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# Making an Earth Battery

Moist earth is used as an electrolyte to create electricity in a voltaic cell. In 1841, Alexander Bain (1810 – 1877) demonstrated the ability of moist dirt to aid in generating electricity. Thus an “earth battery” is a pair of electrodes, of two dissimilar metals, with moist earth used as an electrolyte. To create the battery, Bain buried plates of zinc (anode) and copper (cathode) in the ground about one meter (3.2 feet) apart producing an output voltage of approximately 1 volt.

Have students create earth electrodes out of two dissimilar metals. Ask them to hypothesize what soil conditions are best for creating an earth battery. (Suggestions include: swamp or marsh muds, dry sand (no moisture), lawn soils, clay, sandy soils, acid forest soils, salty soils on roadsides after a season of winter salting.

Go hunting for iron bacteria (see Blog: *Hunting Iron Bacteria*) and use these iron-rich muds as the battery source material.

How much power [ $W = I * V$ ] does your earth battery produce?

Could you create a series circuit (current passes through each circuit element in turn without branching) to power a small LED?

## What You Need

- ✓ aluminum rod (plate)
- ✓ copper rod (plate)
- ✓ insulated wire (stranded, 20 gauge)
- ✓ electrical tape
- ✓ multimeter
- ✓ wire strippers

## Creating Earth Electrodes

1. Use wire strippers to remove approximately 1.5 inches of insulation from two 2-foot pieces of wire; strip approximately 0.5-inch from the other end.

2. Carefully wrap the longer stripped stranded wire around the rod(s)



Wrapping stripped wire around an aluminum rod.

## Making an Earth Battery

1. Identify a location.

2. Insert metal electrodes and attach multimeter leads [copper (+), aluminum (-)] For measuring direct current voltage: set multimeter function switch to "DCV: 20" take a reading in volts DC. for measuring direct current: set multimeter function switch to "DCA: 20m" take a reading in milliamps (mA) DC.

Lawn battery (summer). INSET: Marsh mud battery. (Circles show position of electrodes.)

## Calculating Earth Battery Power ( $W = I * V$ )

EXAMPLE: A lawn battery in late summer (little rain) produces a 0.65V, 0.2mA current. A battery power calculation of 0.00013W (0.13mW).

