fellow of “Fondazione A. Della Riccia” in 2001 e 2002.
- Permanent Scientific Associate EURANDOM, 2007–2012.

Research Activity

My work covers different problems in Probability and Mathematical Physics, in particular applications to Statistical Mechanics (both Equilibrium and Out-of-Equilibrium).

- *Interacting particle systems*
 - Hydrodynamic limit of interacting particle systems with topological interaction; free boundary problem with mass conservation.
 - Duality between stochastic processes.
 - Non-equilibrium steady states, exact computation of correlation functions, exclusion and inclusion processes.
 - Stationary transport, localization and relaxation phenomena in anharmonic lattices. Heat conduction in low dimensional systems. Fourier law.
 - Application to mathematical population genetics.
- *Rare Events and Large Deviation*
 - Exponential law for waiting and hitting times. Relative entropy for continuous time process and Ornstein-Weiss theory.
 - The Cloning Algorithm to evaluate large deviations functions.
- *Random graphs*
 - Exact solutions of models of spin models on random graphs.
 - Comparison of quenched and annealed state in the configuration model and in the generalized random graph model.
- *Disordered systems: spin-glasses*
 - The Sherrington-Kirkpatrick model. Existence of thermodynamic limit for correlated gaussian random energy models. Variational bounds. Generalized Random Energy models.
 - The Edwards-Anderson model. Numerical study of overlap equivalence, ultrametricity, decay of correlation, interfaces.
 - Probability distribution for the overlap. Stochastic stability and Ghirlanda-Guerra identities.
 - Stochastic dynamics for disordered systems. Greedy and reluctant dynamics at zero temperature.
 - Random and deterministic spin models with glassy behavior. Metastable states. Sine model. Random orthogonal model.

- *Other topics*

- High Temperature Superconductivity: Gauge Glass. Vortex glass. Phase diagram. Limit of strong screening. Combinatorial Optimization.
- Differential geometry approach to microcanonical ensemble. Equivalence of ensembles. Strong Stochasticity Threshold in many-body Hamiltonian systems. Fermi-Pasta-Ulam problem. Ergodicity and chaos.
- Application of statistical mechanics and mathematical modelling to complex systems in economy. Random matrix theory and finance. Portfolio optimization in future markets. Short-selling.

Publications

1. Consistent particle systems and duality
(in collaboration with G. Carinci, F. Redig)
preprint arXiv: 1907.10583
2. Stationary states in infinite volume with non zero currents
(in collaboration with G. Carinci, E. Presutti)
preprint arXiv: 1906.06120
3. Annealed Ising model on configuration models
(in collaboration with V.H. Can, C. Giberti, R. van der Hofstad)
preprint arXiv: 1904.03664
4. Non-compact quantum spin chains as integrable stochastic particle processes
(in collaboration with R. Frassek, J. Kurchan)
preprint arXiv: 1904.01048
5. Orthogonal duality of Markov processes and unitary symmetries
(in collaboration with G. Carinci, C. Franceschini, W. Groenevelt, F. Redig)
Symmetry, Integrability and Geometry: Methods and Applications (SIGMA) **15**
(2019), 053, 27 pages.
6. The non-equilibrium Ising model in two dimensions: a numerical study
invited contribution to Inhomogenous Random Systems IRS2018, Paris
to appear on *Markov Processes and Related Fields* (2020).

7. Self-duality of Markov processes and intertwining functions
(in collaboration with C. Franceschini, W. Groenevelt)
Mathematical Physics, Analysis and Geometry 21: 29 (2018).
8. Exact formulas for two interacting particles and applications in particle systems
with duality
(in collaboration with G. Carinci, F. Redig)
preprint arXiv: 1711.11283
9. Large deviations for the annealed Ising model on inhomogeneous random graphs:
spins and degrees
(in collaboration with S. Dommers, C. Giberti, R. van der Hofstad)
Journal of Statistical Physics **173**, 1045 – 1081 (2018)
10. Stochastic duality and orthogonal polynomials
(in collaboration with C. Franceschini)
preprint arXiv:1701.09115
to appear on *Soujourns in Probability and Statistical Physics*, in honor of the
70th birthday of C. Newman
11. Non-equilibrium 2D Ising model with stationary uphill diffusion
(in collaboration with M Colangeli, C. Giberti, C. Vernia)
Physical Review E, **97**, 030103(R) (2018).
12. Metastability in the reversible inclusion process
(in collaboration with A. Bianchi, S. Dommers)
Electronic Journal of Probability, Vol. **22**, paper no. 70, 1–34 (2017).
13. **Monograph:**
Free boundary problems in PDEs and particle systems
(in collaboration with Gioia Carinci, Anna De Masi, Errico Presutti)
ISBN: 978-3-319-33369-4 (Print) 978-3-319-33370-0 (Online)
SpringerBrief in Mathematical Physics (2016).
14. Ising critical behavior of inhomogeneous Curie-Weiss and annealed random
graphs
(in collaboration with S. Dommers, C. Giberti, R. van der Hofstad, M.L. Prior-
iello)
Communications in Mathematical Physics, Vol. **348**, No. 1, 221–263 (2016).
15. Annealed central limit theorems for the Ising model on random graphs
(in collaboration with C. Giberti, R. van der Hofstad, M.L. Prioriello)

