Dark Matter

But there is more than just matter and antimatter

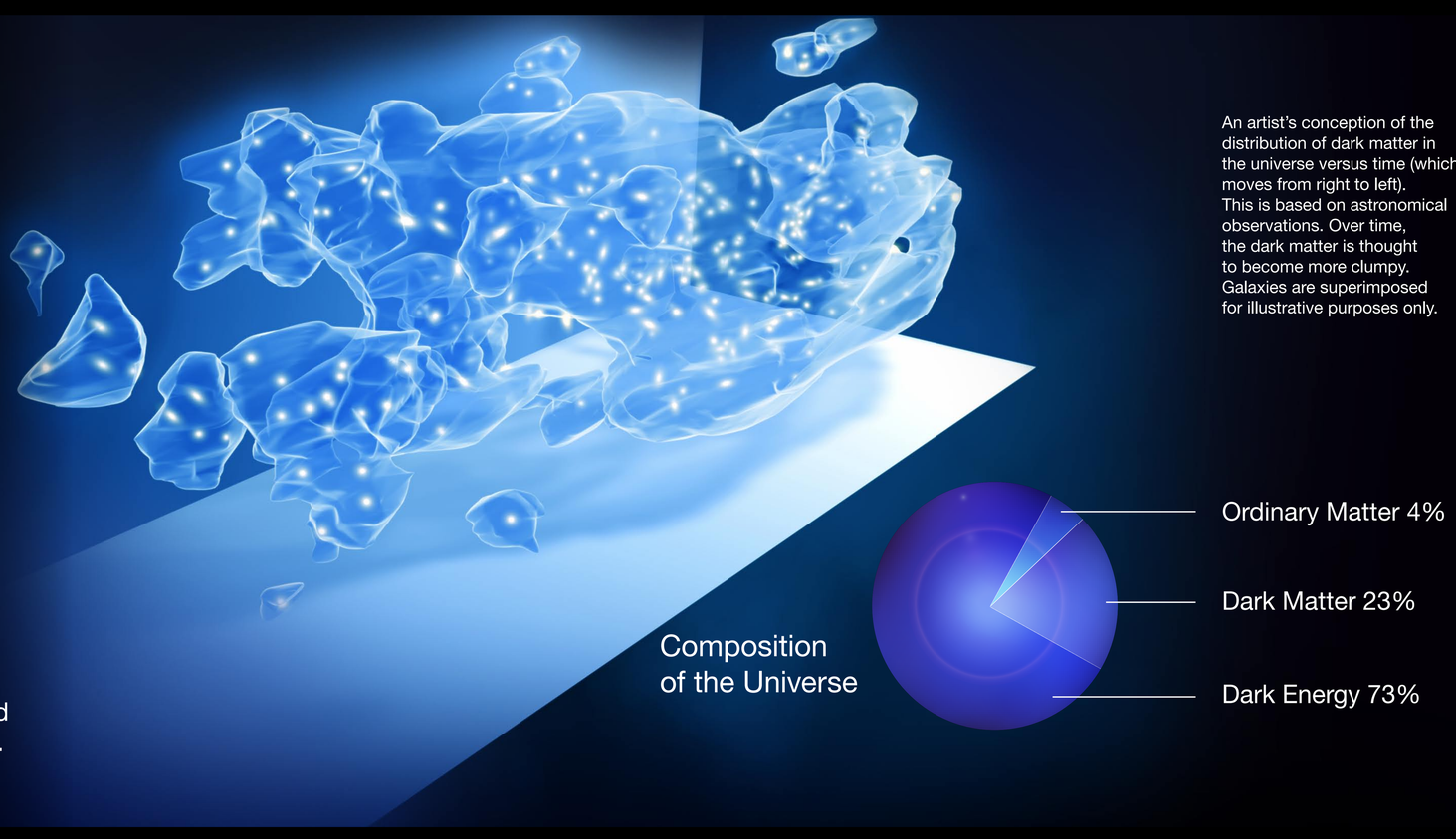
Looking at our Universe we see much more than ordinary matter (or antimatter)...
We see evidence of dark matter in galaxies and clusters of galaxies.



Unseen dark matter holds together rotating galaxies



A collision of two clusters of galaxies momentarily separated ordinary matter and dark matter (seen by gravitational lensing).



An artist's conception of the distribution of dark matter in the universe versus time (which moves from right to left). This is based on astronomical observations. Over time, the dark matter is thought to become more clumpy. Galaxies are superimposed for illustrative purposes only.

Supersymmetry

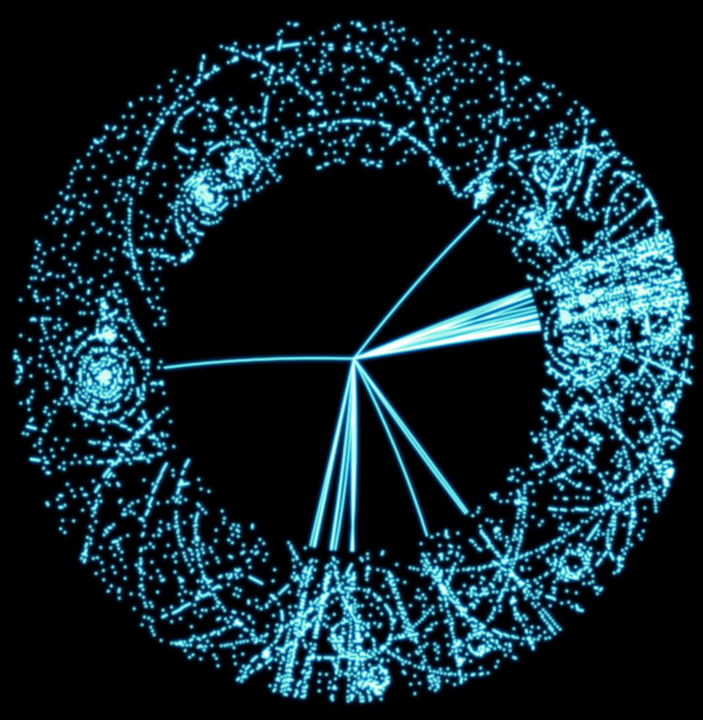
What is dark matter?

We don't know

But we have ideas

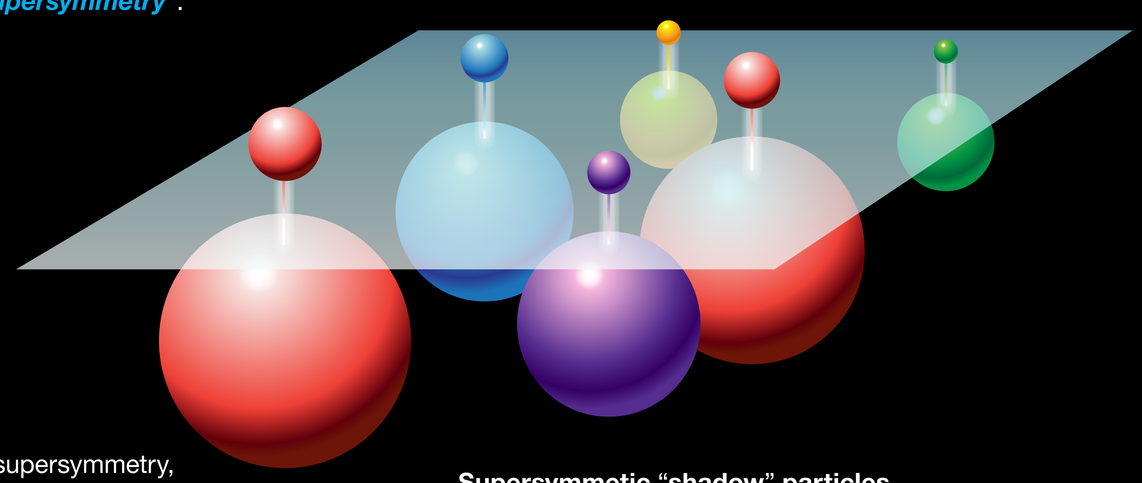
If the constituents of dark matter are new particles,

the ATLAS Experiment should discover them and elucidate the mystery of dark matter.



String theory and supersymmetry

String Theory predicts ***extra dimensions*** of space and a new symmetry called "***supersymmetry***".



In supersymmetry, every particle should have a massive "shadow" particle, and one of these might be the dark matter particle.

Extra Dimensions

Are there extra dimensions of space?

Think about an ***acrobat*** and an ***ant*** on a tight rope.

The ***acrobat*** can move forward and backward along the rope.

But the ***ant*** can also move sideways around the rope.

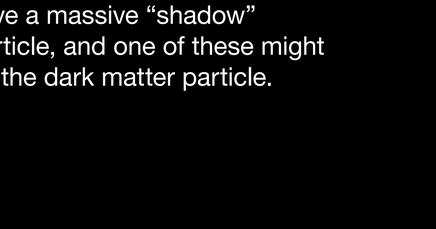
If the ant keeps walking to one side, it goes around the rope and winds up where it started (it is a small dimension).

The acrobat can only detect the one dimension of the rope, just as we can only see the world in three dimensions, even though it might well have more.

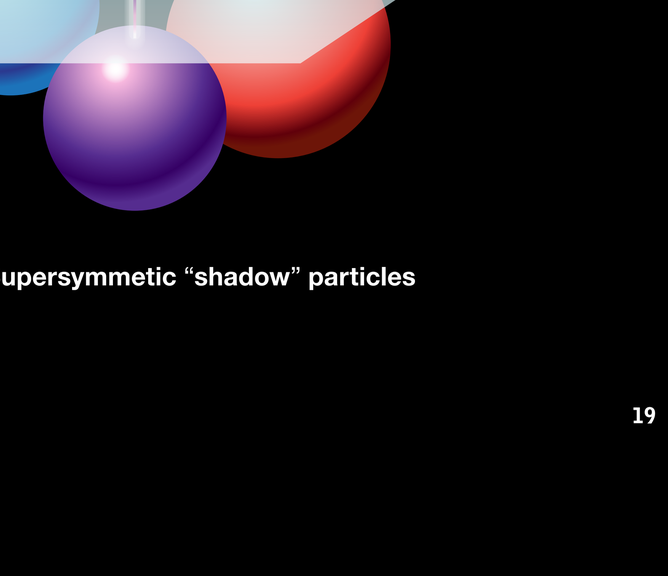
Why is gravity so weak?

We observe that the force of ***gravity*** is far far weaker than that of ***electromagnetism***. This is a great mystery.

Perhaps, ***Electromagnetism*** is confined to our usual three dimensions of space



Maybe ***Gravity*** sees the other dimensions of space. As the force is spread out, it is weakened.



Extra dimensions of space might lead to dramatic events in the ***ATLAS detector***.