

Fundamentals of Physical Computing

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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
- Hopes and plans for this class; what you want to learn

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



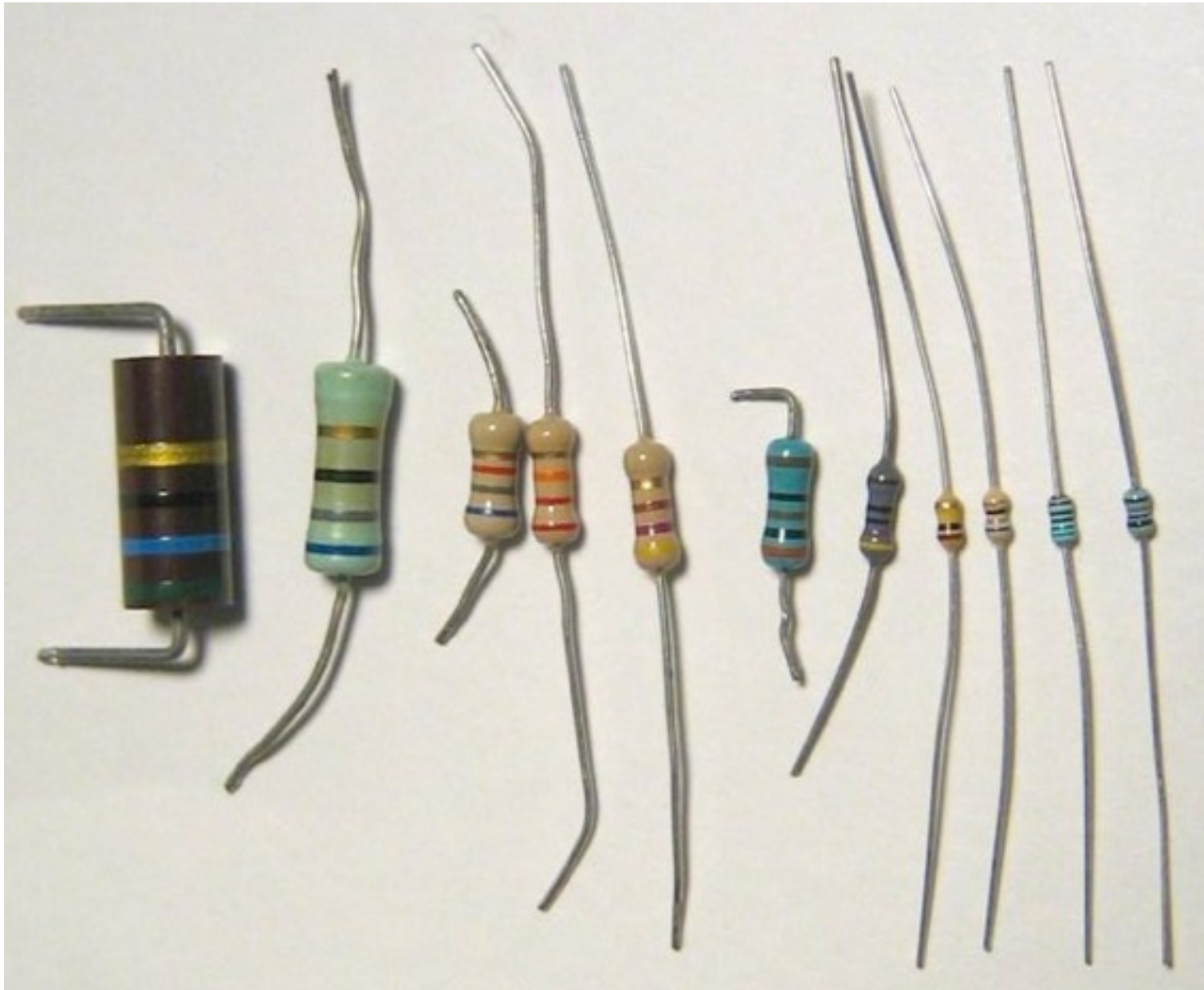
