

Armchair Astronomy No.7 - Come to the Dark Side

Heavens Above! Astronomy from your Armchair. (© R Bee 2007)

Come to the Dark Side

I ended my last article with the quote: *"The Universe is not only stranger than we imagine; it is stranger than we can imagine."* For those uninitiated in current cosmology theory, you might want to take a stiff brandy, tighten your seatbelt and hold on to your hat. You are about to follow Alice down the rabbit hole.

The question of what makes up our Universe has always fascinated mankind. Up until around 1970, it was pretty easy. What you saw was what you got. That is, astronomers had been able, as far as modern visual and radio telescopes could take them, to identify all types of matter making up the Universe – planets, stars, gassy nebulae, galaxies, dust. Certainly a lot of it, but that was all. Such hubris!

It took a woman, astronomer Vera Rubin in 1970, to announce the shocking results of detailed observations of stars rotating on the outskirts of distant galaxies. They weren't behaving as they should. Something else, something dark and unseen, was out there. Naturally, being a woman, she was initially ignored, but eventually, as more data poured in, the astronomical community recognized the truth. There was mysterious matter out there, causing a lot of gravitational affects on galaxies, that couldn't be seen. With typical imagination it was dubbed Dark Matter.

It soon became obvious that there was a LOT of Dark Matter in the Universe, in fact about five times as much as normal matter. That was a scary thought. Over 80% of the Universe was made up of stuff we couldn't see but worse still, had no idea of what it was made of. Stuff scientists could not even conceive of (thus my earlier quotation). BUT, it had huge impacts on the way the Universe worked. Very strange indeed.

The Holy Grail of modern astronomy and science became finding the identity of this mysterious and ubiquitous Dark Matter. The hunt was on. Some credible candidates were found (brown dwarf stars, neutrinos) but these made puny contributions. Over 95% of Dark Matter was still the stuff of Wonderland.

*The Universe is full of stuff,
Quoteth the Mad Hatter.
What we see is part of it,
But most is just Dark Matter.* (R Bee 2007)

Then in 1998, Nature smote cosmologists with the second half of the double-whammy. They never saw it coming. The Universe, which was known by observation to be expanding from the Big Bang and, by all theories, ultimately slowing down due to gravity, was suddenly observed to be not slowing its expansion at all, but accelerating. Hopping Hubble and Einstein's Enigma, what was going on? Galaxies were flying apart faster now than in the past, not slower. It defied all common sense, all known physics, even good taste. But it is happening.

Any attempt to explain this phenomenon involves some heavy science so we won't go there. Suffice it to say that empty space, vacuum if you like, is now believed to contain a form of energy previously undreamed of. A repulsive energy. It's a property of space itself. And as the Universe expands and space grows bigger, that repulsive energy starts to dominate over gravity and causes the Universe's expansion to accelerate, not slow down. Excluding any future surprises, this should continue forever. In trillions of years, galaxies will be out of sight of each other. The name they give to this mysterious energy that space, or vacuum, contains, is Dark Energy.

You thought that was weird? Then hear this. Remember that with Einstein's famous equation $E=Mc^2$, energy is equivalent to matter and vice-versa. Calculations now show that the Dark Energy accounts for 70% of the Universe's matter. Dark Matter accounts for 26%. The rest, our traditional universe which we can actually see out there, including us, accounts for only 4% of the Universe's matter. We're small bikkies in the overall scheme of things. Or are we?

*All is dark, said the Universe,
Energy and Matter.
Not quite, there's still light
Said the Mad Hatter,
Amid all the dust and the stars
Which are rife
With planets all bursting
With hope and with life.* (R Bee 2007)