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Angular Momentum

► See Spin; Stern–Gerlach experiment; Vector model.

Anyons

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Quantum mechanics gives a unique characterization of elementary particles as being either *bosons* or *fermions*. This property, referred to as the ► quantum statistics of the particles, follows from a simple symmetry argument, where the ► wave functions of a system of identical particles are restricted to be either symmetric (bosons) or antisymmetric (fermions) under permutation of particle coordinates. For two spinless particles, this symmetry is expressed through a sign factor which is associated with the switching of positions

$$\psi(\boldsymbol{r}_1, \boldsymbol{r}_2) = \pm\psi(\boldsymbol{r}_2, \boldsymbol{r}_1) \ , \tag{1}$$

with $+$ for bosons and $-$ for fermions. From the symmetry constraint, when applied to a many-particle system, the statistical distributions of particles over single particle states can be derived, and the completely different collective behaviour of systems like ► electrons (fermions) and photons (bosons) (► light quantum) can be understood.