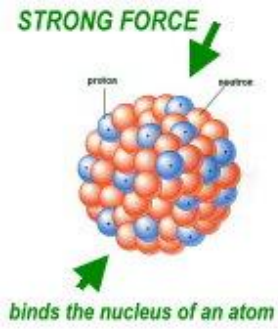
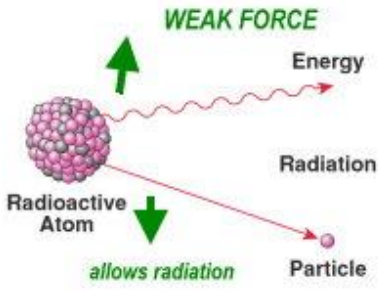
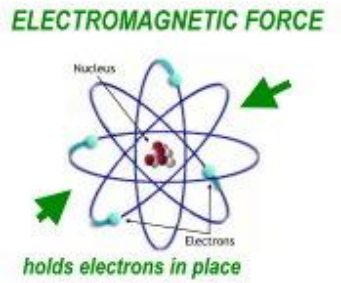
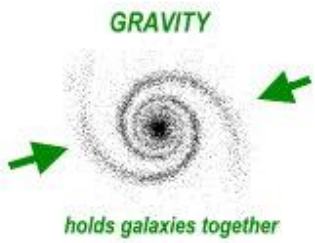
# The Four Forces




There are thought to be 4 forces controlling everything in our universe.

The first and second are two very powerful Nuclear forces which govern how the atoms are either held together or decay when radioactive. These are called the Strong and the Weak nuclear forces and their power is self-evident during nuclear explosions!

The third force is the Electromagnetic one. This is the positive and negative force which holds particles like electrons and protons together because of the attraction of the two opposite charges to each other - for example the north and south edges of two magnets pull together because they have positive and negative charges at each end. The awesome power of electromagnetism is visible in lightning!

The last force and strangest of all, despite the fact that we know it so well, is Gravity.

One of the most puzzling things about gravity is that it's amazingly weak compared to all the other forces and yet can act over very vast astronomical distances.

You may not think it very weak when it causes you to fall and squash your nose on the pavement, but a nice demonstration is to brush or comb your hair and then use the static electricity on the brush or comb to pick up a small piece of paper. The force you are using there is the Electromagnetic one and the tiny charge you quickly generated from your hair is very easily defeating a Gravity force which is being generated by the entire mass of the earth!

To give you an idea of the actual difference in strength, the Strong force is actually a thousand million, million, million, million, million, million times stronger than gravity!
(only over very short distances of course or we would all be in trouble...)

The second oddity about gravity is that the other 3 forces each have their own virtual particle associated with them which have all been identified and measured. That is actually how the forces work - by exchanging these particles. Gravity should also have an associated particle which has been named the graviton, but we haven't been able to verify its existence yet, which may just be a temporary setback or may mean our theories about gravity are completely wrong...

The weakness of gravity is a dilemma which may mean that we are a long way off a true understanding of our universe as it may tie in with difficult to grasp theories such as multiple universes or extra dimensions such as in string theory - the idea being that much of the power of gravity may be leaking away into these other dimensions...

Note: *Recent experiments show that at high temperatures and energies the forces seem to change and get closer to each other in value, which may perhaps mean that there is actually just one force that manifests itself in different ways depending on the situation, although again probably leaving out gravity.*