

Mini-Cours Widom

Institut de Mathématiques de Jussieu
Laboratoire de Probabilités et Modèles Aléatoires
Université Paris-Diderot

Organisateurs :
Anne Boutet de Monvel
Giambattista Giacomin

4-5-8 juin 2009

175 rue du Chevaleret, Paris 13^{ème}
Salle 0-C-2, rez-de-chaussée



Harold Widom

Santa Cruz University
Prix Norbert Wiener 2007
Prix George Pólya 2002

Formulas and Asymptotics for the Asymmetric Simple Exclusion Process

The lectures will describe joint work with Craig A. Tracy on the asymmetric simple exclusion process on the integers.

In this process each particle waits exponential time, then with probability p it moves one step to the right if the site is unoccupied, otherwise it does not move; with probability $1 - p$ it moves one step to the left if the site is unoccupied, otherwise it does not move.

For an N -particle system we use the Bethe Ansatz to obtain a formula for the probability of a given configuration at time t , extending a result of Schütz for the case $N = 2$.

From this we derive a formula, which extends to infinite systems, for the probability that a given particle is at a given site at time t . In the case of step initial condition (particles initially at the positive integers) the probability can be expressed in terms of Fredholm determinants.

This formula is used to obtain three asymptotic results for the positions of these particles. In one an apparently new distribution function arises and in another a distribution function of random matrix theory arises. The last extends a result of Johansson for the case $p = 1$, the totally asymmetric process.

- [1] G.M. Schütz, Exact solution of the master equation for the asymmetric exclusion process, *J. Stat. Physics* **88** (1997), 427–445.
- [2] K. Johansson, Shape fluctuations and random matrices, *Comm. Math. Phys.* **209** (2000), 437–476.
- [3] C.A. Tracy and H. Widom, Integral formulas for the asymmetric simple exclusion process, *Comm. Math. Phys.* **279** (2008) 815–844.
- [4] C.A. Tracy and H. Widom, A Fredholm determinant representation in ASEP, *J. Stat. Phys.* **132** (2008), 291–300.
- [5] C.A. Tracy and H. Widom, Asymptotics in ASEP with step initial condition, to appear in *Comm. Math. Phys.*, arXiv:0807.1713v2.

4 juin

10h-11h

5 juin

10h-11h

8 juin

10h-11h



Avec la participation de l'Université Paris-Diderot, de l'IMJ, du LPMA, de l'ANR GranMA & PolIntBio