Fundamentals of Physical Computing

Instructor: Rob Faludi

Introduction

- Physical Computing
    - Physical
    - Computing
    - Humans
    - Objects
- Rob Faludi
    - Background

Plan for Today

- Introductions
- Syllabus Review
- Physical Computing
- Components
- Arduino
- Readings & Assignments

Introductions

- Name
- Former life
- Imagined super power
- How you ended up in this class, hopes and plans

Syllabus Review

- Syllabus review
  - Class schedule & structure
  - Assignments
  - Documentation
  - Grading
  - Office Hours aka Lab Hours
  - Kit, tools, workshop

Physical Computing

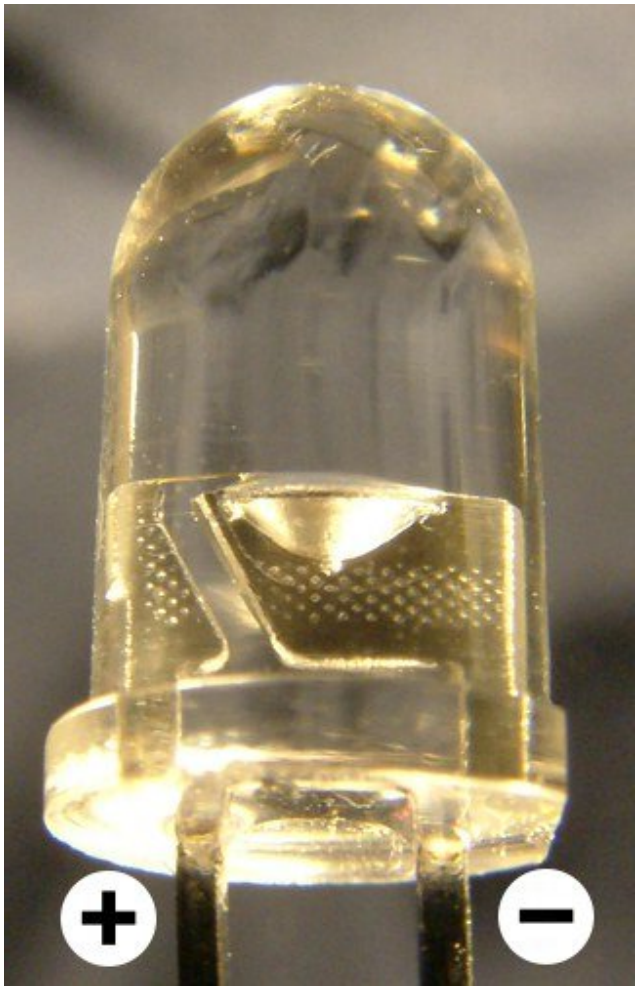
- Your examples of physical computing
- Observation, iteration, thinking about physical action
- Mental models - yours, the embodiment, theirs
- presence / attention
- transduction

