

# Getting Started with Arduino

# Arduino is...

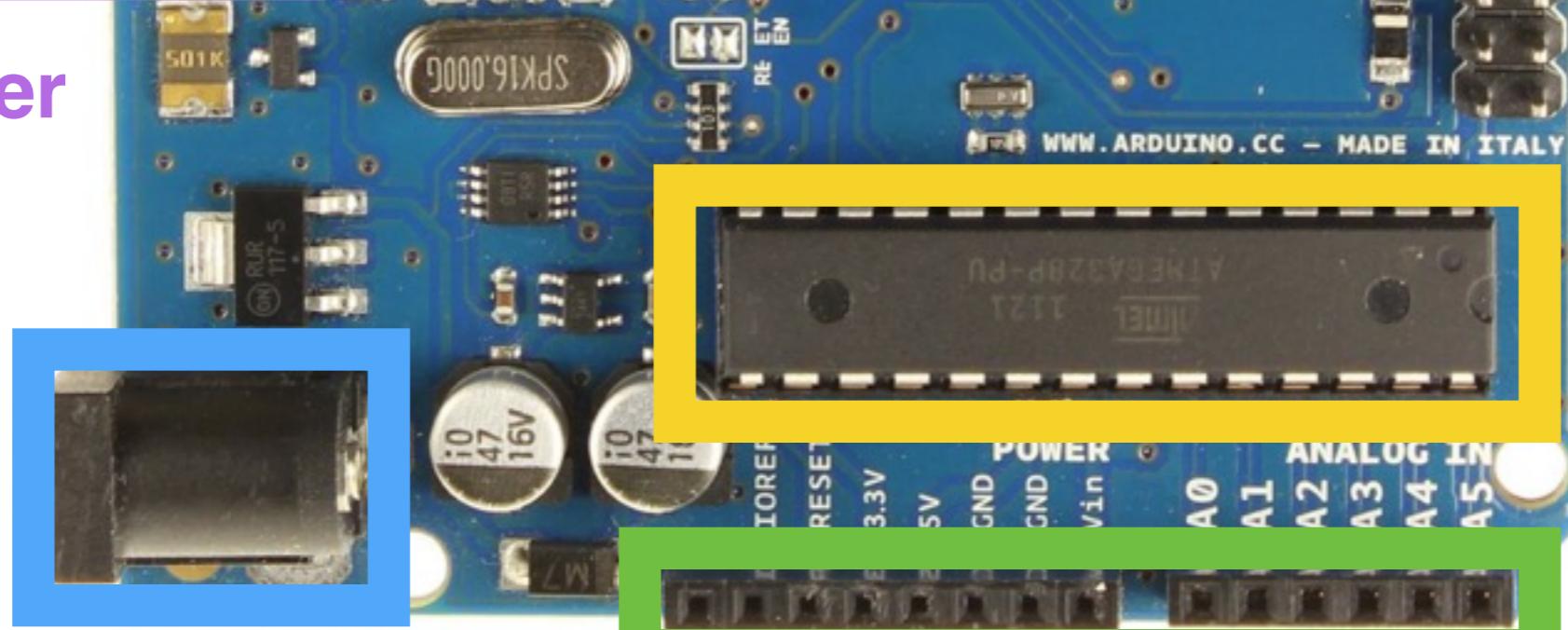
- Small, programmable microcontroller.
- Software that runs on Mac, PC, and Linux. (IDE)
- Learning platform (for electronics & programming).
- Community of people sharing code & ideas.

