

# Curriculum Vitae

## Timothy M. Garoni

Physics Department, NYU  
4 Washington Place  
New York, NY 10003  
USA

Phone: +1 212-443-0834  
FAX: +1 212-995-4016  
email: [garoni@nyu.edu](mailto:garoni@nyu.edu)  
URL: <http://physics.nyu.edu/~tg29>

### Education

- 2003 • **Ph.D.** The University of Melbourne, School of Physics.  
Thesis title: “Lévy flights, exponential asymptotics; One-dimensional impenetrable bosons”
- 2000 • **B.Sc. (Hons)** The University of Melbourne, School of Physics.

### Employment

- September 2005 - present • **Postdoctoral research fellow** in the Physics Department of New York University, working with Professor Alan Sokal. I conduct research on Monte Carlo algorithms for simulating statistical mechanical lattice models.
- September 2003 - September 2005 • **Postdoctoral research fellow** at the Institute for Mathematics and its Applications (**IMA**), at the University of Minnesota. I participated in the IMA 2003-2004 annual program *Probability and Statistics in Complex Systems: Genomics, Networks, and Financial Engineering*, and the 2004-2005 annual program *Mathematics of Materials and Macromolecules: Multiple Scales, Disorder, and Singularities*.

### Professional Associations

- 2004 – present • Member of the American Mathematical Society (AMS).

## Departmental Service

- 2004 - 2005 • Co-organizer of the IMA Postdoc seminar series for the academic year 2004-2005.
- 2003 - 2004 • Co-organizer of the IMA Brown Bag seminar series for the academic year 2003-2004.

## Research interests

- Broadly, my research interests involve computational and mathematical topics in statistical mechanics. In particular, my current research involves studying, and trying to improve the efficiency of, Markov-chain Monte Carlo algorithms for simulating statistical mechanical lattice models near a critical point. This involves performing both mathematical analyses of the algorithms and large scale numerical simulations.

## Teaching Experience

- January 2006 - April 2006 • Taught the recitations for the course *Mathematical Physics*, in the Physics Department of New York University. This involved delivering one lecture per week to a class of senior undergraduate students, which discussed the solutions to the weekly homework assignments. I also graded the homework.
- September 2004 - December 2004 • **Primary instructor** for the course *Methods of Applied Mathematics*, in the School of Mathematics at the University of Minnesota. This was a fourteen week course and the students included both graduate students and senior undergraduate students. I had sole responsibility for the course; including designing the course, selecting the set text, preparing and delivering three lectures per week, writing the set homework exercises and their solutions, and writing and grading the midterm and final exams. I was also responsible for supervising a teaching assistant who graded the students' weekly homework.

## Teaching Experience (continued)

- March 2000-June 2003
- Tutor for the University of Melbourne. I taught the tutorials for a variety of subjects at the first year undergraduate level in the Department of Mathematics and Statistics and also the School of Physics.

## Selected seminars and conference presentations

- December 2005
- *Asymptotics of Hankel determinants generated by Fisher-Hartwig symbols defined on the real line*, presented at the 94th Statistical Mechanics Conference, Rutgers University, December 20, 2005.
- July 2005
- *Impenetrable bosons, random matrices, and generalized Fisher-Hartwig determinants*, Statistical Mechanics Seminar in the Department of Mathematics and Statistics, the University of Melbourne, July 7, 2005.
- January 2005
- *On the asymptotics of some large Hankel determinants generated by Fisher-Hartwig symbols defined on the real line*, presented at the Joint Mathematics Meetings of the American Mathematical Society (AMS) and the Mathematical Association of America (MAA), in the AMS Session on Applied Math I, Atlanta, January 6, 2005.
- February 2004
- *Absolute moments of products of characteristic polynomials, and impenetrable bosons*, Random Matrix Seminar in the School of Mathematics, the University of Minnesota, February 17 and February 24, 2004.
- November 2003
- *Impenetrable bosons, random matrix averages and log-gases*, Institute for Mathematics and its Applications (IMA) Brown Bag Seminar, the University of Minnesota, November 12, 2003.
- December 2002
- *One dimensional impenetrable Bose systems*, presented at the annual Statistical Mechanics Meeting 2002, the University of Melbourne, December 2-3, 2002.
- November 2001
- *Lévy Flights in  $d$  dimensions; Exact Results and Asymptotics beyond all orders*, presented at the annual Statistical Mechanics Meeting 2001, Australian National University, November 26-27, 2001.

