

C.V. of Fabio Martinelli

January 26, 2013

- **Personal Data:** Born 01-03-1956 in Rome, Italy. Citizenship: Italian.
- **Education and Training:**
 - Master Degree in physics cum laude, Rome '79, advisor Prof. G. Jona-Lasinio.
 - CNR-scholarship in mathematical physics ('80-'81).
 - Postdoc in mathematical physics at the Ruhr-University (Germany), advisor Prof. S. Albeverio ('81-'83).
- **Appointments:**
 - Full Professor in Mathematics (Univ. Roma Tre '98-present).
 - Full Professor in Mathematics (Univ. of Aquila, '94-'98).
 - Associate Professor in Mathematics (Univ. of Roma 1, '87-'94).
 - Assistant Professor in Mathematics (Univ of Roma 1 '84-'87).
 - Assistant Professor in Mathematics (Univ. of Trento '83-'84).
- **Awards:** Prize “E.Persico” of the Accademia Nazionale dei Lincei for three consecutive years ('75-79). Prize “B. Finzi” for mathematical physics of the “Accademia Lombarda delle Scienze”, (2000). Marie–Curie fellowship (2000). Miller visiting professorship at UC Berkeley (2002).
- **Main Invited Lectures and Courses:**
 - Twice plenary speaker at the “International Congress on Mathematical Physics”.
 - Invited lecturer: the Saint Flour “Probability Summer School” ('97), Brazilian Summer School in Probability Theory ('99), Summer School on Mathematical Physics (Jerusalem '01), Summer School in Mathematical Statistical Mechanics (Prague '06) .
 - Plenary speaker at the meeting “Theory of Computation & The Sciences” (Berkeley '02).
 - Keynote speaker at the workshop “Markov-Chain Monte Carlo Methods” (Newton Institute '08)
- **Research Projects:**
 - Organizer of two workshops: “Statistical mechanics of interfaces” (Cortona '96) and “Probability Theory, Phase Transitions and Computational Complexity” (Cortona '00).
 - Co-organizer of a four months research period at the MSRI(Mathematical Science Research Institute) in Berkeley on “Markov chains in algorithms and statistical physics” ('05).
 - Organizer of the special session “Probability Theory” for the International Congress of Mathematical Physics ('06).

- Co-organizer of a special semester on “Interacting particle systems, Statistical Mechanics and Probability Theory” at the Institute H. Poincaré (’08).
 - Co-organizer of the “INHOMOGENEOUS RANDOM SYSTEMS 2011” in Paris.
 - Principal investigator of the European Advanced Grant “Phase Transitions in Random Evolutions of Large Scale Systems” (2009-2012, Euro 1,248,000).
- **Professional Counseling:**
 - I served on an international panel to appoint a chair in mathematics at the University of Goteborg (2000) and at the University of Utrecht (2012).
 - I served on an international panel of the Deutsche Forschung Gemeinschaft for a four years research program in “Mathematical Biology” (2011).
- **Editorial activity:** Member of the editorial board of *Journal of Statistical Physics* (’94-97), *Annales de l’Institut Henri Poincaré* (’97-’06), *Journal of Potential Analysis* (’97-’06), *Probability Theory and Related Fields* (2000-2008), *Alea* (2013).
- **Grant Reviewing:** National Science Foundation (US), National Science Foundation (Israel), National Science Foundation (Netherlands).
- **Journal Refereeing:** *Communications in Mathematical Physics*, *Annals of Probability*, *Probability Theory and Related Fields*, *Annales de l’Institut Henri Poincaré*, *Journal of Statistical Physics*, *Random Structures and Algorithms*.
- **Students:** P. Caputo, A. Faggionato (now both Associated Prof. in Rome), G. Posta (Associate Prof. Milano), A. Bianchi (Researcher, Padova), C. Roberto (Full Profesor in Paris.).
- **Funding ID:**
 - ERC Advanced Grant 2009-2012 (1,248,000 Euros)
 - “Research Projects of National Interest”: 2000-2008 (200,000 Euros).
- **Overview of scientific activity** I have coauthored more than 70 research papers in leading international academic journals such as *Comm. Math. Phys.*, *J. of Statistical Physics*, *Probability Theory and Related Fields*, *Ann. Inst. H. Poincaré*, *Ann. Appl. Prob.*, *Ann. of Probability*, *European J. of Mathematics*, *Comm. Pure and Appl. Math.*
- My publication record comprises main contributions to mathematical physics and probability theory on different topics like *probabilistic methods in quantum mechanics*, *random Schroedinger operators*, *random perturbations of dynamical systems*, *metastability phenomena*, *Poincaré and logarithmic Sobolev inequalities*, *phase transitions in statistical mechanics*, *quantum spin models*, *mixing times of randomized algorithms*. Some of the key results obtained in the above areas went definitely beyond the state of the art at that time. Examples include:
- Detailed quantitative analysis of instabilities of tunneling phenomena in the semi-classical limit of quantum mechanics, a series of papers which prompted subsequent important contributions by B. Simon and Helffer-Sjöstrand;
 - The first proof of Anderson localization in dimension greater than one with J. Frohlich, E. Scoppola and T. Spencer and the first (and only one until a recent contribution by J. Bourgain) proof of Anderson localization with Bernoulli random potential;
 - The proof of exponential relaxation towards the equilibrium Gibbs measure of attractive stochastic spin models in the whole uniqueness region;

