Random quantum operations.

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We define a natural ensemble of quantum operations (completely positive, trace preserving) and present algorithms to generate quantum maps on random. Spectral properties of the associated superoperator $\Phi$ are investigated. We derive a general formula for the density of eigenvalues of $\Phi$ and show that for large system size they are described by the real Ginibre ensemble of random non-symmetric matrices. We analyze the size of the spectral gap, which controls the rate of convergence of a generic state of the system to the invariant state of the operation.