# Publications

## *Publications*

- Youjin Deng, Timothy M. Garoni, and Alan D. Sokal, *Dynamic Critical Behavior of the Worm Algorithm for the Ising Model*, Phys. Rev. Lett. **99**, 110601 (2007).
- Youjin Deng, Timothy M. Garoni, Jonathan Machta, Giovanni Ossola, Marco Polin and Alan D. Sokal, *Critical Behavior of the Chayes-Machta-Swendsen-Wang Dynamics*, Phys. Rev. Lett. **99**, 055701 (2007).
- Youjin Deng, Timothy M. Garoni, and Alan D. Sokal, *Critical Speeding-Up in the Local Dynamics of the Random-Cluster Model*, Phys. Rev. Lett. **98**, 230602 (2007).
- Youjin Deng, Timothy M. Garoni, Wenan Guo, Henk W. J. Blöte, and Alan D. Sokal, *Cluster Simulations of Loop Models on Two-Dimensional Lattices*, Phys. Rev. Lett. **98**, 120601 (2007).
- Youjin Deng, Timothy M. Garoni, and Alan D. Sokal, *Ferromagnetic Phase Transition for the Spanning-Forest Model ( $q \rightarrow 0$  Limit of the Potts Model) in Three or More Dimensions*, Phys. Rev. Lett. **98**, 030602 (2007).
- P. J. Forrester, N. E. Frankel, and T. M. Garoni, *Asymptotic form of the density profile for Gaussian and Laguerre random matrix ensembles with orthogonal and symplectic symmetry*, J. Math. Phys. **47**, 023301 (2006).
- T. M. Garoni, P. J. Forrester, and N. E. Frankel, *Asymptotic corrections to the eigenvalue density of the GUE and LUE*, J. Math. Phys. **46**, 103301 (2005).
- T. M. Garoni, *On the asymptotics of some large Hankel determinants generated by Fisher-Hartwig symbols defined on the real line*, J. Math. Phys. **46**, 043516 (2005).
- P. J. Forrester, N. E. Frankel, and T. M. Garoni, *Random matrix averages and the impenetrable Bose gas in Dirichlet and Neumann boundary conditions*, J. Math. Phys. **44**, 4157 (2003).
- P. J. Forrester, N. E. Frankel, T. M. Garoni, and N. S. Witte, *Finite one-dimensional impenetrable Bose systems: Occupation numbers*, Phys. Rev. A. **67**, 043607 (2003).

## Publications (continued)

- P. J. Forrester, N. E. Frankel, T. M. Garoni, and N. S. Witte, *Painlevé Transcendent Evaluations of Finite System Density Matrices for 1d Impenetrable Bosons*, Commun. Math. Phys. **238**, 257 (2003).
- T. M. Garoni, and N. E. Frankel, *On the ubiquity of the Lévy integral – its relationship with the generalized Euler-Jacobi series and their asymptotics beyond all orders*, Fractals **11**, 93 (2003).
- T. M. Garoni, and N. E. Frankel, *d-dimensional Lévy flights: Exact and asymptotic*, J. Math. Phys. **43**, 5090 (2002).
- T. M. Garoni, and N. E. Frankel, *Lévy flights: Exact results and asymptotics beyond all orders*, J. Math. Phys. **43**, 2670 (2002).
- T. M. Garoni, N. E. Frankel, and M. L. Glasser, *Complete asymptotic expansions of the Fermi-Dirac integrals*, J. Math. Phys. **42**, 1860 (2001).