

Hey everyone, and welcome to the first episode of The Universe and You, the show where I, your host, will tell you about the infinite universe that we all live in, and you, the listener, can sit back, relax, and have an existential crisis about your place in the universe.

To start, I want you to think back to when you were a child, and you had your first noteworthy experience with a thunderstorm. Some people are afraid of the lighting and resounding boom of the thunder, some people love them. Regardless of how you feel about them, you know that they are powerful. This was probably your first experience with how powerful nature can be. Now as you get older you know how water can erode castles, or you know how hurricanes form and destroy homes. We can explain a lot about nature, but understanding does not mean that we can control it. Nature on our planet is still an untameable force that humans, despite all our technology or intelligence, cannot hope to match just yet. Keep that lighting and those natural forces on Earth in mind as we expand our view.

Think about the sun, a massive nuclear furnace so large that it could contain 1 million iterations of earth, the planet that contains the entirety of life as we know it. However, from our view on earth, the sun is merely a bright circle in the sky that sometimes gives you a nice tan, or, in the case of my Irish family, burn. It is so small to us, we can block it out with our thumb, or hide from its radiance under a beach umbrella. This is because of the distance between Earth and the Sun. The light from the sun takes a mere eight minutes to travel the roughly 93 million miles to Earth. This is only possible because light travels faster than anything else, setting, according to the theory of general relativity, the universal speed limit. Now light minutes are a long distance, but to really understand what we're talking about today, we need to go even bigger.

A light year is the distance that light, traveling at 186,282 miles per second, can traverse in a year, three hundred sixty five and one quarter days. This ends up being around 6 times 10 to the 12th miles. That is a six with 12 zeros after it. Six trillion miles. Now that you have a healthy respect for how big a light years it, is time to shift to a galactic scale. The milky way galaxy, containing millions of stars and planets, is 100,000 light years across. That means that if you were standing at the opposite end of the Milky Way and had a powerful enough telescope to look at earth, you would just see the beginnings of the species that would become humanity, because it took so long for the light to travel the distance. Our galaxy is a mid-sized galaxy, keep that in mind through the rest of the episode.

Now we can finally get to today's topic, the largest lighting bolt scientists have ever seen. At the center of each galaxy, scientists believe that there is a supermassive black hole, responsible for the crazy amounts of gravity required to keep these ginormous galaxies together. Black holes, create powerful magnetic fields and often generate huge streams of charged particles, firing out of their axis, called cosmic jets. These jets form a beam of radiation that leaves the galaxy at a right angle to the plane of a galaxy. The black holes at the centers of galaxies vary a lot depending on the type of galaxy we are talking about, and how it developed. One galaxy, with the very catchy name of Galaxy 3C 303, has a particularly exciting black hole.

Starting at the core of Galaxy 3C 303 there is a current of positive charge flowing out from the magnetic hellscape that is the galactic center along the cosmic jet. This is the first time scientists have directly observed a Galactic-scale electric current. This current is, like most things out there in the scary blackness of space, colossal. The electric energy shooting out of Galaxy 3C 303 is roughly equivalent to 1×10^{18} amps. It's not just the incredibly high energy that makes this such an incredible phenomena, it's also the distance it is covering. The plume of energy which I'm going to start calling, space lighting, reaches out into the Intergalactic Medium, or IGM, for one hundred fifty thousand light years, leaving a trail of plasma in its wake. That is one and a half times the diameter of our own Milky Way. This space lighting is roughly the same as 1 trillion lightning bolts here on earth, kind of makes that lightning that awed you as a kid a little less impressive now doesn't it.

Thank you everyone for listening in to this week's the Universe and You, join us next week when we talk about the thing that's responsible for the development of the universe as we know it, and why I'm afraid of it. This has been the Universe and You by the Signifying Nothing Network, have a good, existentially unimportant week!