Reset Button



Digital Inputs & Outputs

USB / Power



ATmega 328

DC Power

Power & Analog Inputs

Arduino Hardware: UNO

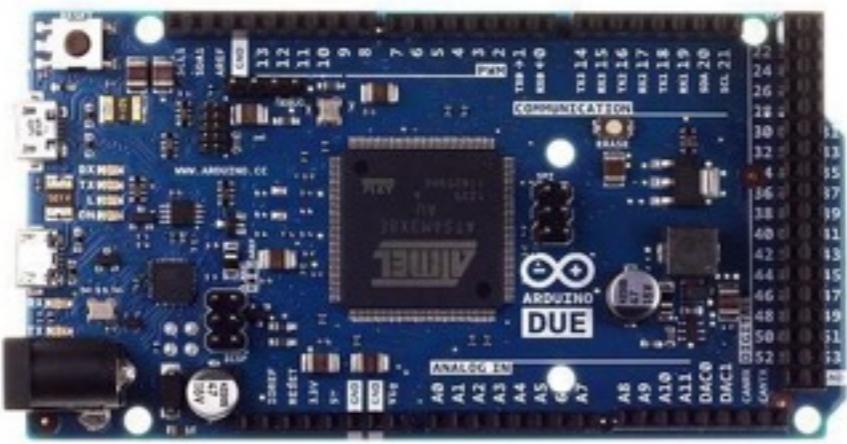
# The Arduino Family



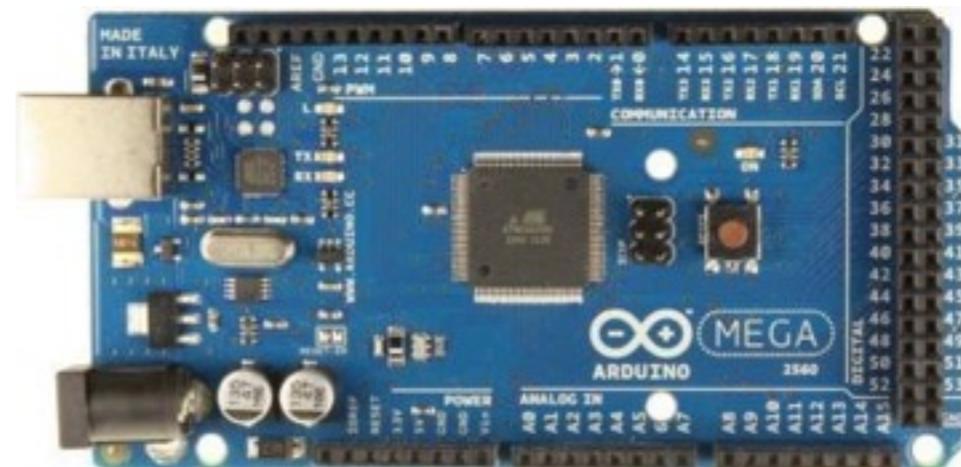
UNO



Leonardo

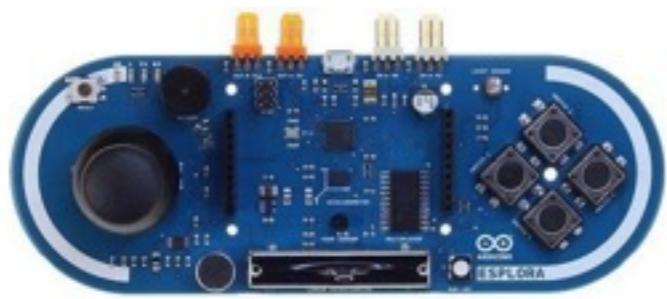


DUE

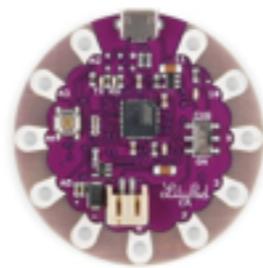


MEGA

# More Family . . .



Esplora



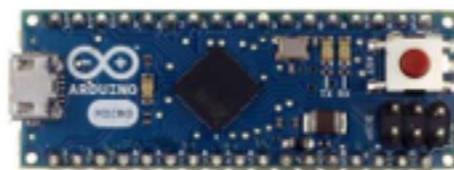