Analog vs. Digital

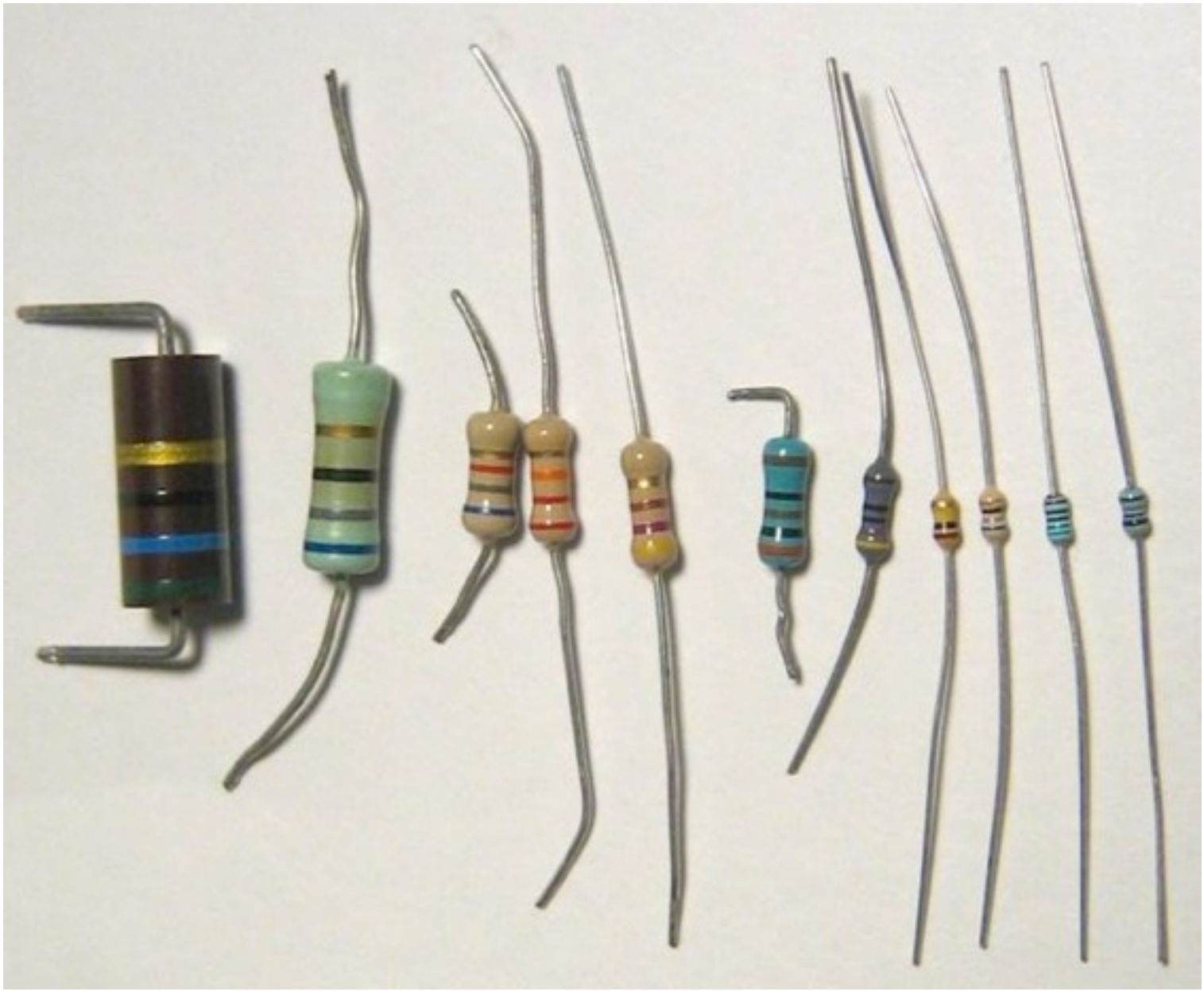
Transduction

Components

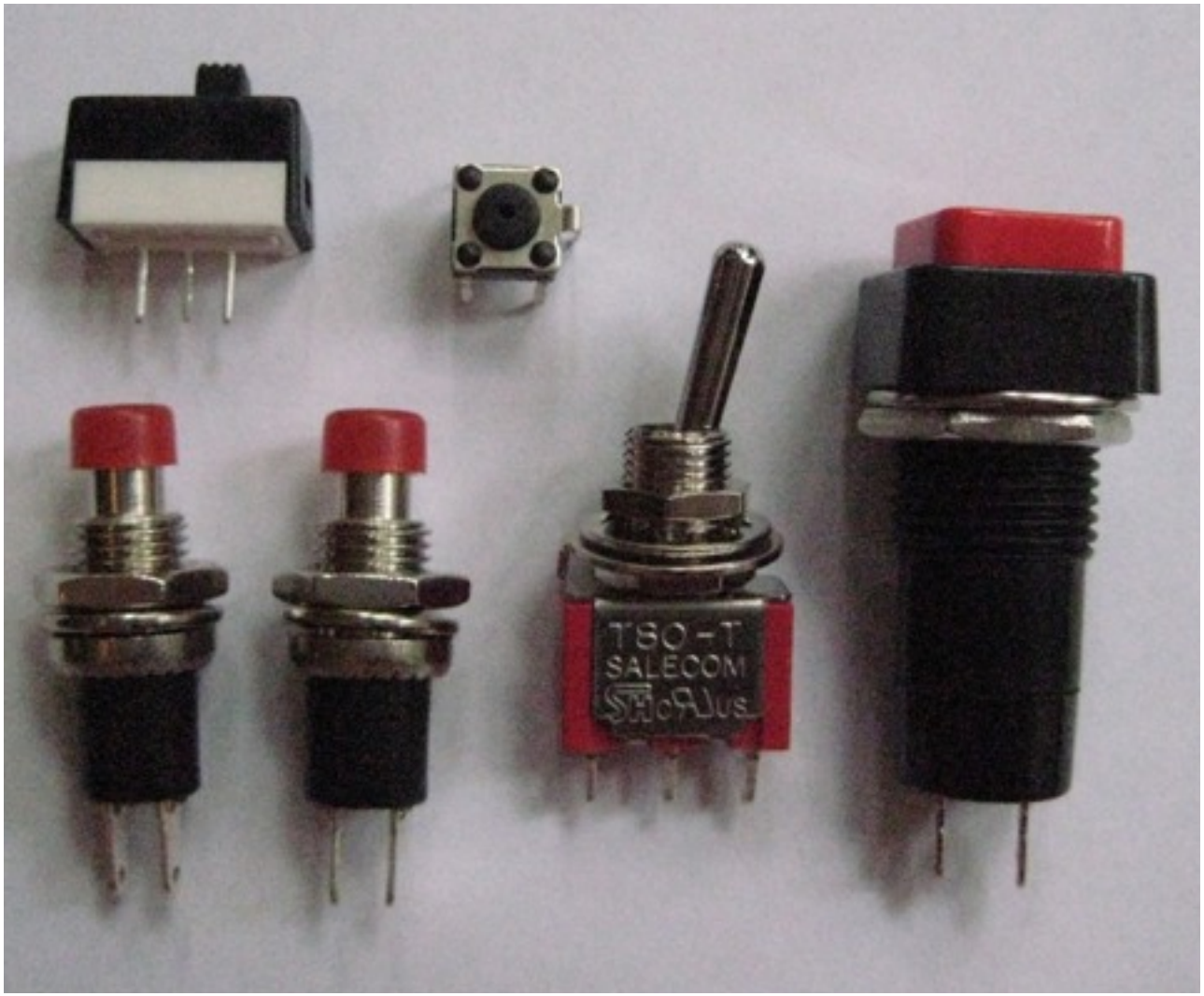
LEDs



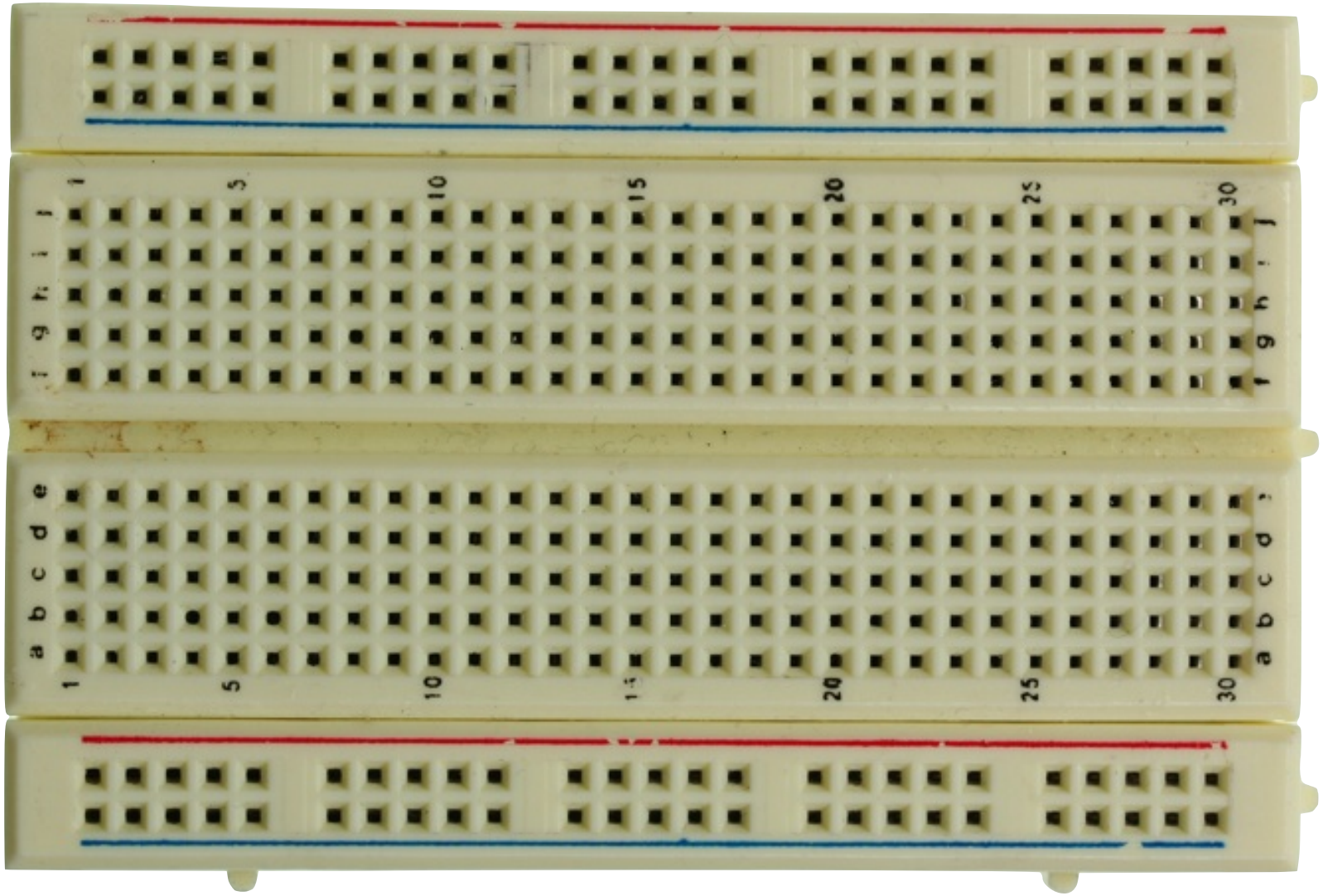
Resistors

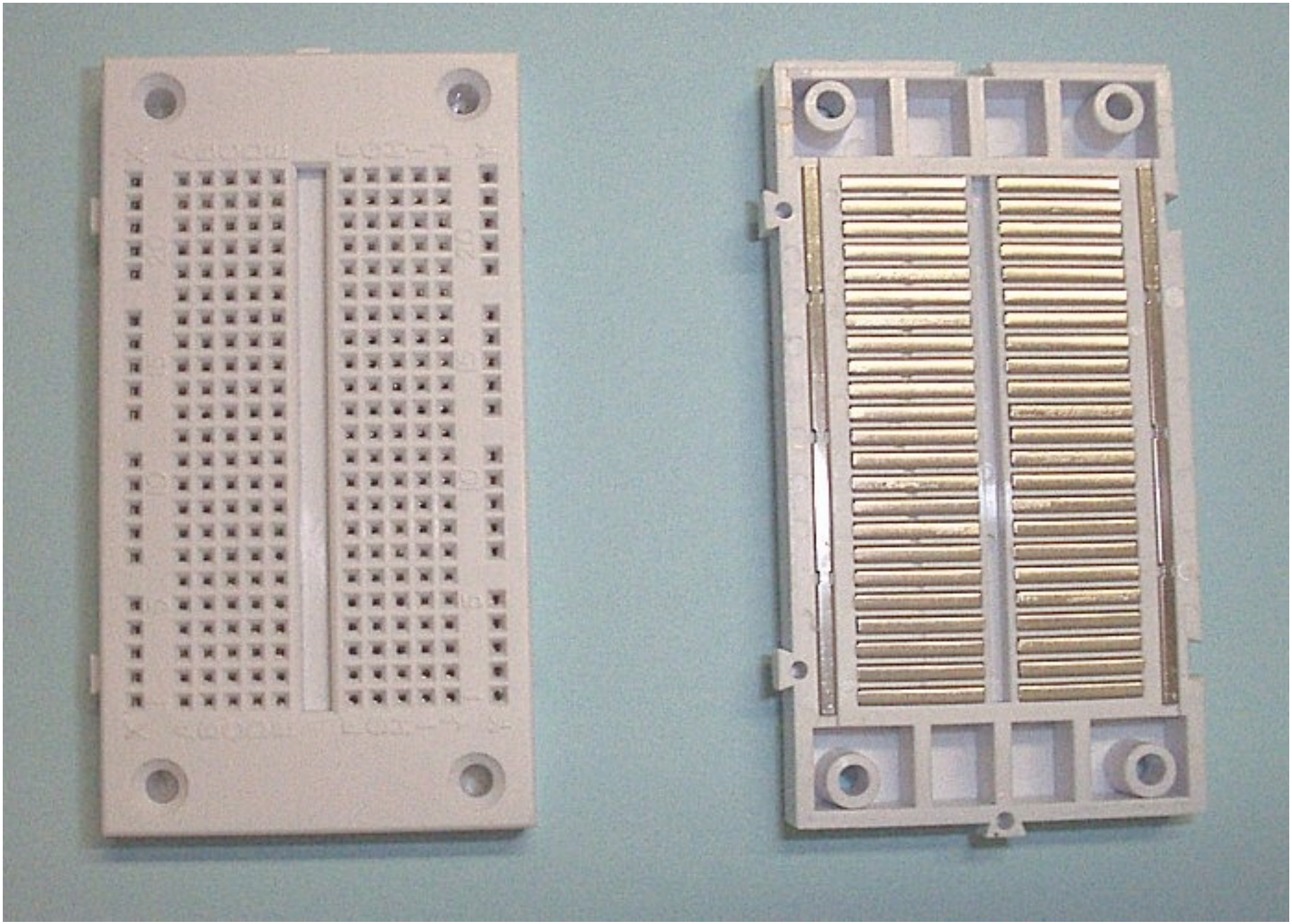


Switches

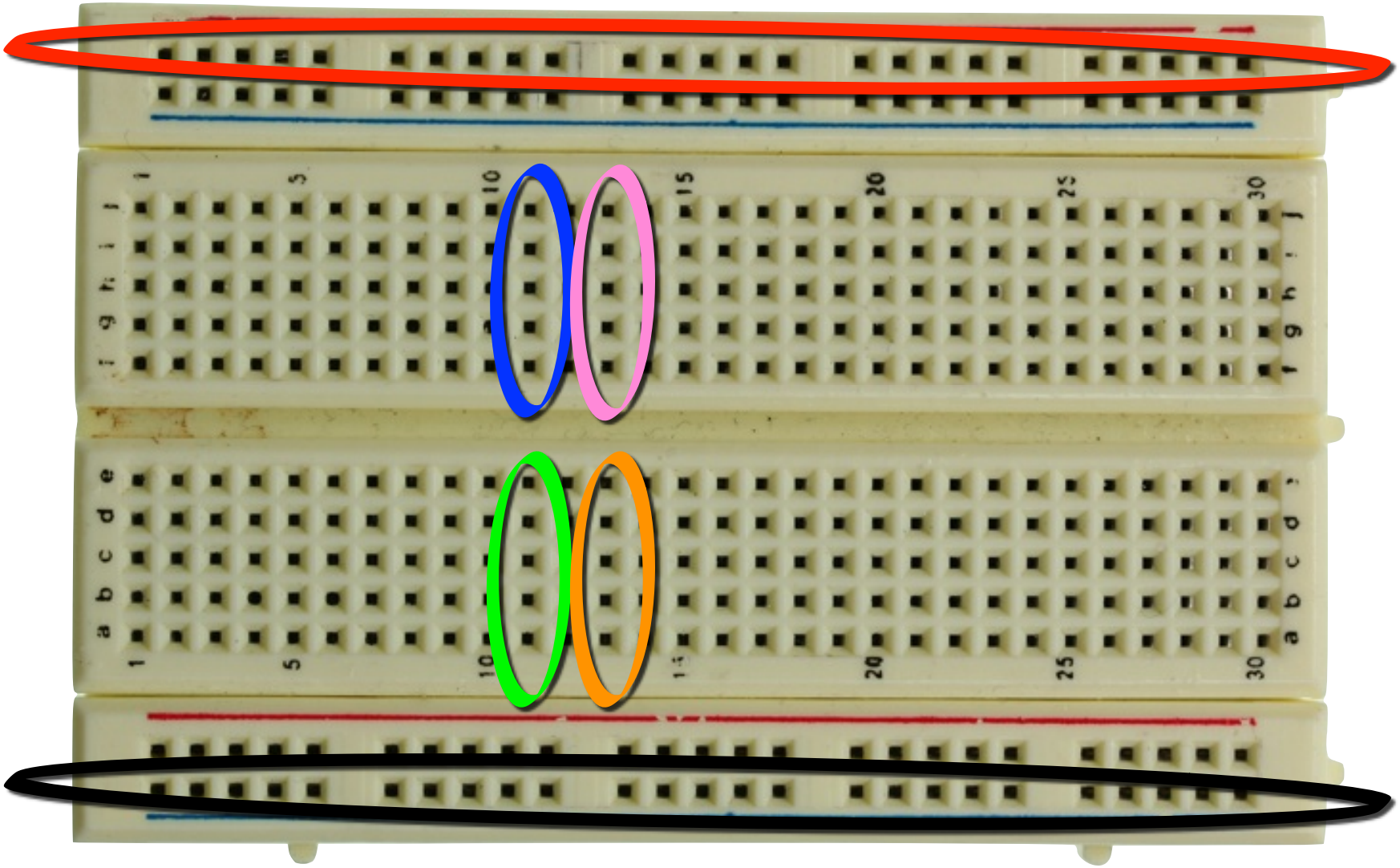


Breadboard

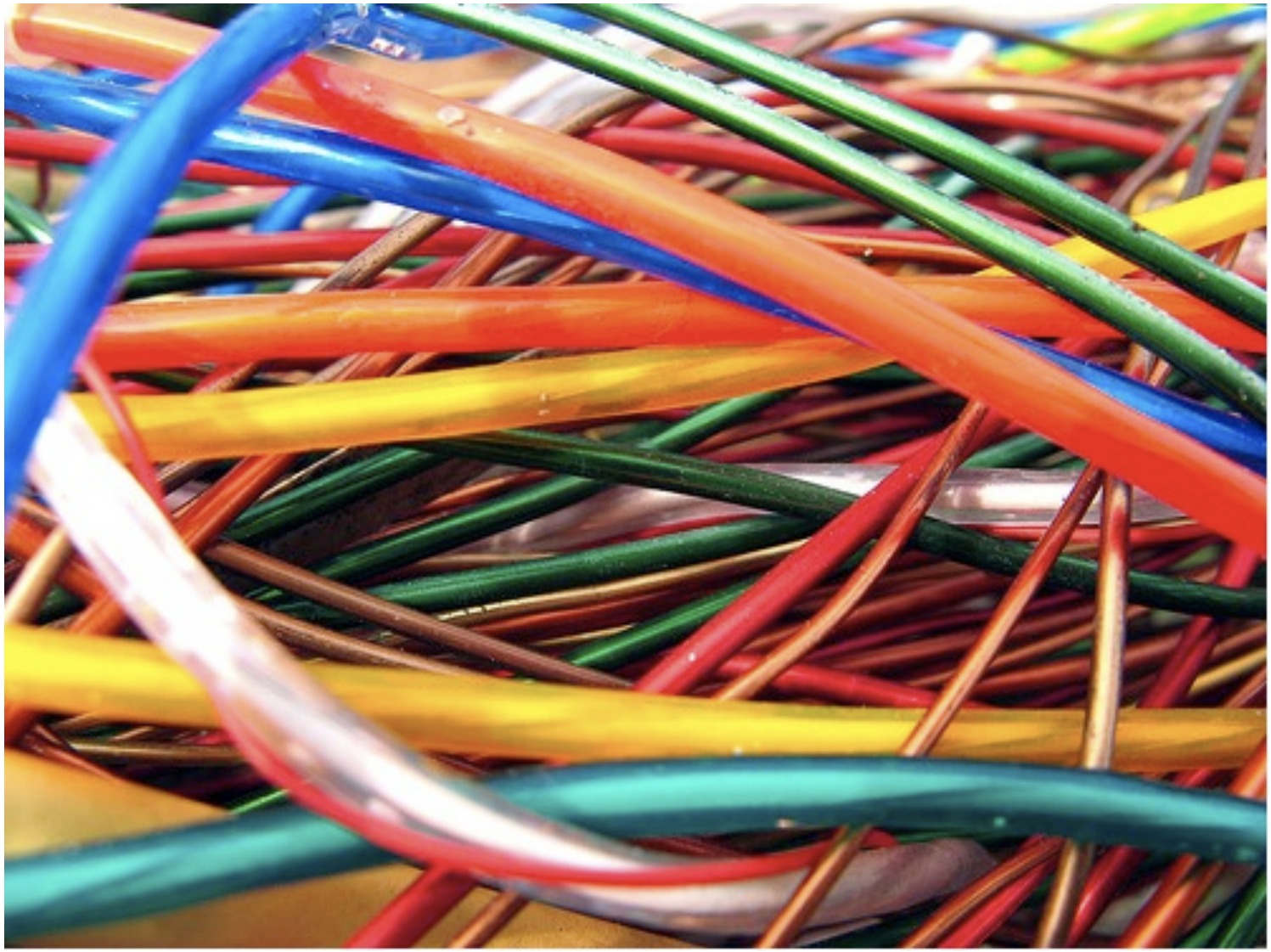




Breadboard

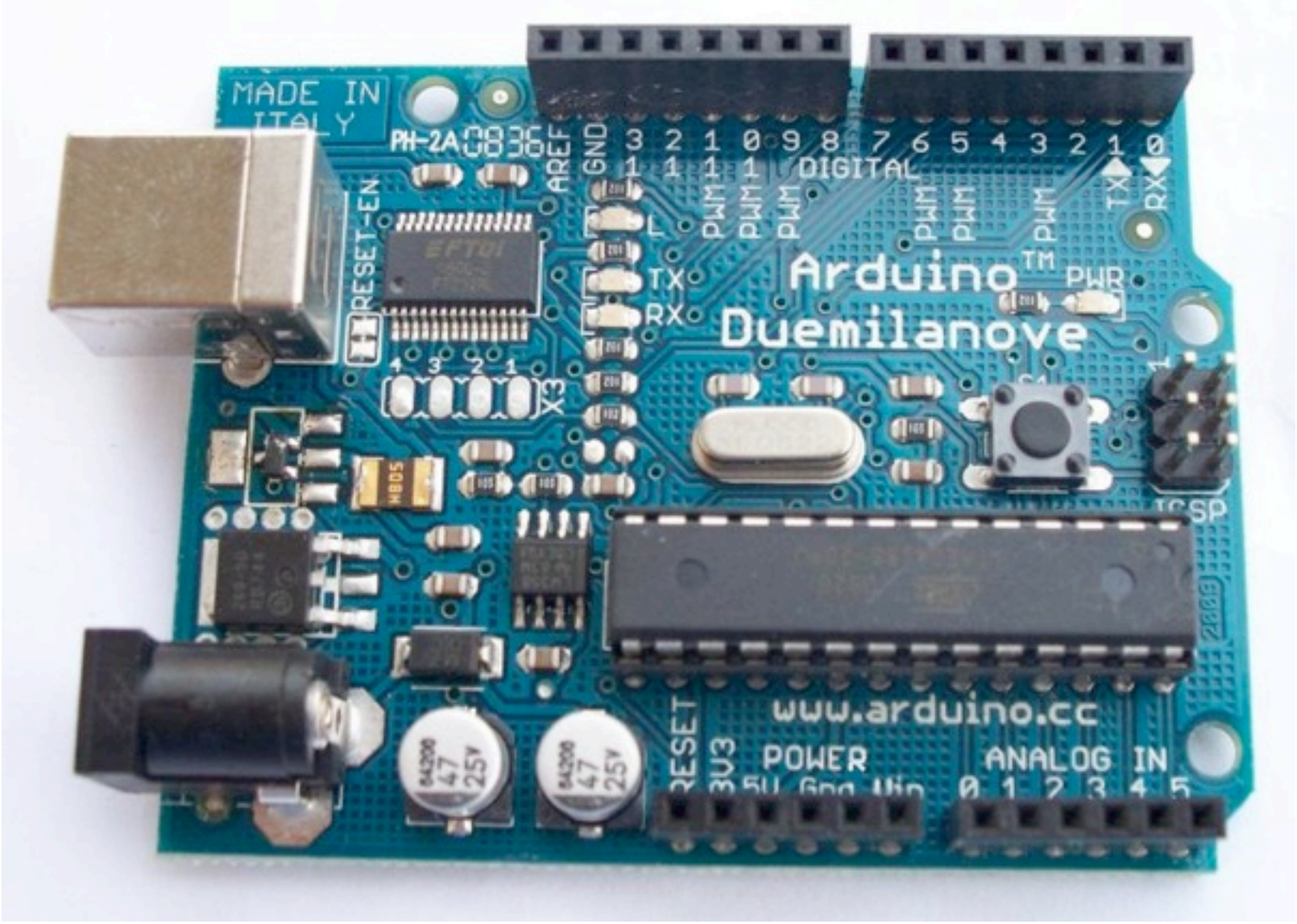


Wire

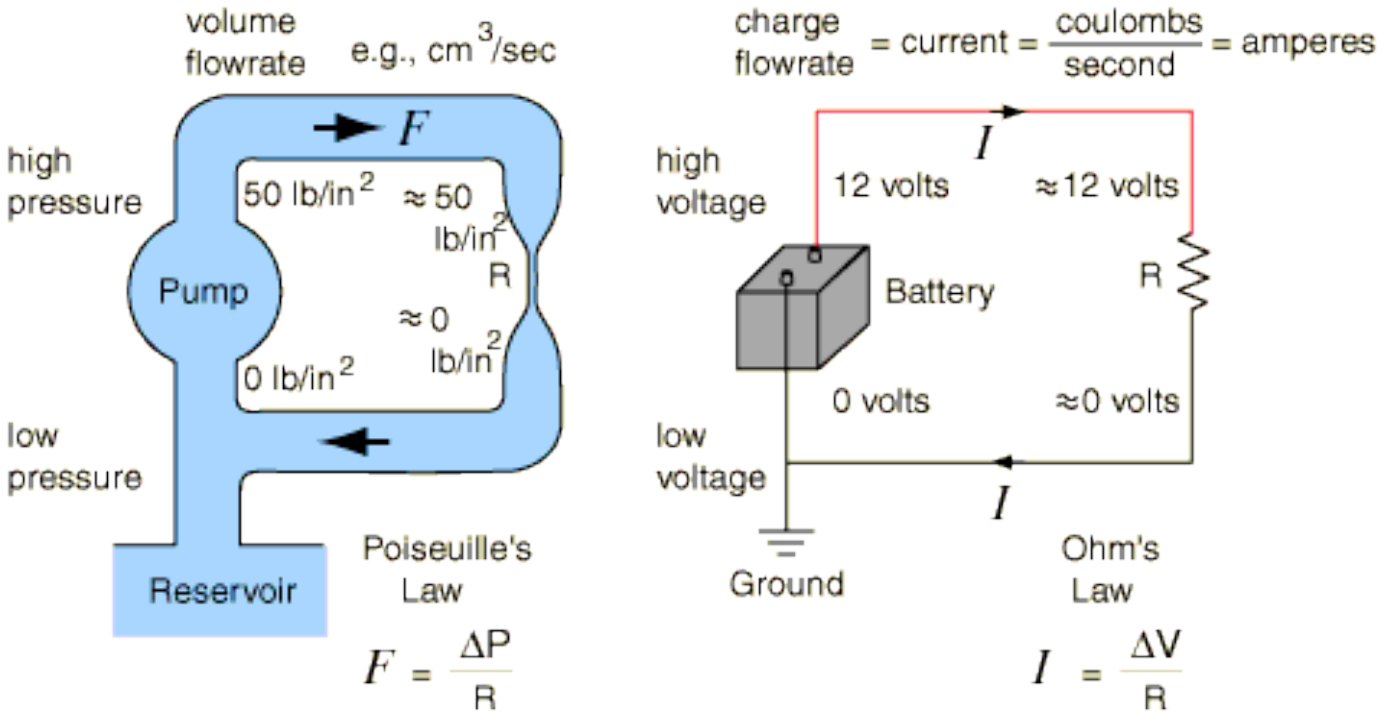


Power Supply

Microcontroller

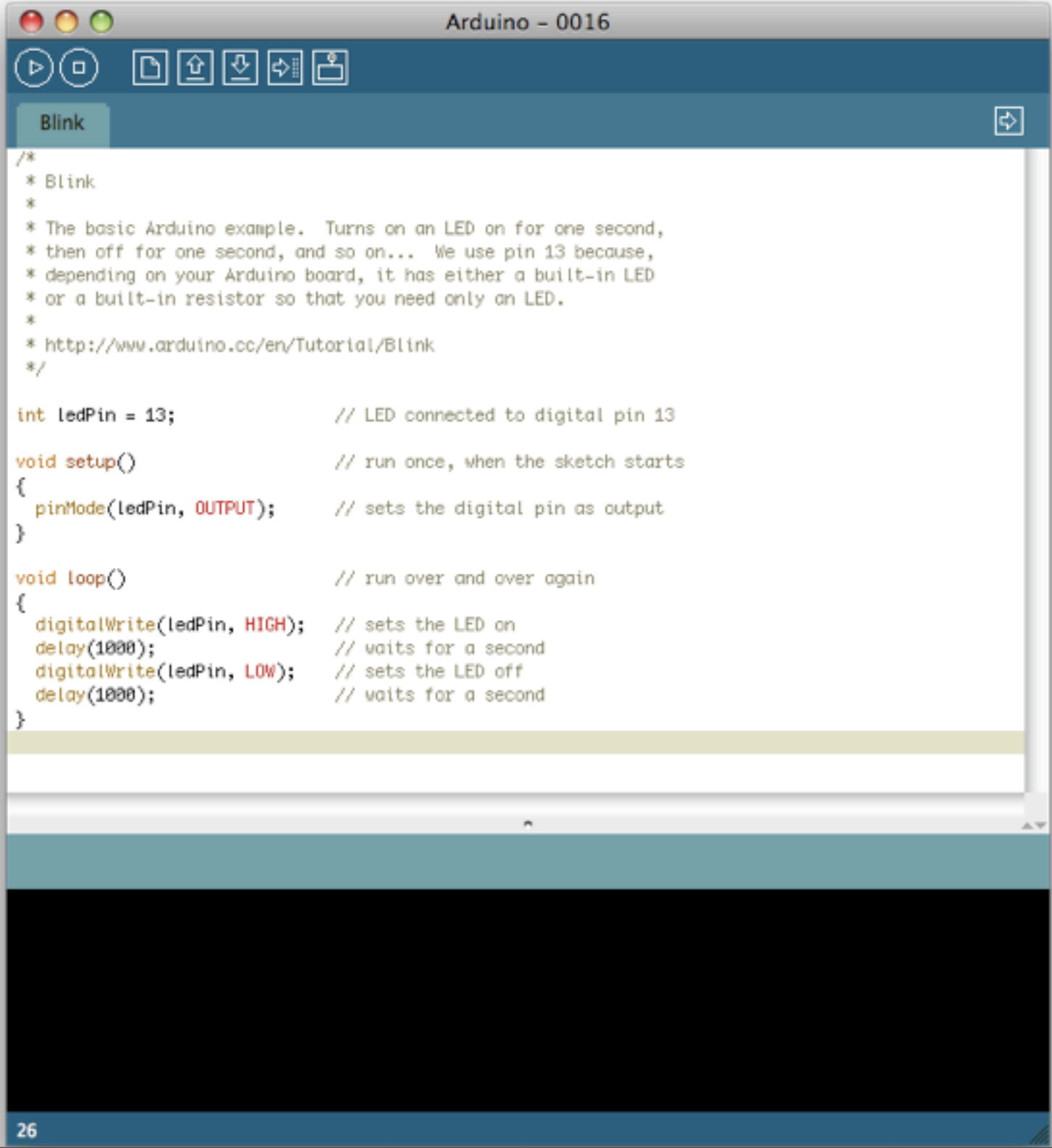