Components



LEDs



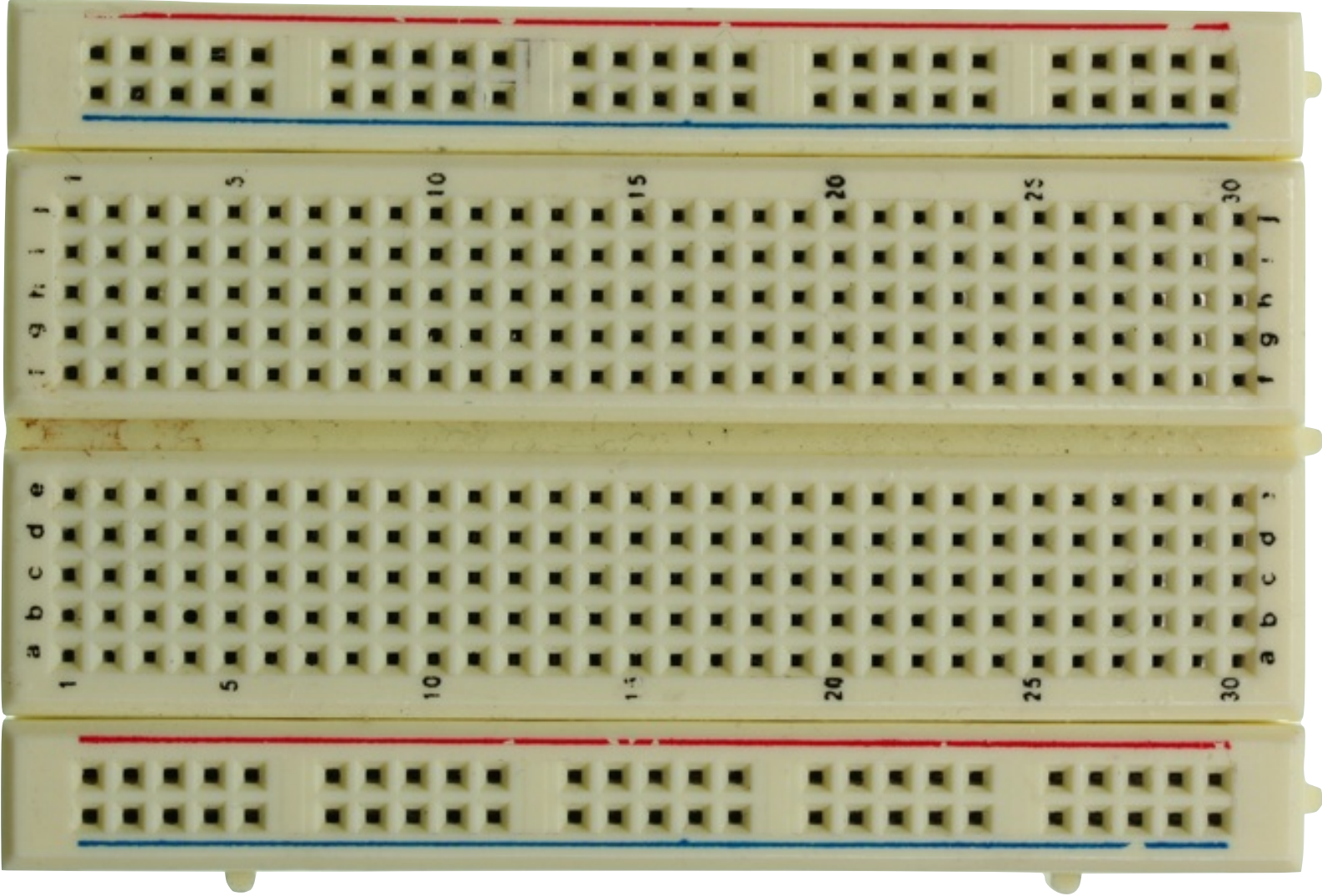
Resistors