ALEA, Latin American Journal of Probability and Statistics , vol. **XIII**, 121–161 (2016)

16. Asymmetric stochastic transport models with $U_q(su(1,1))$ symmetry
(in collaboration with G. Carinci, F. Redig, T. Sasamoto)
Journal of Statistical Physics **163**, 239–279 (2016)
17. A generalized Asymmetric Exclusion Process with $U_q(sl_2)$ stochastic duality
(in collaboration with G. Carinci, F. Redig, T. Sasamoto)
Probability Theory and Related Fields **166**, 887–933 (2016)
18. **Edited Volume:**
Advances in Disordered Systems, Random Processes and Some Applications,
P. Contucci and C. Giardinà, eds.
ISBN: 9781107124103
Cambridge University Press (2016).
19. The spatial fluctuation theorem
(in collaboration with C.P. Espigarez, F. Redig)
Journal of Physics A: Math. Gen. **48** 35FT01, 9 pages (2015)
20. Quenched central limit theorems for the Ising models on random graphs
(in collaboration with C. Giberti, R. van der Hofstad, M.L. Prioriello)
Journal of Statistical Physics **160**, 1623–1657 (2015)
21. Super-hydrodynamic limit in interacting particle systems
(in collaboration with G. Carinci, A. De Masi, E. Presutti)
Journal of Statistical Physics Vol. **155**, 867–887 (2014)
22. Hydrodynamic limit in a particle system with topological interactions
(in collaboration with G. Carinci, A. De Masi, E. Presutti)
Arabian Journal of Mathematics **3**, 381–417 (2014)
23. Dualities in population genetics: a fresh look with new dualities
(in collaboration with G. Carinci, C. Giberti, F. Redig)
Stochastic Processes and their Applications **125**, No. 3, 941–969 (2014)
24. Ising critical exponents on random trees and graphs
(in collaboration with S. Dommers, R. van der Hofstad)
Communications in Mathematical Physics, Vol. **328**, No. 1, 355–395 (2014).

25. Energy-exchange stochastic models for non-equilibrium
(in collaboration with C. Franceschini)
preprint arXiv:1410.3661
26. Global solutions of a free boundary problem via mass transport inequalities
(in collaboration with G. Carinci, A. De Masi, E. Presutti)
preprint arXiv:1402.5529
27. Duality for stochastic models of transport
(in collaboration with G. Carinci, C. Giberti, F. Redig)
Journal of Statistical Physics Vol. **152**, No. 4, 657–697 (2013).
28. Interaction flip identities for non-centered spin glasses
(in collaboration with P. Contucci, C. Giberti)
Journal of Mathematical Physics Vol. **54**, 73301 (2013).
29. Antiferromagnetic Potts model on the Erdos-Rényi random graph
(in collaboration with P. Contucci, S. Dommers, S. Starr)
Communications in Mathematical Physics, Vol. **323**, No. 2, 517–554 (2013).
30. **Monograph:**
Perspectives on spin glasses
(in collaboration with P. Contucci)
ISBN: 9780521763349, Cambridge University Press (2012).
31. Nonconventional averages along arithmetic progressions and lattice spin systems
(in collaboration with G. Carinci, J.-R. Chazottes, F. Redig)
Indagationes Mathematicae Vol. **23**, 589–602 (2012).
32. Simulating rare events in dynamical processes
(in collaboration with J. Kurchan, V. Lecomte, J. Tailleur)
Journal of Statistical Physics **145**(4), 787–811 (2011).
33. Stability of the Spin Glass Phase under Perturbations
(in collaboration with P. Contucci, C. Giberti)
Europhysics Letters **96**, 17003 (2011)
34. Interface Energy in the Edwards-Anderson model
(in collaboration with P. Contucci, C. Giberti, G. Parisi, C. Vernia)
Journal of Statistical Physics **142**(1), 1–10 (2011)

