NARRATION: Guglielmo Marconi’s first radio transmissions in 1894 have spread into space for over 100 years at the speed of light. They passed Sirius in 1903, Vega in 1919, and Regulus in 1971. That signal has already passed over 1 thousand stars. Anyone orbiting one of those stars, with a really good receiver, could detect Marconi’s signal and know that we are here.

Radio waves are the longest and contain the least energy of any electromagnetic wave. While visible light is measured in minute fractions of an inch, radio waves vary from about 19 centimeters, about the length of a water bottle, to waves the length of cars, ships, mountains, all the way up to monstrous waves longer than the diameter of our planet.

Heinrich Hertz discovered radio waves in 1888. The first commercial radio station went on the air in Pittsburgh, Pennsylvania on November 2, 1920. Then, in 1932, a major discovery by Karl Jansky at Bell Labs revealed that stars and other objects in space radiated radio waves. Radio astronomy was born.

However, scientists need giant antennas to detect weak long wavelength radio waves from space. The enormous Arecibo radio dish antenna measures 305 meters in diameter, over 3 football fields. Scientists can link the signals from an array of separate radio antennas to focus on tiny slices of distant space. Such arrays act as a single immense collector. This giant New Mexico array uses 27 parabolic dish antennas shaped into a giant Y, with each arm capable of stretching 13 miles. Scientists have even spread these linked antennas across the globe. One of the largest stretches from Hawaii to the Virgin Islands, and acts like such a powerful telephoto lens that a baseball sitting on the Moon would fill its entire field of view.

Many of the greatest astronomical discoveries have been made using radio waves. Pulsars, the existence of giant clouds of superheated plasma, which are among the largest objects in the universe, and even quasars, such as this one over 10 billion light years away, were all discovered using radio waves.

Radio waves also provide more local information. Astronomical objects that have a magnetic field usually produce radio waves, such as our Sun. Thus, NASA’s STEREO satellite is able to monitor bursts of radio waves from the Sun’s corona. Wave sensors on the WIND spacecraft record the radio waves emitted by a planet’s ionosphere, such as the bursts from Jupiter, whose wavelength measures about 15 meters.

Radio waves fill the space around us to bring entertainment, communications, and key scientific information. We can’t hear these radio waves. When you tune your radio to your favorite station, the radio receives these electromagnetic radio waves and then vibrates a speaker to create the sound we hear. We may not be able to tap our toes to the cosmic radio transmissions, but we certainly discovered much about our universe’s grand cosmic dance by listening to them.