**Random Matrix Ensembles**

So going to explore the different random matrix ensembles out there, having in mind specifically transport. The ensembles seem to be named after the class of transformations that the Hamiltonian matrix they’re supposed to be describing, are invariant under. Effectively, the name of the ensemble would then describe the eigenvectors, U, of the Hamiltonian.

**Orthogonal Ensemble (β = 1)**

This corresponds to the presence of TRS as well as SRS – I suppose the latter occurs when [S,H] = 0 and spin is a conserved quantity, or spectator, basically. In this case the eigenvectors of H are real and so U would be orthogonal. We can formally demonstrate this. Let Θ = UK be the time-reversal operator, where U is (any) unitary matrix, and K is the complex conjugation operator. Then we have:



Now apply Θ()Θ-1 again,



Evidentally he takes this as evidence that:



Perhaps we can conclude this, as opposed to that Θ = ±1 because ΘHΘ-1 = H, because UU\* does lie entirely within the HS, unlike Θ? Well, if we take +1, then that means



So the **eigenvectors** form an **orthogonal symmetric** matrix. Furthermore, **H** will be **symmetric** since:

