

The quantum multiverse

Throughout the centuries, humans have increasingly realised that their existence is not as unique as first thought. Bar the views of the religious communities, it is accepted now that we are on but one planet, in one solar system, within one galaxy, within a multitude of billions of other galaxies. But the little solace we do have is that there is only one universe in which we are all contained in. Or is there?

Welcome to the world of quantum mechanics. Extremely successful in its explanation for the microscopic world, it has many interesting properties. For example, you may be familiar with Schrödinger's cat. This is the idea that before you observe a quantum system, a particle can be thought to be in a superposition of two states. In this famous example, it is the cat that is superposed between life and death. It is only by observing that we see whether the cat is, indeed, alive or dead. The conclusion of this is that by observing a quantum system, you change the state of the system itself.

If we expand on what we mean by 'observing a system', we come to very important, if perhaps trivial, points. One is that we must be alive in order to observe. The other is that, depending on the manner of observation (the time at which you do, etc), your observation may well differ from somebody else's. This draws parallels to Einstein and his Theory of Special Relativity, of course, whereby two observers watch a particular event happen but draw different conclusions of the event, true within their own reference frame.

This is where the theory gets interesting. Say you build a special type of machine gun, so that a bullet is fired or not fired depending on a quantum event occurring (or not occurring, respectively). Take two observers and place one in the line of fire of this gun and the other at a safe distance out of the way. To the person in front of the gun, it will never fire and kill him. But to the other observer, there is nothing to say that the other one will or will not die.

This is why. We said that you can only observe a quantum event if you are alive. Therefore, the only event the person standing in front of the gun can observe will be the quantum event that does not make the gun shoot. If you are dead, then you cannot observe, therefore the quantum system cannot have a definite state of shooting or not shooting.

The other observer has no such ties, however. He can observe it shoot or not shoot, and therefore it is possible he could see the other observer die.

So how can we explain this? Theorists have come up with the idea of a multiverse; that is, for every universe we have here, there are an infinite number of other universes that exist through the happening of other events that did not happen in our perceived reality. In case of the machine gun, one observer stays within a universe where the other dies, and the other one enters another universe whereby he is still alive.

Quantum theory is strange indeed.