

# A Far-Out Theory Describing What's Out There

Physicists have long sought a unified theory to explain all the forces and matter in the universe. Superstring theory is an attempt at such a unification, and now "brane" theory expands on it, proposing that our universe is one of many membranes that "float" in a multidimensional megaverse.

## Brane Theory

It expands superstring theory to include vibrating membranes, or branes, which may have many dimensions.

**1** Our universe can be thought of as a three-dimensional brane floating inside a four-dimensional megaverse.

**2** Most strings that compose our universe are attached to the brane's surface, and so most particles that exist on our brane are confined to its three-dimensional space.

**3** However, the particles that convey gravity, gravitons, are not tightly confined to any particular brane, and some of them roam across to other branes in the megaverse.

Sources: "Q is for Quantum," by John Gribbin; "The Ideas of Particle Physics," by J.E. Dodd

### SUPERSTRING THEORY

At its most basic level, the universe consists of tiny loops of string that vibrate at different frequencies.

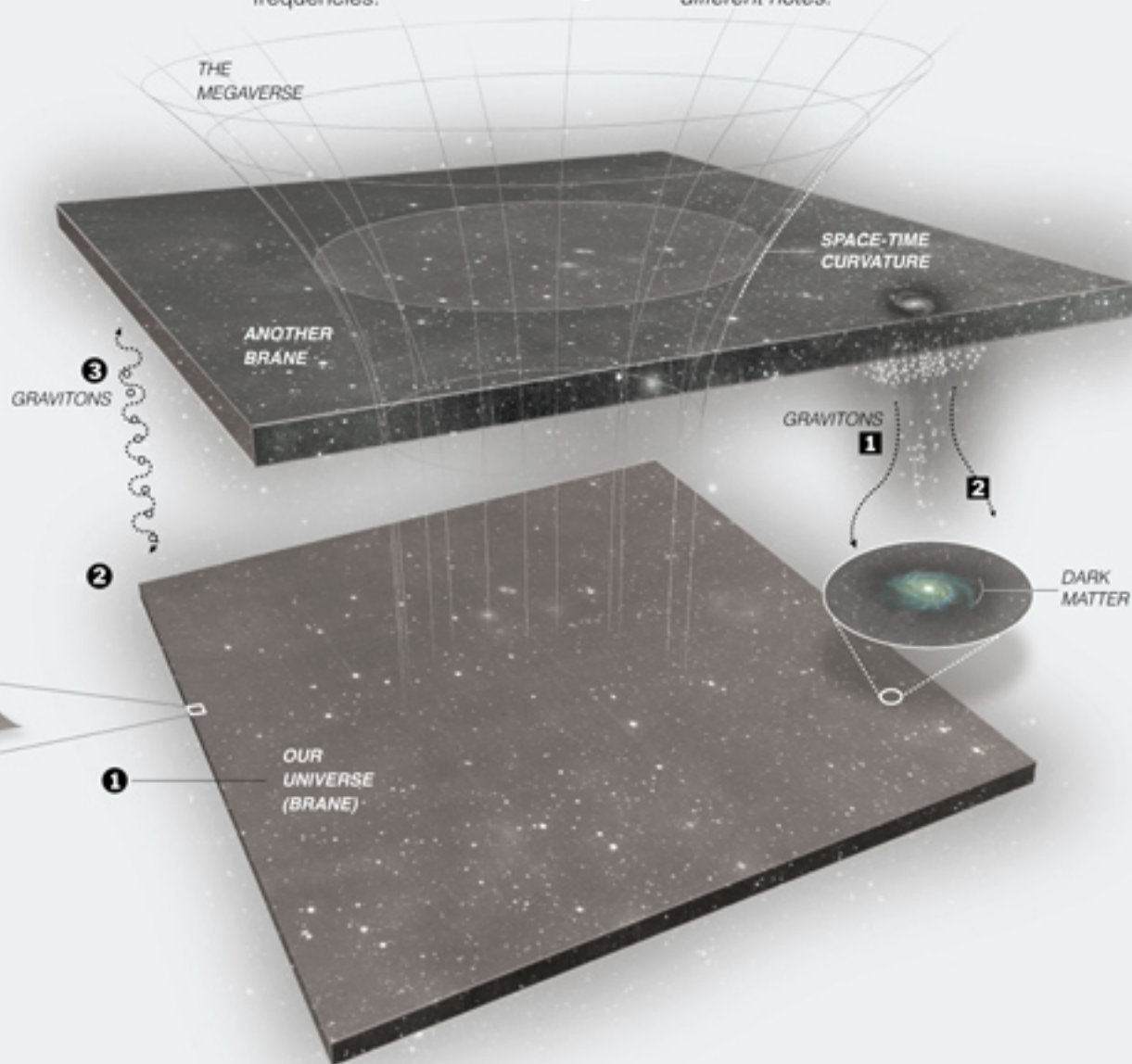


Since matter can be described in terms of energy, each frequency (energy) corresponds to a type of particle (matter) just as different frequencies coming from a violin's strings produce different notes.

STRING SIZE  
The strings are to an atom...



...as an atom is to the solar system.



### BRANE THEORY AND GRAVITY

Gravity is described by relativity theory as curved space-time, and it is the weakest of the forces in our universe. Brane theory contains a possible explanation.

**1** Gravitons, conveyors of gravity, may be concentrated on a different brane where the space-time of the megaverse is severely curved. Only a small number of gravitons make their way here, so gravity is felt as a weak force.

### DARK MATTER

Cosmologists suggest that it makes up 90 percent of our universe. It neither emits or absorbs light, but it exerts gravity. According to brane theory, it may just be ordinary matter concentrated on other branes, and its light cannot shine through to this universe.

**2** The light from dark matter, conveyed by particles called photons, would cling to the surface of the foreign brane, but gravitons might seep across the divide. Pulled by our galaxies' local gravitational force, the gravitons would cluster into halos around the galaxies.