Lilypad



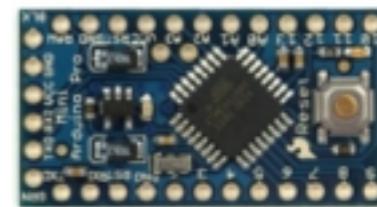
Pro



Arduino Ethernet



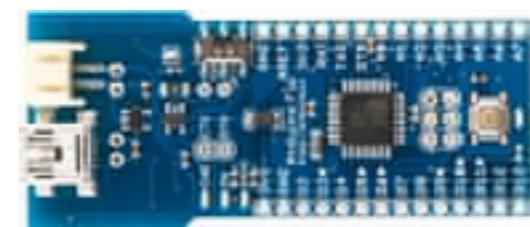
Micro



Pro Mini



Nano

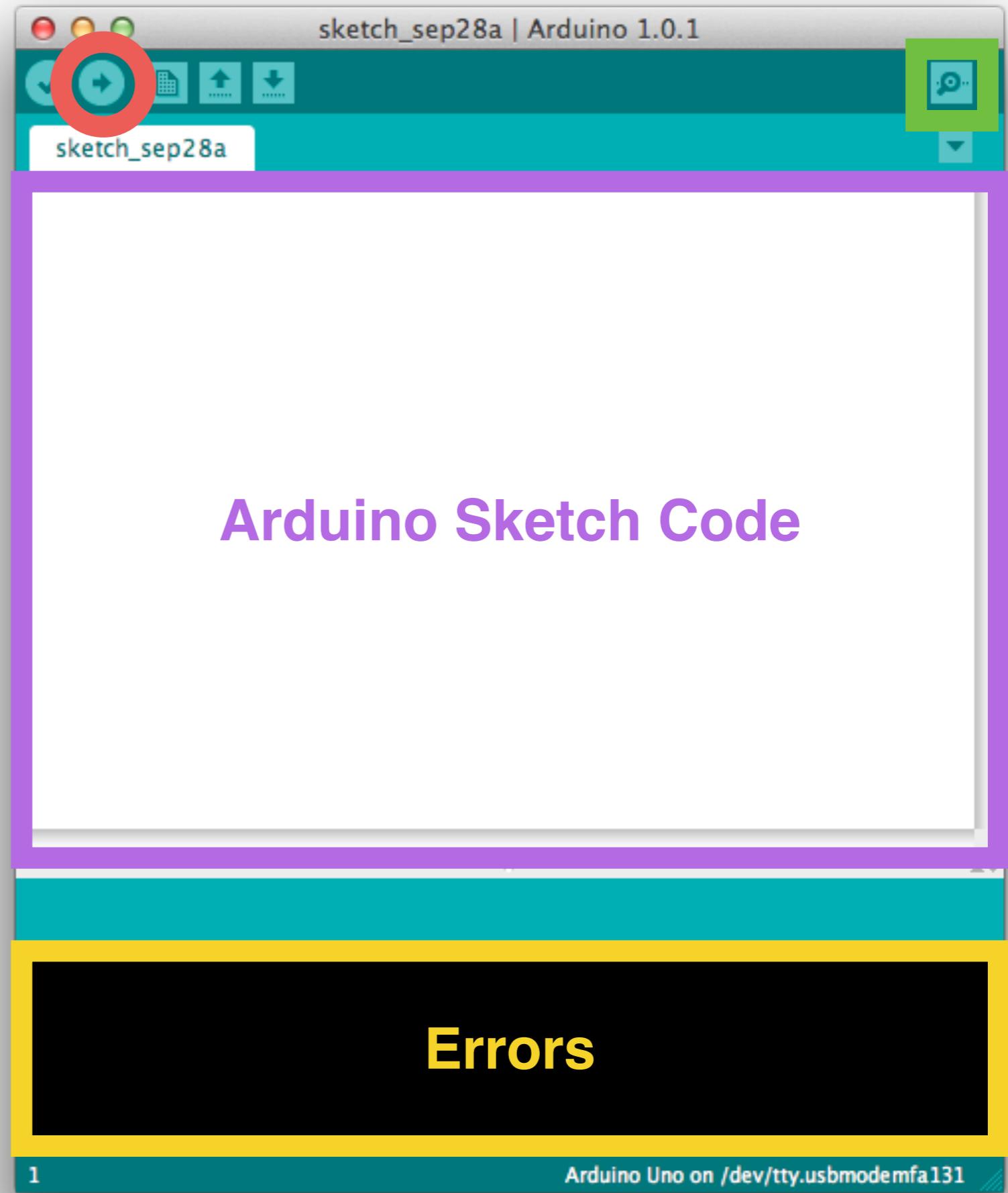


Fio

# Arduino Software

Upload

Serial Monitor



# Anatomy of a Sketch

**/\* Start Comment**

Blink

Turns on an LED on for one second, then off for one second, repeatedly.

This example code is in the public domain.