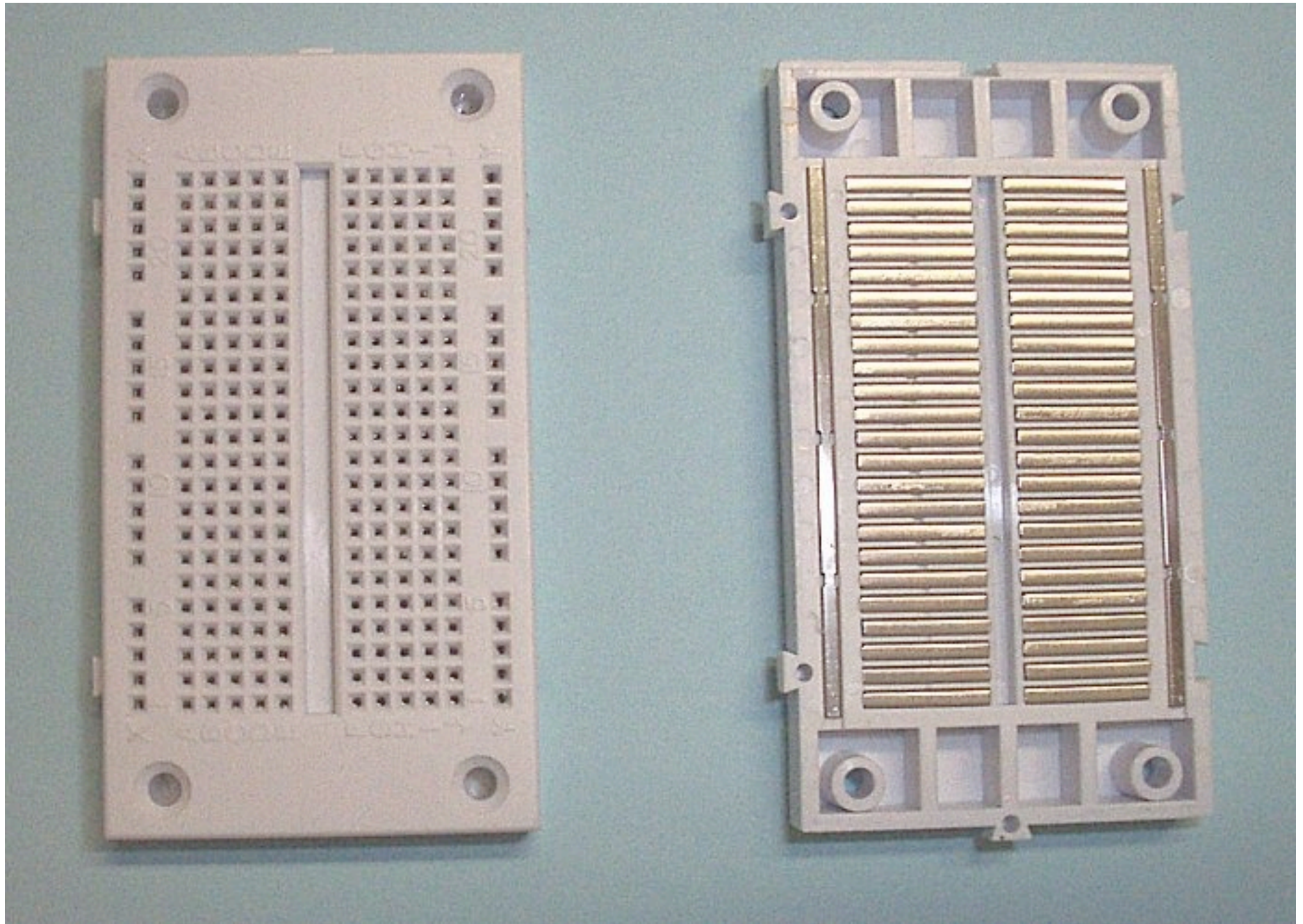


Switches

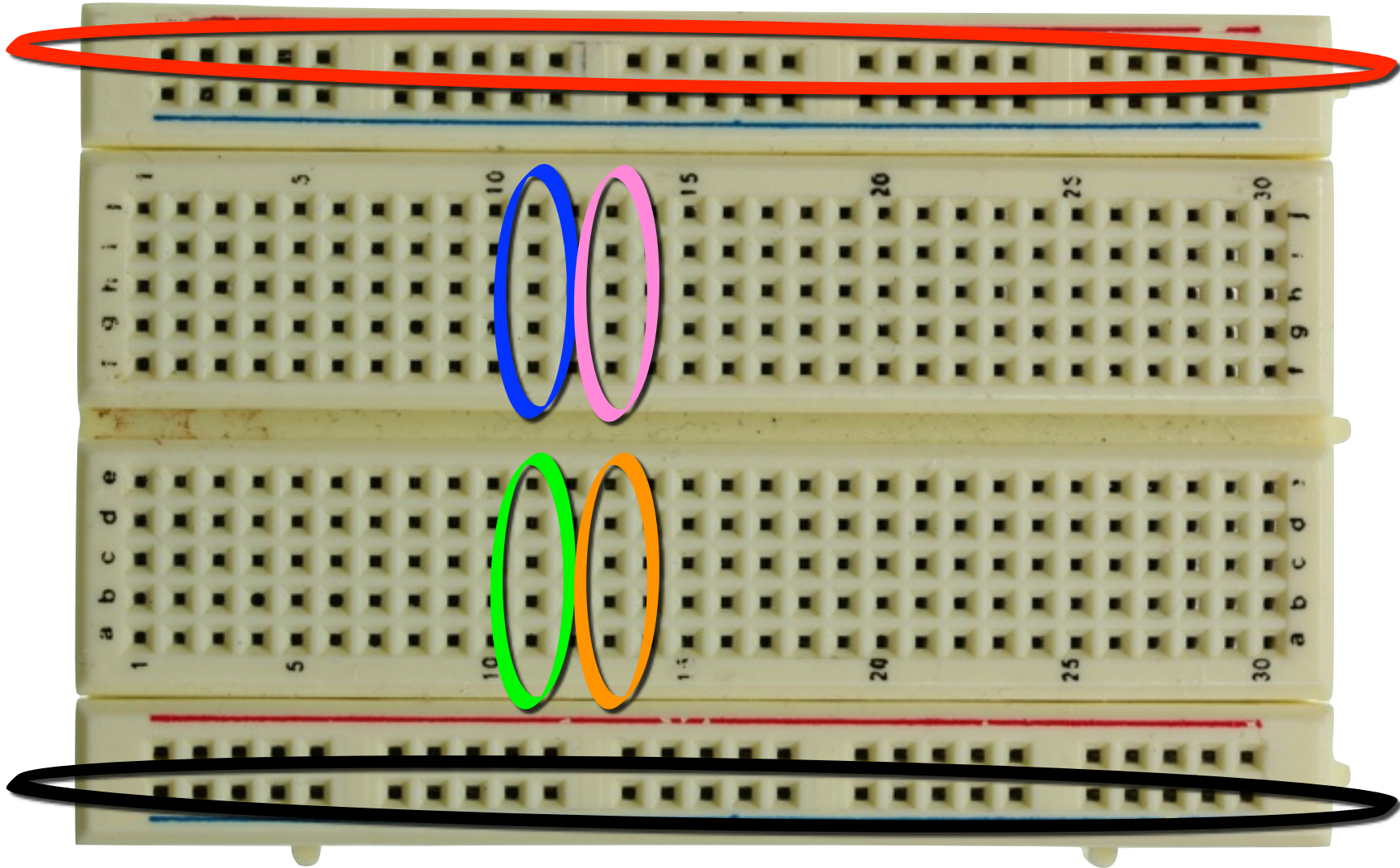


Breadboard

