

$$|\Psi\rangle \Rightarrow \text{Ground state of entire system,}$$

$$\rho = |\Psi\rangle\langle\Psi|$$

$$\rho_A = \text{Tr}_B \rho = \text{density matrix of region } A$$

$$\text{Entanglement entropy } S_E = -\text{Tr}(\rho_A \ln \rho_A)$$