35. Modeling complex systems with statistical mechanics: the computational approach
(in collaboration with P. Contucci, C. Giberti, C. Vernia)
ERCIM News, **81**, 24–25 (2010)
36. Ising models on power-law random graphs
(in collaboration with S. Dommers, R. van der Hofstad)
Journal of Statistical Physics Vol. **141**, No. 4, 638-660 (2010)
37. Correlation Inequalities for Interacting Particle Systems with Duality
(in collaboration with F. Redig, K. Vafayi)
Journal of Statistical Physics Vol.141, No. 2, 242-263 (2010)
38. Spin Glass Identities and the Nishimori Line
(in collaboration with P. Contucci, H. Nishimori)
Progress in Probability (Book Series), Vol. **62**, 103-121 (2009)
39. Matching with shift for one dimensional Gibbs measures
(in collaboration with P. Collet, F. Redig)
Annals of Applied Probability, Vol. **19**, No. 4, 1581-1602 (2009)
40. On the structure of correlations in the three dimensional spin glasses
(in collaboration with P. Contucci, C. Giberti, G. Parisi, C. Vernia)
Physical Review Letters **103**, 017201 (2009)
41. Interaction-Flip identities in spin glasses
(in collaboration with P. Contucci, C. Giberti)
Journal of Statistical Physics Vol. **135**, No 5-6, 1181-1203 (2009)
42. Duality and hidden symmetries in interacting particle systems
(in collaboration with J. Kurchan, F. Redig, K. Vafayi)
Journal of Statistical Physics Vol. **135**, No. 1, 25-55 (2009)
43. Thinking transport as a twist
(in collaboration with J. Kurchan)
Journal of Statistical Physics Vol. **135**, No. 5-6, 895-914 (2009)
44. **Edited volume:**
Special Issue: Statistical Mechanics on Random Structures
(in collaboration with P. Contucci, B. Nachergaele)
Journal of Mathematical Physics **49** (2008).

45. Mathematics and Social Science: A Statistical Mechanics Approach to Immigration
(in collaboration with P. Contucci)
ERCIM News, N. 73, 34-35 (2008)
46. Answer to: Comment on Ultrametricity in the Edwards-Anderson Model",
(in collaboration with P. Contucci, C. Giberti, G. Parisi, C. Vernia)
Physical Review Letters 100, 159702 (2008)
47. Duality and exact correlations for a model of heat conduction
(in collaboration with J. Kurchan, F. Redig)
Journal of Mathematical Physics **48**, 033301 (2007)
48. Ultrametricity in the Edwards-Anderson model
(in collaboration with P. Contucci, C. Giberti, G. Parisi, C. Vernia)
Physical Review Letters **99**, 057206 (2007)
49. Variational Bounds for the Generalized Random Energy Model
(in collaboration with S. Starr)
Journal of Statistical Physics **127**, 1-20 (2007)
50. The Ghirlanda-Guerra identities
(in collaboration with P. Contucci)
Journal of Statistical Physics **126**, 917-931 (2007)
51. Relative Entropy and Waiting Times for Continuous Time Random Process
(with J.R. Chazottes and F. Redig),
Electronic Journal of Probability **11** 1049-1068 (2006)
52. Direct Evaluation of Large Deviation Functions
(with J. Kurchan, L. Peliti),
Physical Review Letters **96**, 120603 (2006)
53. Overlap equivalence in the Edwards-Anderson Model
(with P. Contucci, C. Giberti, C. Vernia)
Physical Review Letters **96**, 217204 (2006)
54. Comment on "Both site and link overlap distribution are non-trivial in 3-dimensional Ising spin glass"
(in collaboration with P. Contucci)
preprint (2006) cond-mat/0611138