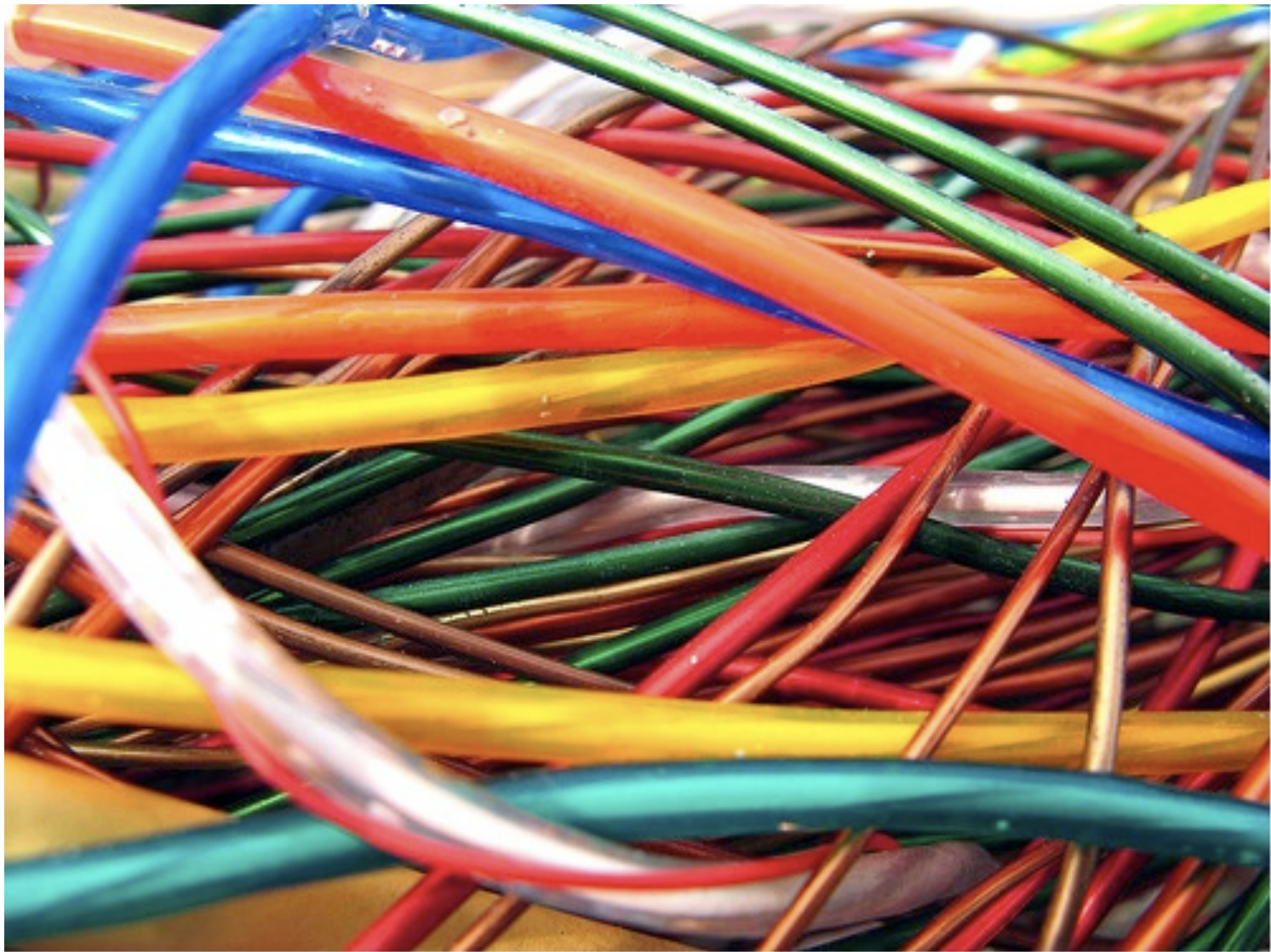




Breadboard



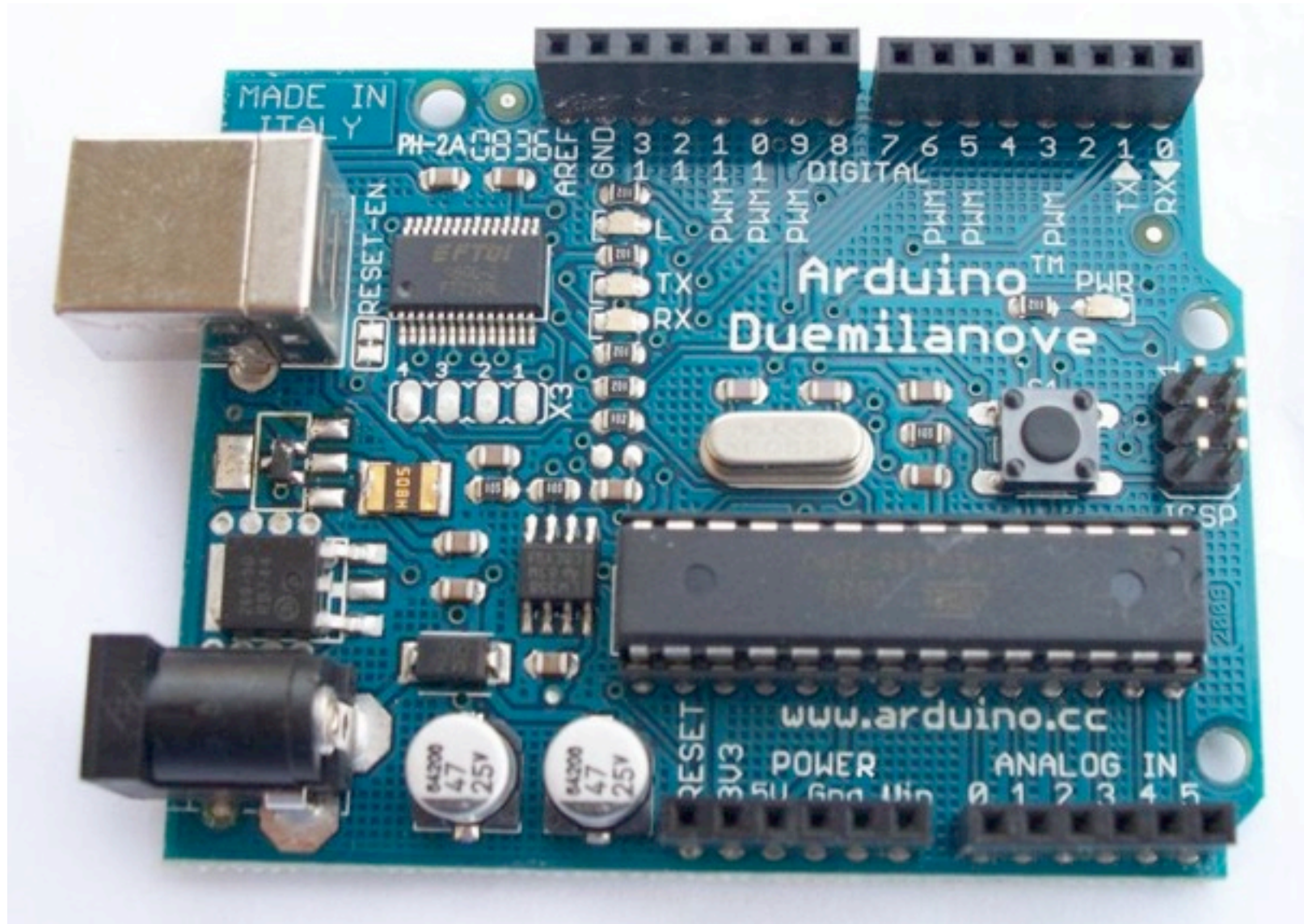
Wire



