If you run an electrical current through an LED, it will get all powered up and discharge some of that energy as light. Everybody knows that, right?

But check this out. You can also use an LED as an input, shine a bright light on it, and it will get all powered up and discharge some of that energy as a weak electrical current.

Which means you can use a plain old LED as a cheap light detector. Let’s build a simple night light to demonstrate the concept.

**LED Refresher**

Remember how LEDs work?

LED stands for Light Emitting Diode, and a diode is a thing that will allow current to flow in one direction, but not the other.

That’s why we fuss over which way it faces when you place one in a circuit. Power goes in the long leg (the anode) and out the short leg (the cathode). You can also tell which side is which by feel: there’s a flat edge on the rim of the cap on the cathode side.

So when building a circuit, you connect the cathode to the ground, or to the negative terminal of a battery. Let’s make up a way to remember that. See how the word “cat” is in “cathode?” Imagine a short-legged, negative cat on the ground, shooting electricity. Really imagine it hard. Cat. Negative/grumpy. Short little legs touching the ground. Shooting electricity. Haha, man, that’s crazy.

There’s a red LED right there looking at how bright it is in the room.

Casting a shadow on the red LED turns on these yellow LEDs! *Science!*

There, now you’ll always remember that the short leg is a cathode and electricity comes out of it. It connects to ground, or to the negative side of a battery. Mnemonics!
Ingredients
If anything below looks unfamiliar, back up and take a look at the Arduino Basics and Breadboard 101 project cards.

You will need
1. An Arduino
2. A breadboard
3. An assortment of jumper wires. At least six.
4. An LED to be a sensor. Another LED to be a light.
5. A 330 ohm resistor.
6. Probably a flashlight or a desk lamp.

Optional: a drinking straw makes a groovy looking diffuser. You don’t need one, but it looks cool.

Do This
Ready to build stuff? Let’s lay out the hardware, and then write the software. If you want, download the Fritzing schematic and the Arduino sketch from http://is.gd/392W6P

THE HARDWARE
1. Take your red “input” LED and plunk it into your breadboard. Wire the anode (the longer lead) to A5 and the grumpy cathode to GND. We’re going to “listen” to A5 by designating it as an input pin. If the LED is under a lot of light, we’ll get a larger number on A5. If it’s dark, we’ll get a smaller number on A5.

2. Take your “output” LED and plunk it into your breadboard. Wire the anode to a 330 ohm resistor, and wire the resistor to pin 3. Wire the cathode to GND. Now we should have a complete circuit.

THE SOFTWARE
Okay, get yourself to a computer and open up the Arduino software. Time to do some coding.
Here's some sample code:

```c
int sense01 = A5;  // sensing LED connected to analog5
int LED01 = 3;    // The shiny light LED on pin 3
int val01 = 0;    // for storing data from sense01
int light = 217;  // Light sensitivity

void setup()
{
    Serial.begin(9600); // setup the serial so we can see our sensor values.
    pinMode(LED01, OUTPUT);  // Tell Arduino LED01 is an output pin.  
    pinMode(sense01, INPUT);  // Tell Arduino sense01 is an input pin.
} // End of setup

void loop()
{
    val01 = analogRead(sense01);    // Read in our light value.
    Serial.println(val01);          // Print the value to the monitor.  

    // This if statement checks the if the value is "dark" or "bright:"
    if (val01 >= light) {
        digitalWrite(LED01, LOW);  // if light, turn off led
    } else {
        digitalWrite(LED01, HIGH); // if dark, turn on led
    }
} // End of void loop. End of program.
```

Hook up your board. Compile and upload your sketch. Open the serial monitor and see what kind of values are coming from that LED. Shine a light on it. Cast a shadow on it.

You might want to change the value of `light`. Your particular LED, plus the ambient lighting in your workspace, might call for a higher or lower value.

This circuit may not detect fluorescent light that well. Try different light sources.

But yeah, that's it. Take a picture of your masterpiece and upload it to the teen site.

**What next?**

Add a couple more LEDs to the circuit. Maybe try reversing the logic to make an alarm clock. (Have the circuit turn on when light instead of dark.) Maybe take out the LED make it power a buzzer. Maybe power an LED and a buzzer!

Try building this circuit using stuff that's actually *supposed* to detect light. For that, you'll need a photodiode and a transistor.

Draw a picture of cat Hode, the Electronics Cat, because he's totally a thing now.

This is the “Darkness Threshold.” (*Darkness Threshold* would be an awesome band name. You can use it if you want.)

I used a red LED. A normally lit room gives us a reading of about 235. The shadow of my hand over the LED brings the value down to about 215. So right here, we're saying anything less than 217 is "dark" and anything greater than 217 is "bright." Your mileage may vary. Try different values to suit your needs.