55. Spin-Glass Stochastic Stability: a rigorous proof,
(with P. Contucci)
Annales Henri Poincare **6**, No. 5, 915 - 923 (2005)
56. Factorization properties in the 3D Edward-Anderson model,
(with P. Contucci)
Physical Review B. **72**, 014456 (2005)
57. Fourier Law in a momentum conserving chain,
(with J. Kurchan)
JSTAT - J. Statistical Mechanics P05009 (2005)
58. Finding Minima in Complex Landscapes: Annealed, Greedy and Reluctant Algorithms, (with P. Contucci, C. Giberti, C. Vernia)
Math. Models and Methods in Applied Science Vol. **15**, No. 9, 1349-1369 (2005)
59. Interpolating Greedy and Reluctant Algorithms,
(with P. Contucci, C. Giberti, F. Unguendoli, C. Vernia)
Optimization Methods and Software Vol. **20**, No. 4/5, 509-514 (2005)
60. Numerical study of random superconductors,
(with N. Akino, J. M. Kosterlitz, N. V. Priezjev)
Physica C Vol. **408-10**, 484-486 (2004)
61. The Thermodynamic Limit for Finite Dimensional Classical and Quantum Disordered Systems, (with P. Contucci, J. Pule')
Rev. Math. Phys. Vol. **16**, No. 5, 629-637 (2004)
62. Optimization Strategies in Complex Systems,
(with L. Bussolari, P. Contucci, C. Giberti, F. Unguendoli, C. Vernia),
Science and Supercomputing at Cineca, Report, pp. 386-390 (2003)
63. Thermodynamic Limit for Mean-Field Spin Models,
(with A. Bianchi, P. Contucci)
Math. Phys. Elec. Journ. Vol. **9**, No.6 (2003)
64. Energy Landscape Statistics of the Random Orthogonal Model,
(with M. Degli Esposti, S. Graffi),
Journ. Phys. A: Math. Gen. **36**, 2983-2994 (2003)
65. Energy-Decreasing Dynamics in Mean-Field Spin Models,
(with L. Bussolari, P. Contucci, M. Degli Esposti),
Journ. Phys. A: Math. Gen. **36**, 2413-2421 (2003)

66. Thermodynamical Limit for Correlated Gaussian Random Energy Models,
(with P. Contucci, M. Degli Esposti, S. Graffi),
Comm. Math. Phys. **236**, 55-63 (2003)
67. Multiple optimal solutions in the portfolio selection model with short-selling,
(with L. Bongini, M. Degli Esposti, A. Schianchi),
Int. Journ. Theor. Appl. Finance **6** 703-720 (2003)
68. Portfolio optimization with short-selling and spin-glass,
(with L. Bongini, M. Degli Esposti, A. Schianchi),
Eur. Journ. Phys. B **27** 263-272 (2002)
69. Screened Vortex Lattice Model with Disorder
(in collaboration with N.V. Priezjev, J. M. Kosterlitz)
preprint (2002) cond-mat/0202487
70. Statistic of energy levels and zero temperature dynamics for deterministic spin
models with glassy behavior,
(with M. Degli Esposti, S. Graffi, S. Isola),
Journ. Stat. Phys. **102**, 1285-1313 (2001)
71. Discrete spin variables and critical temperature in deterministic model with
glassy behavior,
Phys. Rev. E **61**, 3375-3377 (2000)
72. Finite thermal conductivity in 1D lattices,
(with R. Livi, A. Politi, M. Vassalli),
Phys. Rev. Lett. **84**, 2144-2147 (2000)
73. Ergodic properties of microcanonical observables,
(with R. Livi),
Journ. Stat. Phys. **91**, 1027-1045 (1998)

Teaching Activity

- 2019/2020, Modena and Reggio Emilia University
 - *Probabilistic models*, Master course, Physics and Mathematics Department
 - *Classical Statistical Mechanics and Disordered Systems*, Master course, Physics and Mathematics Department

- 2018/2019, Modena and Reggio Emilia University
 - *Probabilistic models*, Master course, Physics and Mathematics Department
 - *Probability and Statistics*, Laurea course, Department of Mathematics
 - *Classical Statistical Mechanics and Disordered Systems*, Master course, Physics and Mathematics Department
- 2017/2018, Modena and Reggio Emilia University
 - *Probability and Statistics*, Laurea course, Department of Mathematics
 - *Classical Statistical Mechanics and Disordered Systems*, Master course, Physics and Mathematics Department
 - *Statistics*, Laurea course, Department of Communication and Economics
- 2016/2017, Modena and Reggio Emilia University
 - *Probabilistic models*, Master course, Physics and Mathematics Department
 - *Probability and Statistics*, Laurea course, Department of Mathematics
 - *Classical Statistical Mechanics and Disordered Systems*, Master course, Physics and Mathematics Department
 - *Statistics*, Laurea course, Department of Communication and Economics
- 2015/2016, Modena and Reggio Emilia University
 - *Classical Statistical Mechanics and Disordered Systems*, Master course, Physics and Mathematics Department
 - *Statistics*, Laurea course, Department of Communication and Economics
- 2014/2015, Modena and Reggio Emilia University
 - *Classical Statistical Mechanics and Disordered Systems*, Master course, Physics and Mathematics Department
 - *Statistics*, Laurea course, Department of Communication and Economics
- 2013/2014, Modena and Reggio Emilia University
 - *Classical Statistical Mechanics and Disordered Systems*, Master course, Physics and Mathematics Department