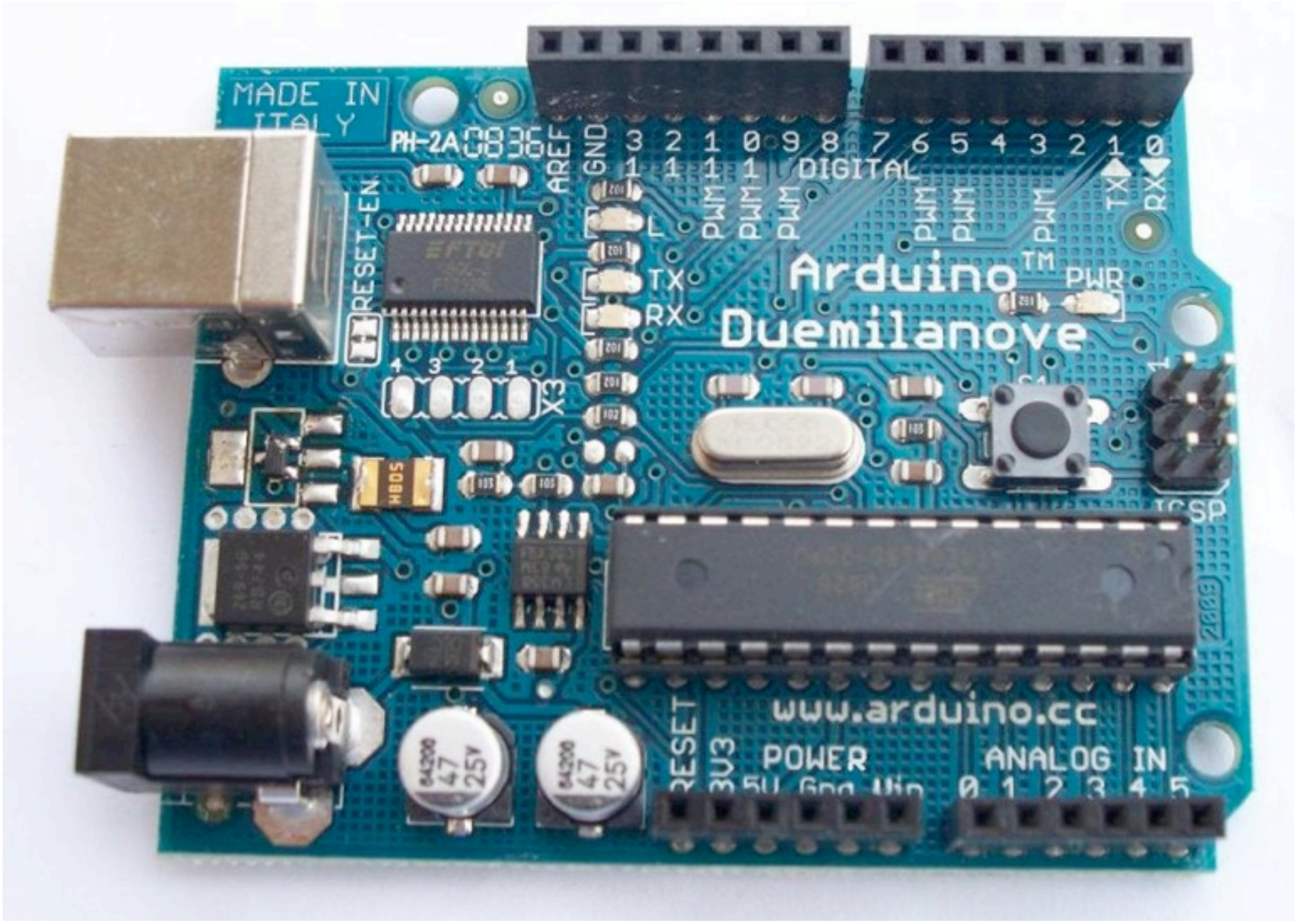
Water Analogy



Arduino Web Site

- reference, learning, playground
- download software
- install drivers
- serial connection


Arduino - 0016
Blink
/*
* Blink
*
* The basic Arduino example. Turns on an LED on for one second,
* then off for one second, and so on... We use pin 13 because,
* depending on your Arduino board, it has either a built-in LED
* or a built-in resistor so that you need only an LED.
*
* http://www.arduino.cc/en/Tutorial/Blink
