KIDS' SCIENCE CHALLENGE

SETI SCIENCE PROJECTS

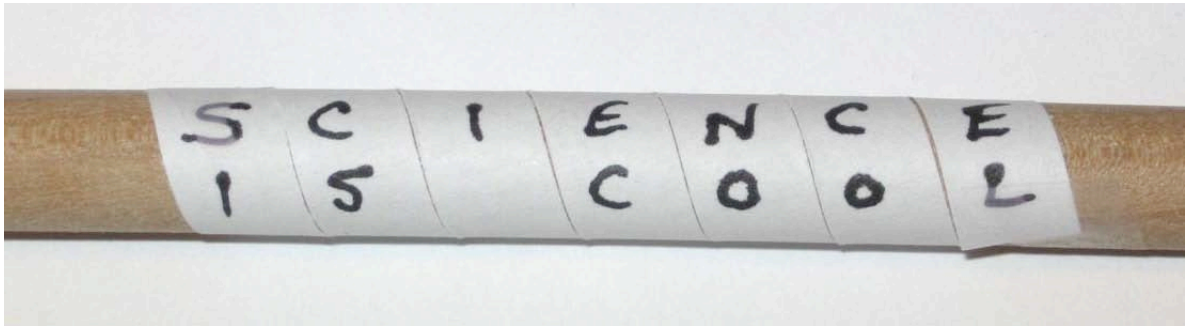
Skytale*

Scientists study radio signals from outer space to search for intelligent life on other planets, sometimes called “extraterrestrials” (ETs) or “aliens.” Many of these scientists work with an organization called the SETI Institute. SETI stands for the Search for Extraterrestrial Intelligence. Of course, nobody knows if space aliens really do exist. And if they do, we don’t know what kind of message they’ll send us. SETI scientists think that if a space alien does send us a message (using radio or light signals), it will form a pattern that repeats over and over again.

When SETI scientists hear a pattern in the middle of the natural sounds that stars make, they study it. Then they try to figure out if it’s a message from an alien. If it is an alien message, it will probably be in code. So the scientists will have to crack the code to “decode” the message.

For centuries, humans have sent messages using secret codes. The only people who can read these kinds of messages are those who know how to decode the messages.

In ancient times, Greeks invented the ***skytale*** to send encoded messages to one another. To create a *skytale,* the Greeks would wrap thin strips of paper or parchment around a tube or cylinder. They would write their message on the wrapped parchment. Then they would unwrap the parchment and send it to somebody. When the person at the other end got the parchment, they would wrap it around a cylinder with the same thickness and decode it.



A skytale looks like this!

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Skytale is a Greek word which is pronounced a bit like the word 'Italy."

Would you like to make your own *skytale*? Follow these steps, and you can send a secret message to a friend!

- ❒ Find a tube from a roll of paper towels or a cylinder like a wooden dowel or piece of pipe.
- ❒ Cut long strips of paper and tape them together to form one long strip.
- ❒ Tape one end of the strip to your tube, then wrap the strip around the tube or cylinder from top to bottom and tape the other end to the tube. (Make sure the edges of the strip don't overlap as shown in the picture.)
- ❒ Write a message across the paper strips, placing one or two letters on each strip.
- ❒ Now unwind the paper and send it to a friend. She will have to wrap your message onto a cylinder or tube the exact same size you used, in order to read it. Otherwise, it's nothing more than jumbled letters.

Would your friend be able to read your message if she didn't know how to decode it? What kind of problems do you think we'd have decoding messages from outer space? If we wanted to send a message into space, how would we send it? What would we say?

Build Your Own Radio!

How do you build a radio telescope to listen to noises from outer space? SETI scientists use special radio telescopes made in factories with lots of expensive tools. But you can build your very own radio right at home, using a cardboard box and wire. Your homemade radio will pick up lots of signals from here on earth. And you don't even need electricity.

What you'll need:

1 cardboard box (anything from 8 inches per side to 20 inches per side)

The following 5 items are available for a total of $13.25 + shipping from http://sci-toys.com.

60 feet of 22 gauge enameled copper wire
1 variable capacitor, 0 to 60 picofarads
1 1N34A germanium diode
1 piezoelectric earphone
(wire, capacitor, diode and earphone -$10 total - can be foundat http://tinyurl.com/4hsfwy)
5 test lead clips (sometimes called alligator clips)
($0.65 each, can be found at http://tinyurl.com/4cwmqy)

Instructions

Photos are included to help you understand the instructions

Making the Coil

1. The first step is to wind the 60 feet of 22 gauge enamel coated magnet wire around the box. You will probably turn the wire around the box somewhere between 8 and 25 times, depending on the size of your box. Every time you wind the wire around the box, you affect the frequencies that your radio can receive. (The variable capacitor also affects the frequencies your radio gets.) If you are not getting the entire AM radio band when you tune the variable capacitor, you can add or remove loops of wire, to get lower or higher frequencies.