**\*/ End Comment**

**Descriptive Comment**

**Start Comment**

```
// the setup function runs once when you press reset or power the board
void setup() {
    // initialize digital pin 13 as an output.
    pinMode(13, OUTPUT);
}
```

**Line Comments**

```
// the loop function runs over and over again forever
```

```
void loop() {
    digitalWrite(13, HIGH); // turn the LED on (HIGH is the voltage level)
    delay(1000);           // wait for a second
    digitalWrite(13, LOW); // turn the LED off by making the voltage LOW
    delay(1000);           // wait for a second
}
```

# Anatomy of a Sketch

```
/*
Blink
Turns on an LED on for one second, then off for one second, repeatedly.

This example code is in the public domain.
*/



// the setup function runs once when you press reset or power the board
void setup() {
    // initialize digital pin 13 as an output.
    pinMode(13, OUTPUT);
}

// the loop function runs over and over again forever
void loop() {
    digitalWrite(13, HIGH); // turn the LED on (HIGH is the voltage level)
    delay(1000);           // wait for a second
    digitalWrite(13, LOW); // turn the LED off by making the voltage LOW
    delay(1000);           // wait for a second
}
```

# Anatomy of a Sketch

```
/*
Blink
Turns on an LED on for one second, then off for one second, repeatedly.

This example code is in the public domain.

*/
Hey Arduino,
here's how you setup

// the setup function runs once when you press reset or power the board
void setup() {
    // initialize digital pin 13 as an output.
    pinMode(13, OUTPUT);
}

// the loop function runs over and over again forever
void loop() {
    digitalWrite(13, HIGH); // turn the LED on (HIGH is the voltage level)
    delay(1000); // wait for a second
    digitalWrite(13, LOW); // turn the LED off by making the voltage LOW
    delay(1000);
}
```



Hey Arduino,  
here's how you **setup**

Code block for **setup**

# Anatomy of a Sketch

```
/*
Blink
Turns on an LED on for one second, then off for one second, repeatedly.

This example code is in the public domain.
*/
```

```
// the setup function runs once when you press reset or power the board
void setup() {
    // Set pin 13 as an output.
    pinMode(13, OUTPUT);
}

// the loop function runs over and over again forever
void loop() {
    digitalWrite(13, HIGH);           // turn the LED on (HIGH is the voltage level)
    delay(1000);                   // wait for a second
    digitalWrite(13, LOW);          // turn the LED off by making the voltage LOW
    delay(1000);                   // wait for a second
}
```