- *Statistics*, Laurea course, Department of Communication and Economics
- 2012/2013, Modena and Reggio Emilia University
 - *Classical Statistical Mechanics and Disordered Systems*, Master course, Physics and Mathematics Department
 - *Statistics*, Laurea course, Department of Communication and Economics
- 2011/2012, Modena and Reggio Emilia University
 - *Classical Statistical Mechanics and Disordered Systems*, Master course, Physics and Mathematics Department
 - *Statistics*, Laurea course, Department of Communication and Economics
 - *Dynamic of complex systems*, Laurea course, Dep. of Comm. and Econ.
- 2010/2011, Nijmegen University
 - *Spin glasses*, Master course, Physics and Mathematics Department
- 2010/2011, Modena and Reggio Emilia University
 - *Classical Statistical Mechanics and Disordered Systems*, Master course, Physics and Mathematics Department
 - *Statistics*, Laurea course, Department of Communication and Economics
 - *Dynamic of complex systems*, Laurea course, Dep. of Comm. and Econ.
- 2009/2010, Eindhoven University (1st semester)
 - *Stochastic processes*, Master and PhD course, Math. Department
 - *Probability and Statistics*, Pre-Master course, Math. Department
- 2008/2009, Eindhoven University
 - *Stochastic processes*, Master and PhD course, Math. Department
 - *Probability and Statistics*, Pre-Master course, Math Department
 - *Calculus I*, Bachelor course, Math. Department
- 2007/2008, Eindhoven University

- *Stochastic processes*, Graduate course, Math. Department
- *Probability and Statistics*, Pre-Master course, Math Department
- *Application of probability*, Bachelor course, Math. Department
- 2006/2007, Eindhoven University
 - *Stochastic processes*., Graduate course, Math. Department
 - *Probability and Statistics*, Pre-Master course, Math Department
 - *Application of probability*, Bachelor course, Math. Department
- 2004/05, Università di Bologna,
 - *Laboratory of Computational Techniques*, Corso di Laurea in Scienze Biologiche
 - *Calculus*, Corso di Laurea in Chimica,
 - *Applied Probability*, Corso di Laurea in Ingegneria Gestionale,
- 2003/2004, Università di Bologna,
 - *Laboratory of Computational Techniques*, Corso di Laurea in Scienze Biologiche,
 - *Calculus*, Corso di Laurea in Chimica,
- 2002/2003, Università di Bologna,
 - *Laboratory of Computational Techniques*, Corso di Laurea in Scienze Biologiche
 - *Financial Mathematics*, Facoltà di Economia
 - *Non-Linear models and numerical methods*, Master course, Dipartimento di Matematica

Invited Talks and Seminars

- 17–20 August, 2020, Bernoulli-IMS 10th World Congress in Probability and Statistics, Seoul
Invited

- 2–6 December 2019, The 8th Particle systems and Partial Differential Equations (PSPDE) meeting, Lisbon
Invited
- 18–22 November 2019, Workshop on aspects of mathematical physics, Kyoto
Invited
- 13 November 2019, Tokyo Institute of Technology
Invited
- 24–25 June 2019, Mathematical physics of disordered systems, Bologna
Quenched and annealed Ising models on random graphs
- 17–20 June 2019, Second Italian meeting on probability and mathematical statistics, Salerno
Sticky Brownian motion as scaling limit of the inclusion process
- 27–29 May 2019, The 27th Meeting of PhD students in Stochastics in the Netherlands, Hilversum
Minicourse (6 hours): Duality theory of interacting particle systems.
- 19–24 May 2019, Scaling limits of dynamical processes on random graphs, Casa Matematica, Oaxaca
Quenched and annealed Ising models on random graphs
- 10–14 September 2018, Annecy
Recent Advances in Quantum Integrable Systems (RAQUIS18),
An algebraic approach to stochastic duality
- 12 February 2018, Delft University
Non-equilibrium 2D Ising model with stationary uphill diffusion.
- 01 February 2018, Warwick University
Non-equilibrium 2D Ising model with stationary uphill diffusion.
- 23 – 24 January 2018, Inhomogeneous random systems, Paris
Non-equilibrium 2D Ising model with stationary uphill diffusion.
- 27 November – 1 December 2017, Particle systems and PDE's, Nice
Free boundary problems and particle systems
- 17 July - 18 August 2017, Genealogies of Interacting Particle Systems, Institute for Mathematical Sciences, Singapore
Scaling limits of inclusion particles

