TONY HADDAD, Université de Montréal

A coupling for the prime factors of a random integer

The sizes of large prime factors for a random integer N sampled uniformly in $[1, x]$ are known to converge in distribution to a Poisson-Dirichlet process $\mathbf{V} = (V_1, V_2, \ldots)$ as $x \to \infty$. In 2002, Arratia constructed a coupling of N and $\mathbf{V}$ satisfying $\mathbb{E} \sum_i |\log P_i - (\log x) V_i| = O(\log \log x)$ where $P_1 P_2 \cdots$ is the unique factorization of N with $P_1 \geqslant P_2 \geqslant \cdots$ being all primes or ones. He conjectured that there exists a coupling for which this expectation is $O(1)$.

I will present a modification of his coupling which proves his conjecture, and show that $O(1)$ is optimal. As a corollary, I will provide a simpler proof of the arcsine law in the average distribution of divisors proved by Deshouillers, Dress and Tenenbaum in 1979. This is joint work with Dimitris Koukoulopoulos.