# On the localization-delocalization critical line for the random copolymer

Erwin Bolthausen (joint work with F. den Hollander, and A.A. Opoku)

We consider the standard model for a random copolymer which has a Hamiltonian $H_n^{h,\beta,\omega}(\pi)$ on directed paths $\pi = \{(k, \pi_k) : k \in \mathbb{N},\ \pi_k \in \mathbb{Z}\}$ given by

$$H_n^{h,\beta,\omega}(\pi) = -\beta \sum_{k=1}^{n} (\omega_k + h) \operatorname{sign}(\pi_k + \pi_{k-1}),$$

where the $\omega_k$ are i.i.d. real-valued centered random variables, for instance $\pm 1$, with probability 1/2. $h \geq 0$ and $\beta > 0$ are parameters. The Gibbs distribution is

$$P_n^{\beta,h,\omega}(\pi) = \frac{1}{Z_n^{h,\beta,\omega}} \exp\left[-H_n^{h,\beta,\omega}(\pi)\right] P(\pi)$$

with the a priory measure $P$ on paths. A standard case is where $P$ is the law of the ordinary nearest neighbor random walk.

The model has a nontrivial localization-delocalization transition: For $\beta > 0$, there is a critical value $h_c(\beta) > 0$ such that the path measure is localized for $h < h_c(\beta)$ and delocalized for $h > h_c(\beta)$, as has been proved in [2].

We present new results obtained with Frank den Hollander and A.A. Opoku on this critical line. In particular, a new lower bound for the tangent of the critical line at the origin is obtained. The results are proved by an application of a variational method developed by Birkner et al [1].

## References


[1] Birkner, M., Greven, A., and den Hollander, F.: *Quenched large deviation principle for words in a letter sequence.* Prob. Th. Rel. Fields **148** 403-456 (2010)

[2] Bolthausen, E., and den Hollander, F.: *Localization transition for a polymer near an interface.* Ann. Prob. **25** 1334-1366 (1997)