- The first detailed analysis with sharp constants of the stochastic Ising model in the phase coexistence region;
 - Completely new proof (after the work by H.T Yau) of the Poincaré and log-Sobolev inequalities for stochastic lattice gases;
 - Quantitative sharp analysis of the energy gap of asymmetric quantum XXZ models via interacting particle systems representation and Poincaré inequalities for lattice gases;
 - Analysis of the stochastic Ising model and other spin systems (independent sets and colorings) on trees inside a pure phase;
 - Recent breakthrough on the rigorous analysis of kinetically constrained spin models, a hot topic in the physics of glasses, where the only mathematical contribution by D. Aldous and P. Diaconis was confined to a one dimensional model and where our results corrected some of the conjectures made by the physicists.
 - First *quasi-polynomial* bound on the mixing time of the stochastic Ising model at low temperature.
 - Stochastic evolution of random surfaces and its connection with random dimer tilings and mean curvature motion.
- **International recognition and diffusion** Because of this body of work I have been invited as visiting professor for periods up to a year in prestigious research institutions such as *Institute des Hautes Etudes Scientifiques, Courant Institute, Newton Institute, Theory Group at Microsoft Research, University of California (UCLA, Irvine, Berkeley)*.

In 1997 I was invited to lecture in the prestigious French summer school in Saint Flour, a major recognition for any probabilist.

In 2000 I was awarded the prize B. Finzi for mathematical physics and a Marie-Curie fellowship to support the one year research in Roma Tre of Dr. C. Roberto, a student from Toulouse.

In 2001 A. Sinclair, 1996 ACM Godel prize, and Y. Peres, 2001 Loeve Prize in Probability, invited me to compete for a prestigious Miller Visiting Professorship at UC Berkeley. I was awarded the professorship and I joined them for a year in Berkeley. At about the same time H. Kesten (Cornell) asked me to write a long survey about *Relaxation times of Markov chains in statistical mechanics and combinatorial structures* for *Encyclopedia of Mathematics*.

Since 1994 I served on the board of some of the best journals in probability theory and mathematical physics and I was part of the program committees of several international conferences.