- 19 – 22 June 2017, First Italian meeting on probability and mathematical statistics, Torino
Duality in population models: an algebraic approach
- 22 February 2017, Dipartimento di Matematica, Università di Roma La Sapienza
The Ising model on random graphs
- 12 - 16 December 2016, Guided Tour in Random Media, Conference in honor of Frank den Hollander 60 birthday, Eurandom, Eindhoven
Dynamical properties of the inclusion process
- 20 April 2016, Dipartimento di Matematica, Università di Ferrara
Ising model on complex networks
- 8 - 19 February 2016, New Approaches to Non-equilibrium and Random Systems, Kavli Institute for Theoretical Physics, Santa Barbara
The asymmetric KMP model, and its duality
- 18 - 22 January 2016, Nonequilibrium: Physics, Stochastics and Dynamical Systems, CIRM, Marseille
Asymmetric dualities
- 25 - 27 November 2015, Opening meeting of the RTG2131 High-dimensional phenomena in probability - fluctuations and discontinuity, Bochum
Ising model on random graphs: results and open problems
- 31 August - 4 September 2015, Meccanica Statistica e Termodinamica di Non-equilibrio, Castel Cellesi, Italy
Current reservoirs in Non-equilibrium systems
- 27 July - 1 August 2015, XVIII International congress of Mathematical Physics, Santiago del Chile
Duality in Interacting Particle Systems: A Lie algebraic approach
- 5 June 2015, Marc Kac Seminar, Utrecht
Stochastic dualities and Lie algebras
- 4 - 8 May 2015, Workshop on Stochastic Processes in Random Media, Singapore
Duality for interacting particle systems modeling non-equilibrium
- 6-7 November 2014, Mini-workshop Duality of Markov processes and applications to spatial population models TU Berlin,
Stochastic dualities and Lie algebras

- 15-27 September 2014, XXXIX Scuola Estiva di Fisica Matematica, Ravello
Minicourse (6 hours): Introduction to interacting particle systems and their duality theory.
- 28 Jul.–1 Aug. 2014, 37th Conference on Stochastic Processes and their Applications, Buenos Aires,
Free boundary random walkers
- 20–25 Jul. 2014, Spin glasses and related topics, BIRS, Banff
Central limit theorems for Ising model on random graphs
- 5–30 May 2014, Advances in Non-equilibrium Statistical Mechanics, Galileo Galilei Institute, Firenze
Minicourse (3 hours): Stochastic energy-exchange models of non-equilibrium
- 29 April 2014, Roma 3 University
Heat conduction models
- 18 September 2013, ERC-Consolidator interview, Brussel, Belgium
Mathematical physical methods for interacting random processes
- 5–9 August 2013, The 2nd workshop on Universality and Scaling Limits in Probability and Statistical Mechanics, Hokkaido University, Japan.
Stochastic models of transport
- 29 July – 3 August 2013, Mathematical Statistical Physics, Kyoto, Japan
Boundary driven interacting particle systems
- 24 June – 26 June 2013, XVIII Convegno di Meccanica Statistica, Parma
Stochastic models of transport
- 30 May – 4 June 2013, New Directions in Probability, Indian Statistical Institute, Bangalore
Stochastic processes and duality
- 22 May 2013, Padova University
Boundary driven interacting particle systems.
- 08 May 2013, Delft University
Lie algebras and interacting particle systems.
- 07 May 2013, Nijmegen University
An introduction to spin glasses and their properties

- 02 May 2013, Leiden University
Algebraic approach to self-duality of the exclusion process.
- 11 March 2013, Milano Bicocca University
Duality theory for Markov processes and applications to non-equilibrium.
- 16-18 December 2012, Statistical Mechanics Conference, Rutgers University
Stochastic models of heat conduction: symmetries, duality and exact solvability.
- 26 October 2012, Universidad Carlos III de Madrid
Stochastic processes and statistical mechanics
- 12 October 2012, Leiden University
Concentration inequalities in spin glasses
- 23-27 July 2012, Spectral Properties of Complex Networks, ECT Trento
Cooperative and competitive interactions on random graphs
- 10 May 2012, National University of Singapore
Exactly solvable models of heat conduction
- 22-28 January 2012, Oberwolfach meeting: Interplay of Analysis and Probability in Physics, Germany
Exactly solvable models of heat conduction
- 12-13 December 2011, workshop on Non-equilibrium statistical mechanics and particle systems, Leiden, The Netherlands
Interacting diffusions and particle systems
- 12 - 14 September 2011, Applications of RG Methods in Mathematical Sciences, Kyoto, Japan
Exactly solvable models of heat conduction
- 14 & 15 July 2011, University College Dublin
Stochastic processes in physics
- 27 April 2011, Nijmegen University
Spin glasses: from heuristic to rigorous results and open problems
- 16-20 January 2011, workshop Probability Theory, Statistical Physics and Applications, under the auspices of the NYU Abu Dhabi Institute, Abu Dhabi
Duality in Interacting Particle Systems and Inclusion Processes

