

Wormholes And Cosmic Strings

What Is A Wormhole?

According to current hypotheses, a wormhole is an imperfection in spacetime that has two ends. Instead of a black hole, which only has one point singularity in space- time, a wormhole could have one point where matter can only enter and another point where matter can only exit.

Do Wormholes Really Exist?

No wormhole has ever been detected. Science fiction writers like to invoke wormholes as useful ways to violate the known laws of physics (for instance, making objects disappear into nothingness or appear out of nowhere, for no apparent reason), but real wormholes, if they exist, would destroy anything on a terrestrial scale that is near one of its openings.

What Is A Cosmic String?

According to current hypotheses, a cosmic string is a giant vibrating strand or closed loop of matter; it is almost like a black hole, but long and thin, rather than a point or sphere. Cosmic strings may have been produced by gravitational shifts in the early universe. They could be envisioned as "creases" left in an otherwise smooth transition from the initial phases of cosmic evolution. They might also be described as "wrinkles" in the texture of the universe, moving and wiggling around in spacetime. A cosmic string may be many light-years long, but far thinner than the width of a human hair, and may contain the mass of billions upon billions of stars. A cosmic string may also carry an extremely strong electrical current.

Do Cosmic Strings Really Exist?

No cosmic string has ever been detected. Every once in a while, observational evidence suggests that a cosmic string might have been seen, but these observations have never been confirmed. It may be possible that the universe may have contained many cosmic strings early in its history, but almost all of them may have decayed away by now.

Can Cosmic Strings Be Used To Travel Backward In Time?

The American astrophysicist J. Richard Gott (1938-) has published a book describing a special kind of time machine that might be possible using cosmic strings. In a nutshell, if there are two straight cosmic strings passing close by to one another as they move about in the universe, the spacetime between the two strings will be heavily distorted by the strings' gravitational influence, and time could loop around in a strange configuration. If an object can somehow follow that loop in exactly the right way, it could wind up taking a wild, corkscrew path through time so that it would end up in a location in spacetime before where it started. Research into the theoretical possibilities of such a "Gott time machine" continues, but again, no cosmic strings have ever been detected, let alone two.

Could Wormholes Be Used To Travel Faster Than Light?

Mathematically, it is possible to manipulate the equations of Einstein's general theory of relativity to create a wormhole that could stretch across a large distance in space. Then, if the known laws of physics do not apply in the wormhole, it might be mathematically possible to go from one end to the other in an amount of time shorter than a beam of light would take to traverse that same distance. However, those same manipulated equations suggest that nothing larger than microscopic particles could get through a wormhole without being destroyed by the extreme conditions within. In a nutshell, if there are two straight cosmic strings passing close by to one another as they move about in the universe, the spacetime between the two strings will be heavily distorted by the strings' gravitational influence, and time could loop around in a strange configuration. If an object can somehow follow that loop in exactly the right way, it could wind up taking a wild, corkscrew path through time so that it would end up in a location in spacetime before where it started. Research into the theoretical possibilities of such a "Gott time machine" continues, but again, no cosmic strings have ever been detected, let alone two.

What Is A Galaxy?

A galaxy is a vast collection of stars, gas, dust, and dark matter that forms a cohesive gravitational unit in the universe. In a way, galaxies are to the universe what cells are to the human body: each galaxy has its own identity, and it ages and evolves on its own, but it also interacts with other galaxies in the cosmos. There are many, many different kinds of galaxies; Earth's galaxy is called the Milky Way.

How Many Galaxies Are There In The Universe?

Thanks to the finite speed of light and the finite age of the universe, we can only see the universe out to a boundary called the cosmic horizon, which is about 13.7 billion light-years in every direction. Within this observable universe alone, there exist an estimated 50 to 100 billion galaxies.

What Kinds Of Galaxies Are There?

Galaxies are generally grouped by their appearance into three types: spiral, elliptical, and irregular. These groups are further subdivided into categories like barred spiral and grand design spiral, giant elliptical and dwarf spheroidal, and Magellanic irregular or peculiar. Galaxies are also often categorized by characteristics other than their appearance. For example, there are starburst galaxies, merging galaxies, active galaxies, radio galaxies, and many more.

How Big Are Galaxies?

Galaxies range greatly in size and mass. The smallest galaxies contain perhaps 10 to 100 million stars, whereas the largest galaxies contain trillions of stars. There are many more small galaxies than large ones. The Milky Way, which has at least 100 billion stars, is on the large end of the scale; its disk is about 100,000 light-years across.

What Are Some Well-known Galaxies?

The table below lists some of the galaxies that are well known to both professional and amateur astronomers.

Some Well-Known Galaxies		
Common Name	Catalog Name	Galaxy Type
Andromeda	Galaxy Messier 31	spiral
Antennae	NGC 4038/4039	interacting
Cartwheel Galaxy	ESO 350-40	spiral ring
Centaurus A	NGC 5128	elliptical
Flagellan	G515	peculiar elliptical
Messier 49	NGC 4472	elliptical
Messier 61	NGC 4303	barred spiral
Messier 87	NGC 4486	elliptical
Mice	NGC 4676	interacting
NGC 1300	ESO 547-31	barred spiral
Pinwheel Galaxy	Messier 101	spiral
Sombrero Galaxy	Messier 104	lenticular
Southern Pinwheel	Messier 83	spiral
Triangulum Galaxy	Messier 33	spiral
Whirlpool Galaxy	Messier 51	spiral