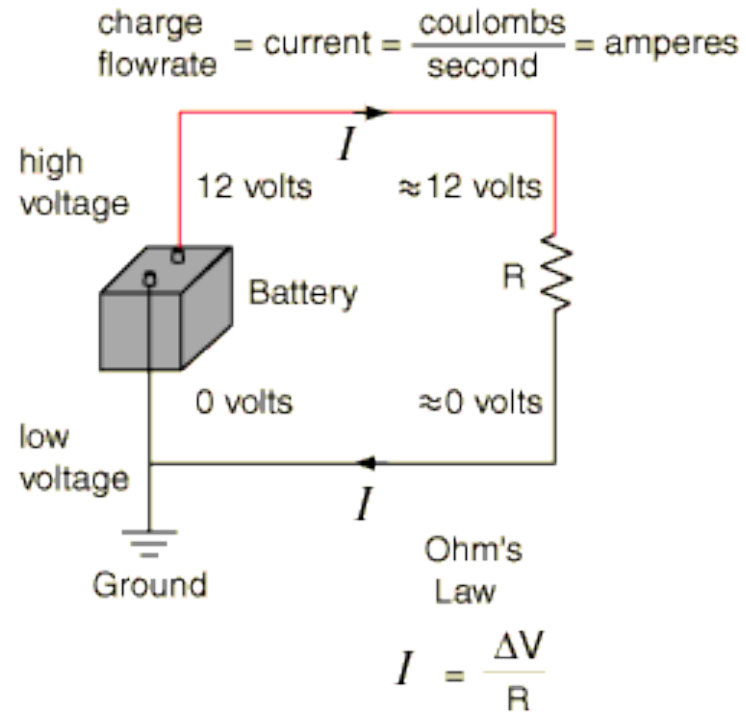
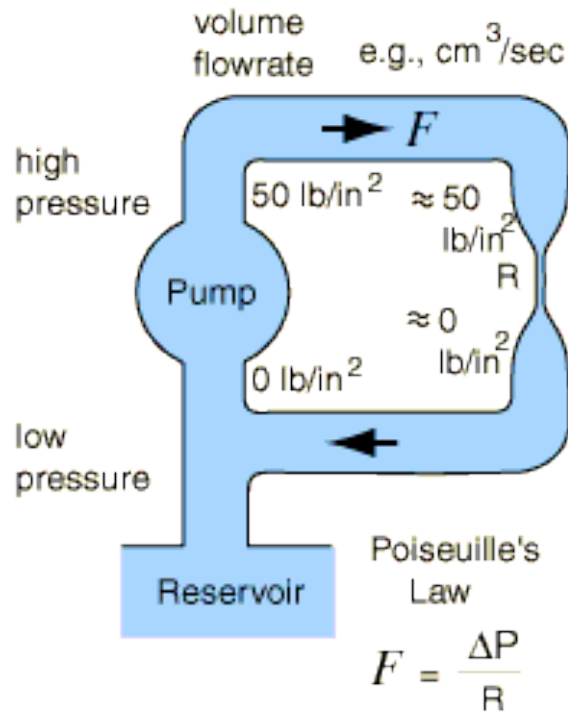
Power Supply



