Science Lab

SEED

Build An Electrical Logging Tool

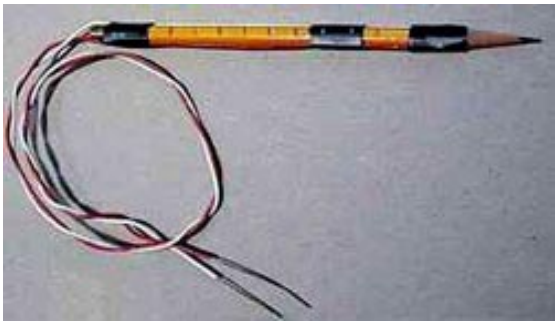
Logging is the process of gathering and recording geological information from deep within the earth. While an oil well is being drilled, a logging tool may be lowered into the borehole to gather data that is then used to produce a kind of graph known as a log.

Logging tools

A logging tool about to be lowered into a well

In 1927 the Schlumberger brothers made the first electrical log in France. An early electrical log is shown in the Science Lab experiment The Electrical Resistivity of Materials. It shows the electrical resistivity of the ground at different depths. This information can give an indication of what is in the ground. Oil soaked rock generally has a high resistivity while water soaked rock has lower resistivity. That's useful information to people looking for oil, but it's not the whole story. In Nuclear Magnetic Resonance Six Miles Deep you can learn about another logging technique that provides additional information about the subsurface.

You can get a good idea of how logging works by building and using a working model of electrical logging tool to measure the resistance of the ground and then use that information to generate a log. Here's what we did:



Our Design

Our little logging tool is made from a pencil, wire and electrical tape. We taped two pieces of plastic insulated wire along opposite sides of a pencil.

We decided that we could use the wires themselves as sensors by removing the insulation from a small area of each wire.

In order to provide a scale to measure how far below the surface the sensors were we used a small knife to cut notches in the side of the pencil at 1-centimeter intervals, beginning 1 cm above the sensors. To measure resistance we connected the ends of the wires to the probes of an ohmmeter.

Using Our Tool

We stuck our logging tool into the soil of a potted plant.

We lowered it so that the notch 1cm above the sensors was just at the surface of the soil. We checked the ohmmeter and noted the resistance. Then we pushed the tool down so that the next notch was at the surface and recorded the resistance 2 cm below the surface. We continued lowering the tool 1 cm at a time and recording resistance until the sensors were 10 cm deep.

Here's a chart showing our results:

depth in centimeters	Resistance in thousands of ohms
1	too high to measure
2	1,930
3	1,850
4	1,851
5	1,580
6	1,770
7	1,660
8	1,710
9	1,580
10	1,668

Now let's see what the data shows at:
http://www.slb.com/seed/en/lab/logging/interpret.htm