Level dynamics for complex matrices

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Abstract

We establish level dynamics for finite matrices, employing a unified treatment of real symmetric, complex Hermitian, quaternion real, unitary, and arbitrary complex matrices. In all cases the level dynamics take the form of the classical Hamiltonian flow of some fictitious many-particle system. Equilibrium statistical mechanics of the latter leads to the well-known matrix ensembles of random-matrix theory. Ginibre's ensemble, in particular, is thus associated with level dynamics of arbitrary complex matrices.