Microcontroller



Water Analogy



Arduino Web Site

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



Blink

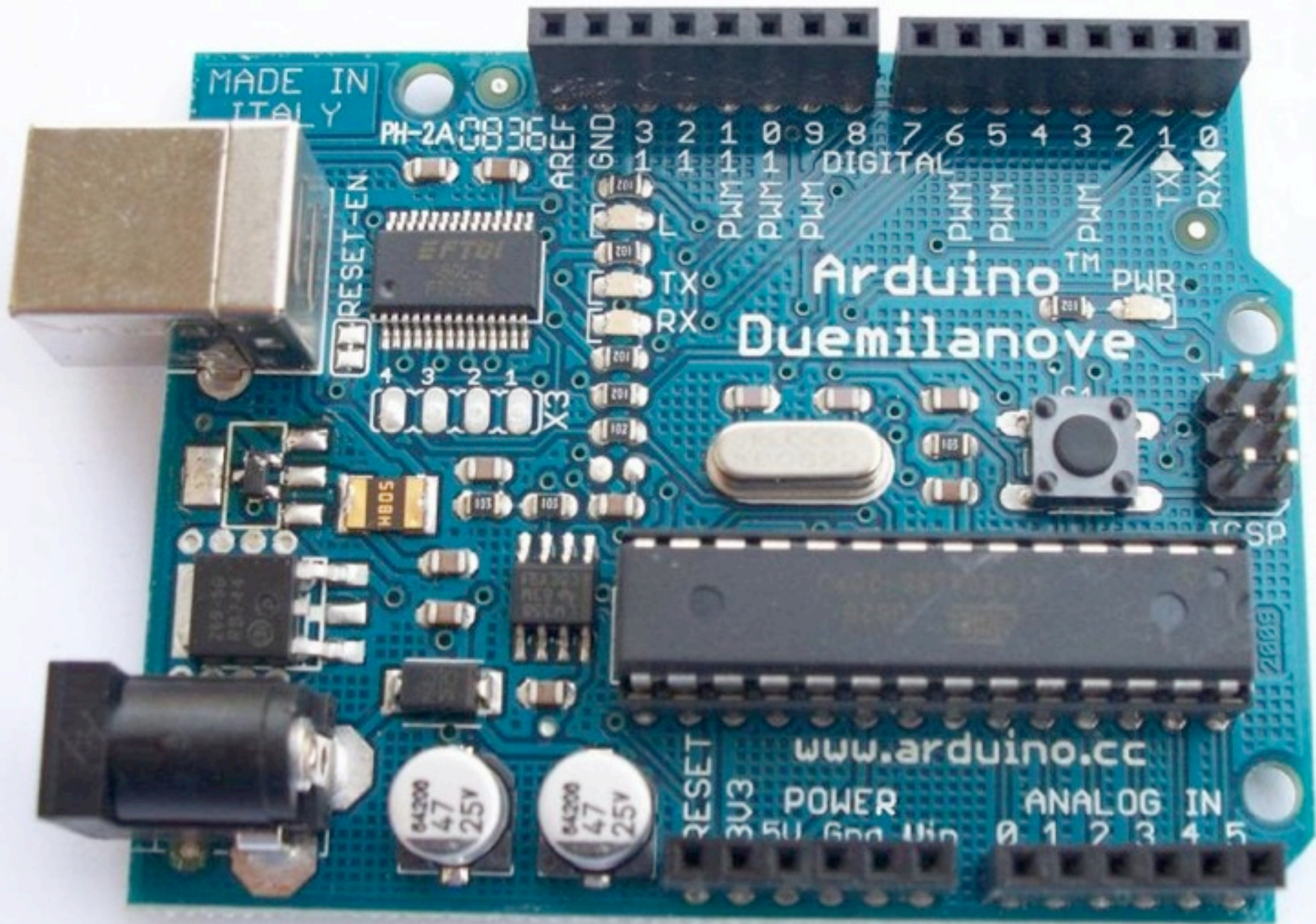


```
/*
 * Blink
 *
 * The basic Arduino example. Turns on an LED on for one second,
 * then off for one second, and so on... We use pin 13 because,
 * depending on your Arduino board, it has either a built-in LED
 * or a built-in resistor so that you need only an LED.
 *
 * http://www.arduino.cc/en/Tutorial/Blink
 */

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
}
```

MADE IN ITALY

PH-2A 0030

RESET-EN

4 3 2 1 X3

AREF GND 3 2 1 0 9 8 7 6 5 4 3 2 1 0
DIGITAL

PWM 1 PWM 1 PWM 1 PWM 1 PWM 1 PWM 1
TX RX

Arduino Duemilanove

PWR

ICSP

www.arduino.cc

RESET 3V3 5V GND 1pin 0 1 2 3 4 5
ANALOG IN

2009

Programming is Easy

```
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void loop()               // run over and over again
{
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  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

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void loop()
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  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