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THE EDGE OF THE UNIVERSE

Ken Tapping, 26th September, 2017

The universe began about 14 billion years ago in an event that is called the "Big Bang". This name conjures up a vision of an unimaginably big and violent explosion, with the stuff that would one day become galaxies, stars, planets and us flying off in all directions, at high speed and incredibly hot. "Big Bang" was a derisive term used by astrophysicist Fred Hoyle, who did not believe it. The term stuck.

The idea that the universe had a definite Beginning comes from the discovery that the universe is expanding. By measuring the distances of galaxies and the speeds they are moving away from us, we can track back where those galaxies were in the past, and we found that just under 14 billion years ago they were all at the same location. So far this supports the explosion concept.

However, we see the same relationships between distance and rate of expansion no matter in which direction we look. If we, along with everything else were being thrown out from an explosion, we would see different things in different directions. Looking back towards the explosion location would give us a very different relationship between distance and expansion rate than the one we would see looking in the other direction, in the way we were moving. If such an explosion happened, there would be only one place where we would see the same things no matter which way we look, and that is at the precise centre of the explosion.

However, throughout history we have harboured illusions about being at the centre of everything, and have been shown over and over again that we have been wrong. The rest of the universe does not orbit around the Earth. The Earth is just one of a number of bodies orbiting the Sun. Herschel thought the Sun lies at the centre of the Milky Way galaxy, which was believed to be the only galaxy. Then we found we live in the Milky Way's suburbs, far from the centre. Now we know there are billions of galaxies, stretching out as far as we can see, all containing billions of stars and countless planets.

The Beginning of the Universe was not just a creation of matter and energy; it was also the creation of space and time. We see galaxies getting further away because they are being swept away by the expansion of space. Imagine a bubble or a balloon with dots on its surface. As that bubble or balloon inflates, the inhabitants of any of those dots would see the other dots getting further away, with the rate of recession increasing with their distance. Those living on the surface of the balloon live in a two dimensional world, which is expanding in a third dimension. We live on a three-dimensional environment that is expanding in a fourth dimension. An ant wandering around on the surface of the balloon would never find an edge; she would just end up back where she started. If we set off in a spaceship and held to a straight line course, after a very, very, very long time we would wind up back where we started. Like the surface of a bubble or balloon, the universe has no edge.

The Big Question is what was going on before the "Big Bang"? An idea getting increasing interest, and one that marks one more level of demotion for us, is that what we call universes form and disappear like bubbles in multidimensional cosmic foam. This raises an interesting possibility. What would we see if our "balloon" is touching one or more others? It is possible to calculate what the contact points would look like, and a search is going on. If our universe is just one of many in a multiverse or superverse, what comes after that? A scientist once said that "the universe is not only stranger than we imagine; it is stranger than we CAN imagine". We can still try to understand a little though, like reading a good book that never ends.

Saturn lies low in the southwest. Spectacularly brilliant Venus rises in the early hours, with Mars and Mercury lower in the dawn glow. The Moon reaches First Quarter on the 27th.

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