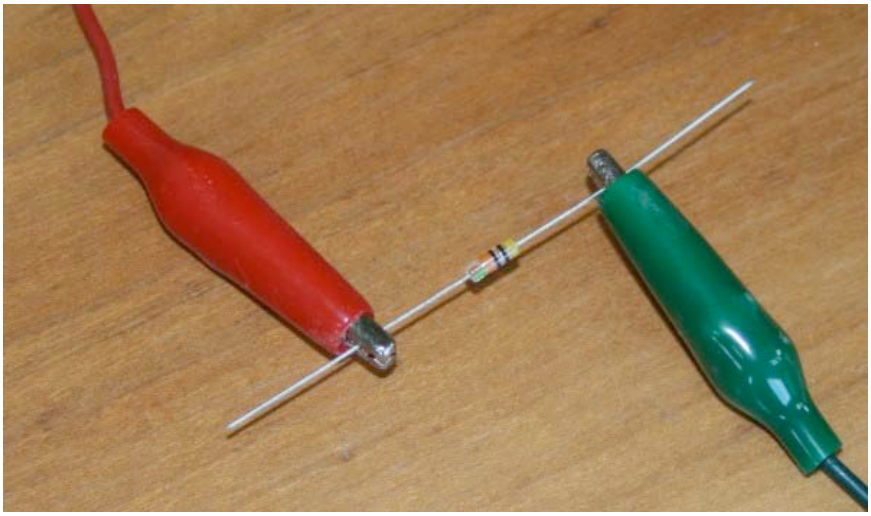
2. You can use clear packing tape to keep the wire in place. Tape one end of the wire to the box, leaving about 12 inches (one foot) free, to connect to the rest of the parts. Now start winding. When you are almost out of wire, tape down the last part, leaving 12 inches free for connecting again. You can then use more tape to neatly keep all the wires in place.

3. The last part of the coil construction is to scrape the insulation off the last inch of each of the ends of the wire, using a knife or some sandpaper. **Ask an adult for help.**

← Wire wound around a box

Making the Connections

(All photos and directions courtesy of http://sci-toys.com)



1. **Test lead clip #1:** Attach one end of the clip to the end of the scraped-off box coil wire, and the other end of the clip to one end of the germanium diode.

← Clips attached to the germanium diode

2. **Test lead clip #2:** Attach one ckip to the same end of the box coil, and the other side to the center terminal of the variable capacitor (connections are made with the dial facing away from you).

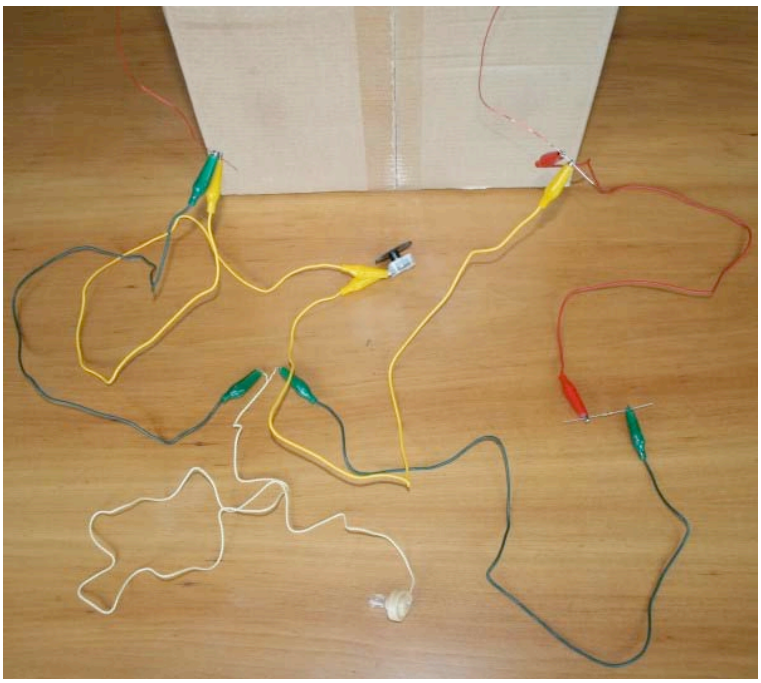
3. **Test lead clip #3:** Attach one clip to the second box coil end, and the other side to the right-hand terminal of the variable capacitor. The left-hand terminal on the capacitor will not be used.

← Clips attached to variable capacitor terminals

4. **Test lead clip #4:** Attach one clip to the second box coil end, and the other side to one of the wires on the piezoelectric earphone.

5. **Test lead #5:** Attach one clip to the other wire on the piezoelectric earphone, and the other side to the free side of the germanium diode

Clips attached to piezoelectric earphone →



← Your completed radio!

Ready to test your radio?

Carefully place the earphone in your ear. Now, tune the radio by turning the knob on the variable capacitor. When you hear a faint radio station, turn the box around slowly to see if you can make the sound stronger.

The radio station is sending sounds to you through its transmitter. Can you tell in which direction the radio station's transmitter is? Look at where your coil antenna is facing. The transmitter is probably in front of the coil or behind it. We can make that guess because the coil antenna works best by picking up signals from its front or back. Is there a city or a mountain in front or back of the coil? That may be where the transmitter is located.

What You'll Hear on Your Radio (and what SETI hopes to hear on their radios)

The radio you built will be able to receive AM radio signals. Maybe you'll hear news, or sports, or music broadcast from different radio stations here on earth.

The giant radio telescopes that SETI builds are designed to receive radio signals from outer space. They are listening to **100 million** different radio signals at any one time. Most of these signals are naturally produced by stars, but SETI hopes someday they'll hear a signal that's a message sent by aliens. SETI scientists use radio telescopes to listen to radio signals, then they use high-powered computers to study the radio signals that have been picked up. When the computers notice a signal that doesn't seem to come from a star or other natural object, they alert their scientists. Their scientists then analyze the signal for messages or other signs of communication from aliens.

Radio Telescopes

One big challenge for SETI scientists is cutting through all the noise in the galaxy and being able to hear a single radio signal. Imagine 100 million radios blaring music at the same time, while just one radio is broadcasting news. That's what it's like trying to find a signal sent by aliens. How will we hear a radio signal sent by space aliens through all that noise? SETI scientists believe that aliens could send us messages that form a pattern, so they search for or try to decode patterns that may be hidden in noise signals from outer space.

Kids' Science Challenge Science Projects are presented by the award-winning radio series, *Pulse of the Planet*.

Made possible by *The National Science Foundation*.