The FIVE Forces of Nature (that is, according to Dick Henry !)

Isaac Newton taught us correctly (not obvious!) that if a body is not subject to a FORCE, that body simply moves in a straight line at constant speed forever. No forces = dull Universe!

Fortunately, there ARE forces, so, such things as, say, ballets can occur. Applause !!

Here is what the woman in the street needs to know about those wonderful forces!

First, there are FIVE of them. At least, I think there are! Maybe I'm wrong. (I'm often wrong, but I do have fun!) Anyway, here are all five, in order, from strongest to weakest:

1) The "Strong Force", which holds intact the protons and neutrons in the universe. It is VERY STRONG. That's all it does, and that is ALL you need to know about it ... if even that.

2) The "Electromagnetic Force", which is by far the most interesting force! Hey, just look around you. You do see things happening! That is mostly due to the electromagnetic force doing its thing. It can be broken down into the Electric Force $E$ and the Magnetic Force $B$, but that is artificial: they are parts of one whole. $J$ is the electric current density, and Greek Rho is the electric charge density. There are positively charged particles (e.g. protons) and negatively charged particles (e.g. electrons), making for a VERY interesting Universe indeed!

\[
\nabla \cdot E = \rho \quad \nabla \times B = \frac{\partial E}{\partial t} + J
\]

\[
\nabla \cdot B = 0 \quad \nabla \times E = -\frac{\partial B}{\partial t}
\]

and the Lorentz force equation Maxwell's “Displacement Current”

\[
\frac{dp}{dt} = q(E + v \times B).
\]

3) "the Weak Force", which causes isolated neutrons to decay in about 15 minutes, producing a proton, an electron, and an antineutrino. Oh, doesn't THAT excite you? Meh! You can IGNORE the Weak Force from this moment forward. (It is mathematically interesting.)

4) "the Feeble Force", which I discovered. It accounts for the mysteriously strong cosmic background ultraviolet radiation that (with my colleagues) I have observed, near the Lyman limit. That's ALL that ANYONE, including even me, needs to or can know about it.

Last, and by far the LEAST (it is so weak it hardly exists at all!):

5) "the Gravitational Force" (Isaac Newton). You know all about that one! Albert Einstein EXPLAINED it, via his wonderful Theory of General Relativity: the simplest theory ever: Mass, causes curvature, causes planets to orbit. That's all there is to it, and it works perfectly. The math is mostly un-illuminating; not like the Electromagnetic Force (above). It predicts the possibility of Black Holes, and Tom Bolton (Toronto) discovered the first one.