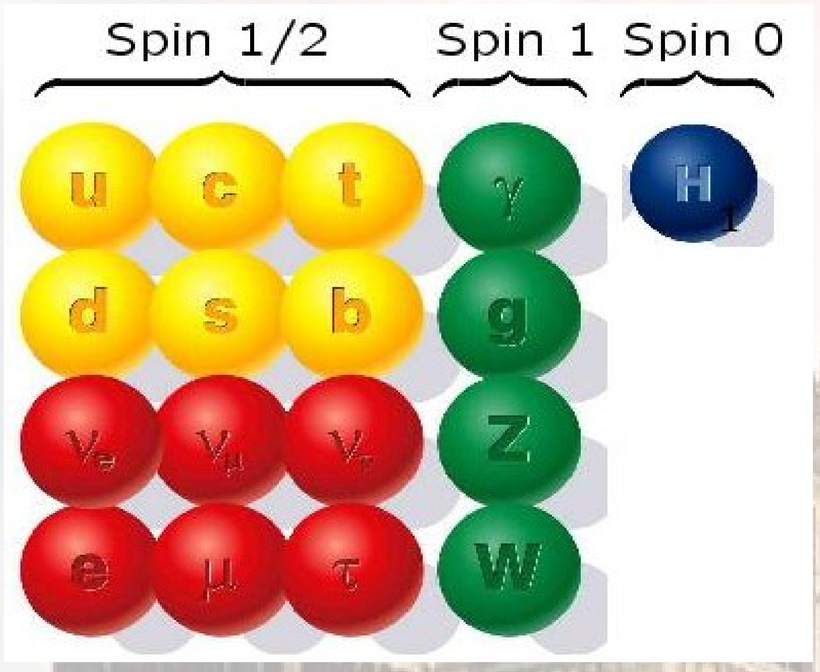
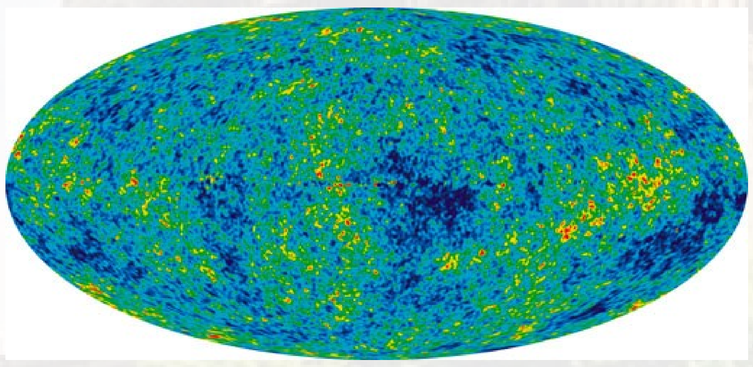
Durham University

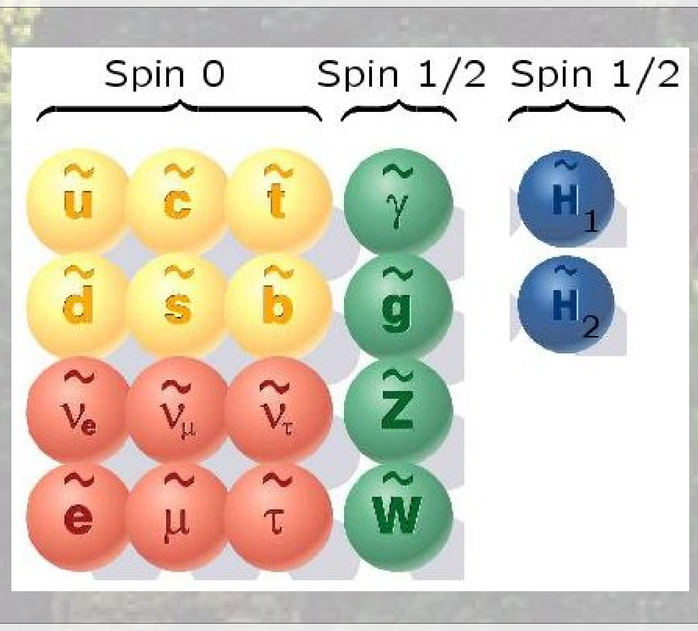
SUPERSYMMETRY



The Standard Model is a wonderfully precise model of the particles that make up our world, and the way in which they interact. There are two types of particle – fermions and bosons. All of the matter around us is made up of fermions, like electrons and quarks. The bosons are responsible for carrying the three forces of the Standard Model: electromagnetism, the strong force and the weak force. Fermions are either attracted to or repelled from each other by exchanging bosons. When two magnets snap together, it is because they are exchanging a type of boson called a photon.



Despite its many triumphs, there are some problems with the Standard Model. For example, by studying the cosmic microwave background, and the rotation curves of galaxies, astronomers have determined that there is far more mass in the Universe than can be accounted for by the normal 'shiny' matter that makes up stars and gas. In fact, approximately a quarter of the Universe consists of dark matter, which isn't made up of any of the particles that are included in the Standard Model. The Standard Model therefore needs to be extended to include whatever this dark matter particle is.



Supersymmetry is a way of directly relating fermions and bosons. The theory postulates that every particle in the standard model has a supersymmetric partner of the opposite type: for every Standard Model fermion, there is a corresponding supersymmetric boson, and for every boson there is a corresponding fermion.

Not only is supersymmetry an extremely beautiful theory, but it also solves many of the problems of the Standard Model. In many supersymmetric theories, the lightest supersymmetric particle (lsp) does not decay into other (Standard Model) particles. The lsp will interact very weakly with standard particles, thus making it a perfect candidate for dark matter.

The ILC will give us the chance to discover and study supersymmetry in depth, allowing very precise measurements of supersymmetric particles.

IP3

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