Publications after year 2000

- [1] Pietro Caputo, Fabio Martinelli, and Fabio Lucio Toninelli. “Mixing times of monotone surfaces and SOS interfaces: a mean curvature approach”. In: *Comm. Math. Phys.* 311.1 (2012), pp. 157–189.
- [2] Pietro Caputo et al. “Polymer dynamics in the depinned phase: metastability with logarithmic barriers”. In: *Probab. Theory Related Fields* 153.3-4 (2012), pp. 587–641.
- [3] Pietro Caputo et al. “The shape of the $(2 + 1)$ -dimensional SOS surface above a wall”. In: *C. R. Math. Acad. Sci. Paris* 350.13-14 (2012), pp. 703–706.
- [4] A. Faggionato et al. “Aging through hierarchical coalescence in the East model”. In: *Comm. Math. Phys.* 309.2 (2012), pp. 459–495.

- [5] Fabio Martinelli and Marc Wouts. “Glauber dynamics for the quantum Ising model in a transverse field on a regular tree”. In: *J. Stat. Phys.* 146.5 (2012), pp. 1059–1088.
- [6] Pietro Caputo, Fabio Martinelli, and Fabio Lucio Toninelli. “Convergence to equilibrium of biased plane partitions”. In: *Random Structures Algorithms* 39.1 (2011), pp. 83–114.
- [7] Pietro Caputo, Fabio Martinelli, and Fabio Lucio Toninelli. “Sharp mixing time bounds for sampling random surfaces”. In: *2011 IEEE 52nd Annual Symposium on Foundations of Computer Science—FOCS 2011*. IEEE Computer Soc., Los Alamitos, CA, 2011, pp. 130–139.
- [8] Pietro Caputo et al. ““Zero” temperature stochastic 3D Ising model and dimer covering fluctuations: a first step towards interface mean curvature motion”. In: *Comm. Pure Appl. Math.* 64.6 (2011), pp. 778–831.
- [9] David Galvin et al. “The multistate hard core model on a regular tree”. In: *SIAM J. Discrete Math.* 25.2 (2011), pp. 894–915.
- [10] N. Cancrini et al. “Facilitated oriented spin models: some non equilibrium results”. In: *J. Stat. Phys.* 138.6 (2010), pp. 1109–1123.
- [11] N. Cancrini et al. “Kinetically constrained lattice gases”. In: *Comm. Math. Phys.* 297.2 (2010), pp. 299–344.
- [12] Fabio Martinelli and Fabio Lucio Toninelli. “On the mixing time of the 2D stochastic Ising model with “plus” boundary conditions at low temperature”. In: *Comm. Math. Phys.* 296.1 (2010), pp. 175–213.
- [13] Marek Biskup et al. *Methods of contemporary mathematical statistical physics*. Vol. 1970. Lecture Notes in Mathematics. Berlin: Springer-Verlag, 2009.
- [14] N. Cancrini et al. “Facilitated spin models: recent and new results”. In: *Methods of contemporary mathematical statistical physics*. Vol. 1970. Lecture Notes in Math. Berlin: Springer, 2009, pp. 307–340.
- [15] Fabio Martinelli and Alistair Sinclair. “Mixing time for the solid-on-solid model”. In: *STOC’09—Proceedings of the 2009 ACM International Symposium on Theory of Computing*. New York: ACM, 2009, pp. 571–580.
- [16] N. Cancrini et al. “Kinetically constrained spin models”. In: *Probab. Theory Related Fields* 140.3-4 (2008), pp. 459–504.
- [17] Pietro Caputo, Fabio Martinelli, and Fabio Lucio Toninelli. “On the approach to equilibrium for a polymer with adsorption and repulsion”. In: *Electron. J. Probab.* 13 (2008), no. 10, 213–258.
- [18] Fabio Martinelli, Alistair Sinclair, and Dror Weitz. “Fast mixing for independent sets, colorings, and other models on trees”. In: *Random Structures Algorithms* 31.2 (2007), pp. 134–172.
- [19] N. Cancrini, P. Caputo, and F. Martinelli. “Relaxation time of L -reversal chains and other chromosome shuffles”. In: *Ann. Appl. Probab.* 16.3 (2006), pp. 1506–1527.
- [20] Pietro Caputo and Fabio Martinelli. “Phase ordering after a deep quench: the stochastic Ising and hard core gas models on a tree”. In: *Probab. Theory Related Fields* 136.1 (2006), pp. 37–80.
- [21] Fabio Martinelli. “Relaxation times of Markov chains in statistical mechanics and combinatorial structures”. In: *Probability on discrete structures*. Vol. 110. Encyclopaedia Math. Sci. Berlin: Springer, 2004, pp. 175–262.
- [22] Fabio Martinelli, Alistair Sinclair, and Dror Weitz. “Fast mixing for independent sets, colorings and other models on trees”. In: *Proceedings of the Fifteenth Annual ACM-SIAM Symposium on Discrete Algorithms*. New York: ACM, 2004, 456–465 (electronic).

