Playing Music With Light!
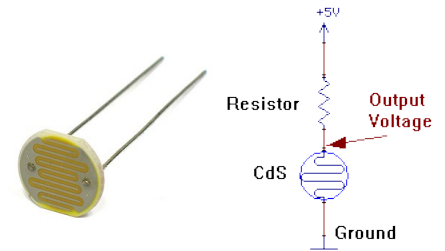
What:

A light sensing cell or photo-resistor or Cadmium Sulfide (CdS) cell turns light into a variable resistance. Usually dark = high resistance and high light = low resistance. In simple terms it is a bit like a volume knob for light!

Just like a volume knob, a light sensor can be used as an input to change programming values for time delays, controlling a motor or even making sounds!

How:

This circuit is pretty straight forward. It is a light sensor and a 1k ohm resistor wired in series (between +5V and GND on the breadboard), and you take the voltage measurement from where the sensor and resistor meet on the breadboard.

This will give you a roughly 0.5v (value in the arduino with a light shining on it) to 3.5v (value in the arduino in ambient light) range read in from the arduino.
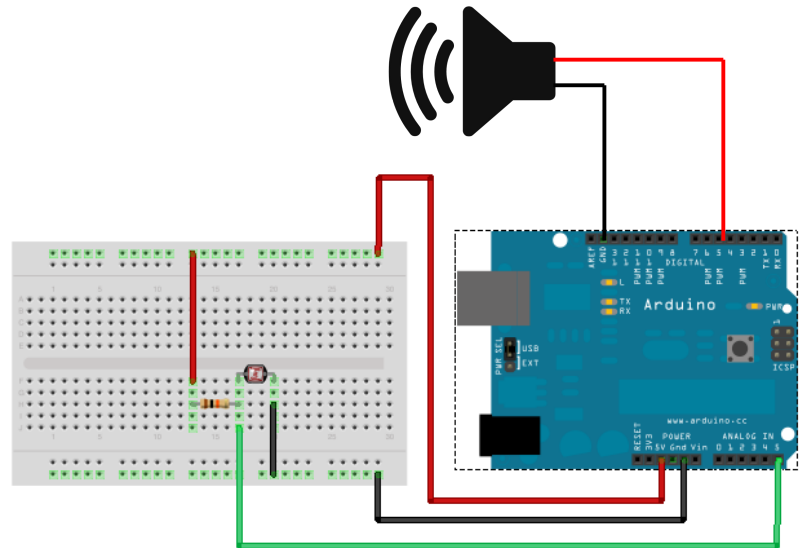
Here's the code:

Wiring diagram for the 1k resistor and light sensor.
Source: http://wiki.xinchejian.com/wiki/Introduction_to_Arduino

```
// This program reads in light from the A5 (analog in pin #5) and converts
// it to a number from 0 — 1023. Then we can tell the speaker, using the
// command "tone(pin,freq,duration)", what tone to play! This makes a
// touch-less musical instrument called a Theremin! Cool!

int ls = A5;              // analog input pin hooked to the light sensor
int ls_value = 0;        // variable to store the light sensor values,
                         // we'll set this to zero for now.
int soundOut = 5;        // Sound output pin

void setup()
{
  Serial.begin(9600);          // Start the serial monitor (for monitoring)
  pinMode(ls, INPUT);          // Tell arduino that this pin is for input
  pinMode(soundOut, OUTPUT);   // This just makes the sound out pin an output
}

void loop()
{
  ls_value = analogRead(ls);     //reads the light sensor values
  Serial.println(ls_value);      //prints the LS values to serial monitor
  -->sound maker line goes here<--
}
```

Activity Instructions:

Follow the activity instructions below to learn how to talk to the arduino and make it do your bidding!

1) Try running the program first and see if you can get any light readings out of the ardino. Lots of light will make small numbers, and darkness will make large values.

> NOTE: You will need to click the ⮕ button to compile and upload your program from the laptop to the arduino each time you make a change to the program.

> Q1: Did the program appear to upload and start running? A1: Y / N   Inst:_____
> (click the serial monitor button to see the light values)
>
> Q2: What did the serial monitor show you? What were the max and min values? Inst:_____
> A2:_____
> _____

> **Info:**
> Ever hear of a Thermin? It's a musical instrument you can play by holding your hand over it!
> You can make one by combining filling the the variables in the tone() command below.
>
> ```
> tone(<?soundpin>, <?freq>, <?time>);  //The sound making line
> ```
>
>   Follow the directions below to complete this activity!
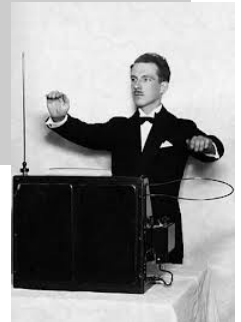
2) Type the tone command above into the arduino programming interface, except:
- Use the variable or pin number that the light sensor is hooked to.
- Now plug in a frequency. Try 1000 Hz and a duration or time to play it.
  (1000 Hz is the "beep" frequency used to bleep out bad words in music on the radio)
- Now compile and upload your new program and record what it does below:
  Q3) Did your program play any sounds? What?   Inst:_____
  _____

3) Now figure out how to get the tone command to play your light data.   Inst:_____
   Q4) What did you do to get it to play the light as sound?
   _____
   _____
   _____

Here's a video of the real Mr. Theremin playing the instrument that he created a long time ago!
            http://www.youtube.com/watch?v=w5qf9O6c20o

You can get your own Arduino and parts at any local Radio Shack store! Tell'em "Tweeks" sent you!

Here's tons more information on the Arduino: http://learn.adafruit.com/lesson-0-getting-started/the-lessons