ZEROS OF ENTIRE FUNCTIONS AND RELAXATION PROCESSES

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We show in talk three infinite particle systems on $\mathbb{R}$ exhibiting typical non-equilibrium dynamics, relaxation phenomena. The first one is Dyson's model with $\beta = 2$, starting from a configuration in which every point of $\mathbb{Z}$ (the zero of $\sin(\pi z)$) is occupied by one particle and converging to the determinantal point process (DPP) with the sine kernel. The second one is a kind of drift transformation of Dyson's model with $\beta = 2$, starting from a configuration in which every zero of the Airy function $\mathrm{Ai}(z)$ on the negative $\mathbb{R}$ is occupied by one particle and converging to the DPP with the Airy kernel. The last one is the noncolliding squared Bessel processes with index $\nu > -1$, starting from the configuration in which every point $(j_{\nu,i})^2$ is occupied by one particle, $i \in \mathbb{N}$, and converging to the DPP with the Bessel kernel. Here $j_{\nu,i}$ denotes the i-th positive zero of the Bessel function $J_\nu(z)$. In the random matrix theory, these three DPPs are obtained in the scaling limits of eigenvalue distributions of the Gaussian random matrices called the bulk, the soft-edge, and the hard-edge scaling limit, respectively. In our relaxation processes, they are attractors of dynamics, and the equilibrium dynamics in them are realized in the long time limits. This is a joint work with Hideki Tanemura (Chiba University).

[1] Katori, M., Tanemura, H.: Non-equilibrium dynamics of Dyson's model with an infinite number of particles. Commun. Math. Phys. DOI:10.1007/s00220-009-0912-3; arXiv:math.PR/0812.4108.
[2] Katori, M., Tanemura, H.: Zeros of Airy function and relaxation process. J. Stat. Phys. DOI:10.1007/s10955-009-9829-7; arXiv:math.PR/0906.3666.