- [23] Fabio Martinelli, Alistair Sinclair, and Dror Weitz. “Glauber dynamics on trees: boundary conditions and mixing time”. In: *Comm. Math. Phys.* 250.2 (2004), pp. 301–334.
- [24] Pietro Caputo and Fabio Martinelli. “Relaxation time of anisotropic simple exclusion processes and quantum Heisenberg models”. In: *Ann. Appl. Probab.* 13.2 (2003), pp. 691–721.
- [25] Alessandra Faggionato and Fabio Martinelli. “Hydrodynamic limit of a disordered lattice gas”. In: *Probab. Theory Related Fields* 127.4 (2003), pp. 535–608.
- [26] T. Bodineau and Fabio Martinelli. “Some new results on the kinetic Ising model in a pure phase”. In: *J. Statist. Phys.* 109.1-2 (2002), pp. 207–235.
- [27] N. Cancrini, F. Martinelli, and C. Roberto. “The logarithmic Sobolev constant of Kawasaki dynamics under a mixing condition revisited”. In: *Ann. Inst. H. Poincaré Probab. Statist.* 38.4 (2002), pp. 385–436.
- [28] Nicoletta Cancrini, Fabio Martinelli, and Cyril Roberto. “Spectral gap and logarithmic Sobolev constant of Kawasaki dynamics under a mixing condition revisited”. In: *In and out of equilibrium (Mambucaba, 2000)*. Vol. 51. Progr. Probab. Boston, MA: Birkhäuser Boston, 2002, pp. 259–271.
- [29] Pietro Caputo and Fabio Martinelli. “Asymmetric diffusion and the energy gap above the 111 ground state of the quantum XXZ model”. In: *Comm. Math. Phys.* 226.2 (2002), pp. 323–375.
- [30] N. Cancrini and F. Martinelli. “Diffusive scaling of the spectral gap for the dilute Ising lattice-gas dynamics below the percolation threshold”. In: *Probab. Theory Related Fields* 120.4 (2001), pp. 497–534.
- [31] N. Cancrini and F. Martinelli. “Stochastic dynamics for the dilute Ising lattice gas: results and open problems”. In: *Markov Process. Related Fields* 7.1 (2001), pp. 39–50.
- [32] Giorgio Favrin, Enzo Marinari, and Fabio Martinelli. “Droplet motion for the conservative 2D Ising lattice gas dynamics below the critical temperature”. In: *J. Phys. A* 34.30 (2001), pp. 5901–5910.
- [33] F. Martinelli. “On the kinetic Ising model below the critical temperature”. In: *XIIIth International Congress on Mathematical Physics (London, 2000)*. Int. Press, Boston, MA, 2001, pp. 297–301.
- [34] N. Cancrini and F. Martinelli. “On the spectral gap of Kawasaki dynamics under a mixing condition revisited”. In: *J. Math. Phys.* 41.3 (2000), pp. 1391–1423.
- [35] F. Martinelli. “An elementary approach to finite size conditions for the exponential decay of covariances in lattice spin models”. In: *On Dobrushin’s way. From probability theory to statistical physics*. Vol. 198. Amer. Math. Soc. Transl. Ser. 2. Providence, RI: Amer. Math. Soc., 2000, pp. 169–181.