Spin - Statistics Theorem

All sub - atomic particulars with which we have experienced have an integral degree of freedom known as intrinsic spin, which comes in integral multiple of ħ/2. The value of this spin is has remarkably powerful consequence for the behaviour of many - body systems.

Fermions (odd - integer multiple of ħ/2= s = ħ/2 ; 3ħ/2 ; 5ħ/2 ; etc)

$$\Psi_F (x_1, x_2) = - \Psi_F (x_2, x_1)$$

Bosons (even - integral multiple of ħ/2= s =0 , ħ , 2ħ, 3ħ, . . .)

This connection between the intrinsic spin of the particle and the " exchange symmetry " of the many body wavefunction is known as the spin - statistics theorem. We won't try to provide it (it comes out of relativistic quantum field theory) , but over the next couple of weeks we will look at some of its important consequences .