- 13- 17 September 2010, Junior Trimester Program on Stochastics, Disordered systems and extreme value statistics, Hausdorff Institute for Mathematics, Bonn
Ferromagnetic models on random networks
- 6-10 September 2010, 34th Conference on Stochastic Process and Their Application, Osaka, Japan
Cooperative phenomena on random networks
- 30 August - 6 September, 2010, Universality and Scaling Limits in Probability and Statistical Mechanics, Hokkaido University
Stability of the quenched measure and universal identities in disordered spin systems
- 16 July 2010, Dublin Institute for Advanced Study,
Universal identities in disordered systems
- 26-29 May 2010, Second Annual Meeting of the COST Action MP0801 "Physics of Competition and Conflicts", Sunny Beach, Bulgaria
Ferromagnetic Ising models on power-law random graphs
- 4 March 2010, Modena and Reggio Emilia University
Estimators of interaction parameters in statistical mechanics models
- 13 January 2010, Eindhoven University
Disordered systems
- 28 September 2009, Modena and Reggio Emilia University
Duality in interacting particle systems: the example of the inclusion process
- 8-13 June 2009, Workshop Disordered System Spin Glasses, Montreal
Finite dimensional spin glasses
- 27-30 May 2009, NET2009: Evolution and Complexity + First Annual Meeting of the COST Action MP0801 "Physics of Competition and Conflicts", Roma
Statistical mechanics and social systems
- August 2008, Meccanica, International conference of mathematical physics, Bologna
Duality and hidden symmetries in transport models
- July 2008, Technische University, Berlin
Duality for interacting particle systems
- April 2008, Utrecht University,
Overlap distribution and ultrametricity in spin glasses

- February 2008, Vrije Universiteit, Amsterdam
Duality for a stochastic model of heat conduction
- October 2007, Markov Chain Montecarlo Methods, Eindhoven University
Simulated annealing and combinatorial optimization problems
- August 2007, Chiba University (Japan)
Hamiltonian and stochastic models for heat conduction
- August 2007, Tokyo Institute of Technology (Japan)
On Ultrametricity in spin glass models
- June 2007, Spin Glass Summer School, Paris (France)
Joint overlaps distribution for gaussian spin glass
- May 2007, Università di Bologna (Italy),
Hamiltonian and stochastic models in non-equilibrium statistical mechanics
- May 2007, Colloquium at Leiden University (The Netherlands),
Hamiltonian and stochastic models for heat conduction
- March 2007, Kac Seminar, Utrecht (The Netherlands)
Hamiltonian and stochastic models for heat conduction
- November 2006, Seminar at LPS, École Normale Supérieure, Paris (France)
Mean-field versus short-range spin glass models
- October 2006, International Conference “Dynamical Systems: Classical, Quantum and Stochastic”, CNR, Rome (Italy)
On ultrametricity in the Edwards-Anderson model
- June 2006, Seminar at La Pietra-2006, Stochastic processes in mathematical physics, Florence (Italy)
A numerical study of ultrametricity in the Edwards-Anderson model
- April 2006, Seminar at Delft University (The Netherlands)
Spin Glasses: some rigorous results and open problems
- March 2006, Workshop “YEP-2006 (Young European Probabilists) Large deviations, random media, and random matrices”, EURANDOM
Problem Session: Factorization properties for the quenched measure of spin-glasses

- November 2005, Marc Kac Seminar, Utrecht (The Netherlands)
Variational Principles for the Generalized Random Energy Model
- June 2005, Seminar at CWI, Amsterdam (Netherlands)
The Ghirlanda-Guerra identities for spin glasses
- June 2005, International Conference “Mathematical Physics of Spin-Glasses”, Cortona (Italy)
On the (link) overlap distribution on the Edwards-Anderson model
- April 2005, EPPS seminar at EURANDOM (The Netherlands)
Heat Conduction in 1-dimensional lattices
- October 2004, RSS Seminar at EURANDOM (The Netherlands)
Thermodynamic limit and stochastic stability of spin glasses
- September 2004, Invited speaker at International Conference “Mathematical Problems in Dynamics and Statistical Physics”, Camerino (Italy),
Spin glass stochastic stability
- September 2004, International Conference “Dynamical Systems: classical, quantum, stochastic”, Acireale (Italy)
Factorization properties for the Edward-Anderson model
- February 2004, Seminar at Université de Cergy-Pontoise (France),
Monotonicity and Thermodynamic Limit for Disordered Spin Models
- March 2003, Convegno ”Caos, complessita’, informazione: prospettive e metodi a confronto”, Pisa (Italy), Dip. Matematica,
Random and deterministic spin systems with glassy behavior
- February 2002, Seminar at Stevens College, New York, (USA)
Multiple optimal solutions in the portfolio selection model with short-selling
- April 2000, Seminar at Math Department of GeorgiaTech, Atlanta (USA)
Heat transport in one dimensional lattice
- September 1999, Seminar at Applied Math Dep. Bristol University (UK) and BRIMS (Basic Research Institute of Mathematical Science), research center of Hewlett-Packard
Deterministic spin systems with glassy behavior

- September 1998, Workshop “Chaos and complexity”, Institute for Scientific Interchange, Torino (Italy)
Dynamic and thermodynamic in non-linear oscillator chains

Other Conferences attended

- 1–6 June 2014 Non-equilibrium problems in physics and mathematics, Centro Stefano Franscini, Ascona
- 22–23 August 2013 Statistical Physics of Disordered Systems: A Celebration in Honor of Dan Stein’s 60th Birthday, The Courant Institute New York.
- December, 2008: Trimester Interacting particle systems, Statistical Mechanics, Probability Theory, Institute Henri Poincare, Paris.
- November 3-7, 2008: RSS Workshop: Hitting, returning and matching in dynamical systems, information theory and mathematical biology, EURANDOM, Eindhoven.
- September 8-10, 2008: Wandering with curiosity in complex landscape: a conference in honor of Giorgio Parisi, Roma.
- March 10-14,2008: YEP-V workshop on Statistical Mechanics on Random Structures, EURANDOM.
- September 10-13, 2007: RSS Workshop Sandpile models and related fields, EURANDOM.
- July 9-11, 2007: INFORMS conference, Eindhoven
- March 19-23,2007: YEP-IV workshop on Random Graphs and Complex Networks, EURANDOM.
- August 05-11, 2006: International Congress on Mathematical Physics - ICMP 2006 and Young Researchers Symposium IMPA, Rio de Janeiro,
- July 30 - August 04, 2006: IMS Annual Meeting & X Brazilian School of Probability IMPA, Rio de Janeiro
- July 17 - 21, 2006: 31st Conference on Stochastic Processes and their Applications, Paris

- November 14-16, 2005: Stochastics Meeting Lunteren 2005, The Netherlands
- July 4- July 29, 2005: LES HOUCHEs SUMMER SCHOOL - Session LXXXIII “MATHEMATICAL STATISTICAL PHYSICS”
- January 31-February 4, 2005: Les Houches Meeting - 2005, “Statistical Physics of Glasses, Spin Glasses, Information Processing and Combinatorial Optimization”
- July 25-27, 2003: Young Research Symposium, XVI International Congress on Mathematical Physics, University of Lisbon (Portugal)
- July 1-26, 2002: LES HOUCHEs 2002 SUMMER SCHOOL - SESSION LXXVII Nato Advanced Study Institute - EuroSummerSchool “SLOW RELAXATIONS AND NONEQUILIBRIUM DYNAMICS IN CONDENSED MATTER”, Les Houches (France).
- June 10-15, 2002: International Conference: “Field Theory and Statistical Mechanics”, Roma (Italy).
- December 5-7, 2001: International Conference “Application of Physics in Financial Analysis 3”, London (UK).
- September 1-10, 2001: Summer School: “The mathematical aspects of quantum chaos”, Bologna (Italy).
- April 6-12, 2001: Conferenza “Problemi Attuali Di Fisica Teorica”, Istituto Alti Studi Scientifici E.R. Caianello, Vietri Sul Mare (Italy).
- September 23-30, 2000: International Conference: “Dynamical Systems: Classical, Quantum, Stochastic”, Porto Malu, (Italy).
- September, 1998: Workshop “Chaos and complexity”, Institute for Scientific Interchange, Torino (Italy).
- September 15-26, 1997: Summer School on parallel and vectorial computation , CINECA, Bologna, (Italy).