*/
int ledPin = 13; // LED connected to digital pin 13
void setup() // run once, when the sketch starts
{
pinMode(ledPin, OUTPUT); // sets the digital pin as output
}
void loop() // run over and over again
{
digitalWrite(ledPin, HIGH); // sets the LED on
delay(1000); // waits for a second
digitalWrite(ledPin, LOW); // sets the LED off
delay(1000); // waits for a second
}
26


MADE IN ITALY
PH-2A 0836
AREF
GND
13 12 11 10 9 8 7 6 5 4 3 2 1 0
DIGITAL
PWM
TX
RX
RESET-EN
L
TX
RX
Arduino TM
Duemilanove
PWR
ICSP
www.arduino.cc
POWER
ANALOG IN
RESET
3V3
5V
Gnd
Vin
0 1 2 3 4 5

Programming is Easy

```
int ledPin = 13;                  // LED connected to digital pin 13

void setup()                      // run once, when the sketch starts
{
  pinMode(ledPin, OUTPUT);        // sets the digital pin as output
}



void loop()                       // run over and over again
{
  digitalWrite(ledPin, HIGH);     // sets the LED on
  delay(1000);                    // waits for a second
  digitalWrite(ledPin, LOW);      // sets the LED off
  delay(1000);                    // waits for a second
}
```

digitalWrite()

Description

Write a HIGH or a LOW value to a digital pin. If the pin has been configured as an OUPUT with pinMode(), its voltage will be set to the corresponding value: 5V (or 3.3V on 3.3V boards) for HIGH, 0V (ground) for LOW.

If the pin is configured as an INPUT, writing a HIGH value will enable an internal 20K pullup resistor (see the tutorial on digital pins). Writing LOW will disable the pullup.

Syntax

digitalWrite(pin, value)

Parameters

pin: the pin number

value: HIGH or LOW

Returns

none

Example

```
int ledPin = 13;                // LED connected to digital pin 13

void setup()
{
  pinMode(ledPin, OUTPUT);      // sets the digital pin as output
}

void loop()
{
  digitalWrite(ledPin, HIGH);   // sets the LED on
  delay(1000);                  // waits for a second
  digitalWrite(ledPin, LOW);    // sets the LED off
  delay(1000);                  // waits for a second
}
```

Soldering is Easy

- tin the tip
- heat the components
- apply solder
- clean the tip
- repeat
- practice

Readings and Assignments

- Readings
  - Physical Computing, Chapter 2, 3, 4
  - Getting Started with Arduino, Chapters 1 - 4
  - There Will Come Soft Rains – Bradbury: http://www.faludi.com/classes/fundamentalsphysicalcomputing/readings/Bradbury_Soft_Rains_1950.pdf
- Assignment
  - Digital Output Input Lab
  - Soldering Lab
  - Imagined Physical Computing System