Topic 5 - What Channel Is This?

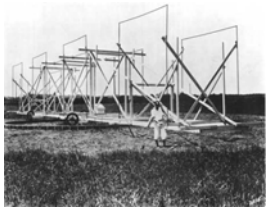
Radio Telescopes

Radio waves are received from stars, galaxies, nebulae, the Sun and even some planets. With the development of *radio telescopes*, astronomers gain an advantage over optical telescopes, because they are not affected by weather, clouds, atmosphere or pollution and can be detected day or night. Much information has been gained about the composition and distribution of matter in space, namely neutral hydrogen, which makes up a large proportion of matter in our Milky Way galaxy. Radio telescopes are made of metal mesh and resemble a satellite dish, but are much larger, curved inward and have a receiver in the center.

Radio telescope in Arecibo, Puerto Rico.

In 1932 Karl Jansky built a radio antenna that was able to identify radio waves from space.

Grote Reber built a radio dish based on Jansky's antenna findings, where he 'listened' to the sky during the 1930's. He discovered that the strongest radio waves came from specific places in space. The static Rober heard became louder when he tuned into these *radio objects*. The loudest being our Sun in the Milky Way Galaxy.



Bigger Radio Telescopes

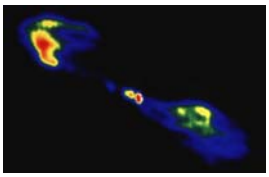
Radio waves have wavelengths that are millions of times longer than light waves, meaning that these waves give less resolution, but can penetrate dust clouds in the galaxy, where light waves cannot.

Seeing Radio Waves

Radio telescope waves provide data, which astronomers graph, using computers to store the data and false color it to produce images of the radio waves, which are coded to the strength of the waves. Blues for low intensity, and as the signal gets stronger the colors go through greens, yellows, reds and whites. Radio observations have provided a whole new outlook on objects we already knew, such as galaxies, while revealing pulsars and quasars that had been completely unexpected.

Optical Connections

Radio astronomers wanted to connect their radio waves with visual data obtained from optical telescopes. Until the resolution of radio telescopes improved making the connection was difficult. It is now common.



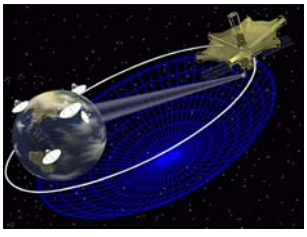
Connecting Radio Telescopes

By combining several small radio telescopes (just like they do with optical telescopes) greater resolving power can be achieved. This is referred to as **radio** *interferometry*, improving the accuracy and performance of the image in making radio maps. The greater the distance between the radio telescopes the more accurately they can measure position.

Arrays, like the *Very Large Array* in Sorocco, New Mexico, which uses **27** telescopes arranged in a **Y**, can improve accuracy even more.

Radio Telescopes Bigger Than Earth

Telescopes can now be connected without wires, thanks to computers and clocks. This method is called Very Long Base Interferometry (VLBI). With this technique, images 100 times that of the largest optical telescope can be captured. This is done by capturing images from any or all radio telescopes in the world.



Imagine a telescope as large as the Earth itself.