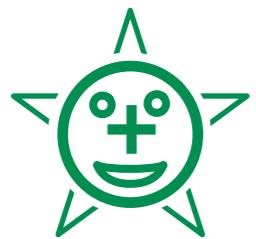
Hey Arduino,  
here's how you **loop**

Code block for **loop**

# Electronics is... Moving Charge



Highly energetic charge particle

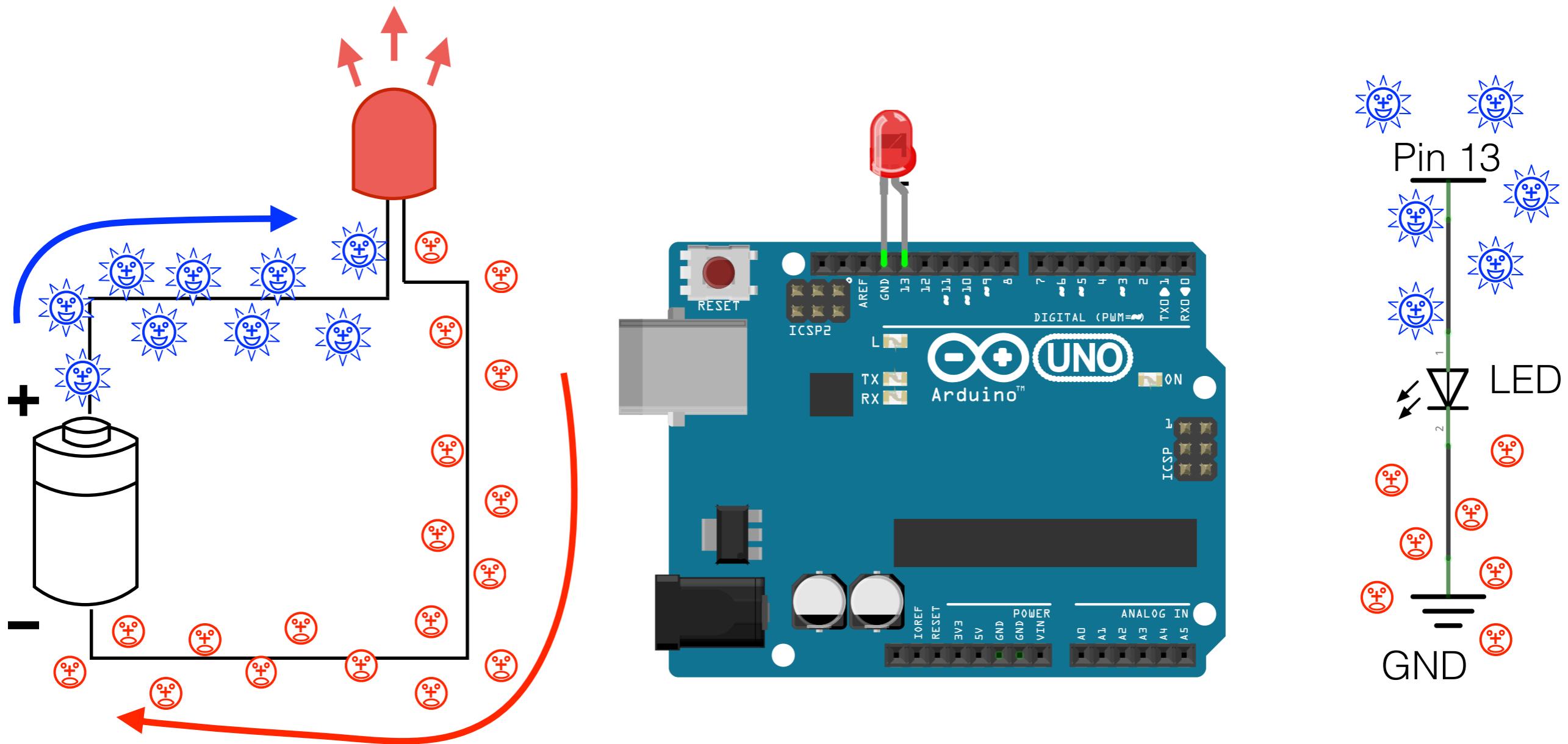


Less energetic charge particle

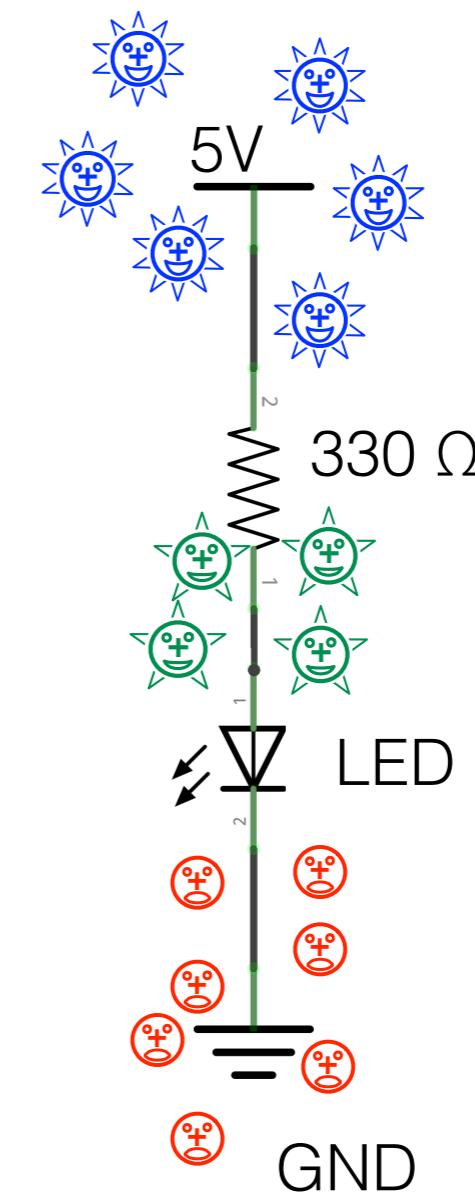
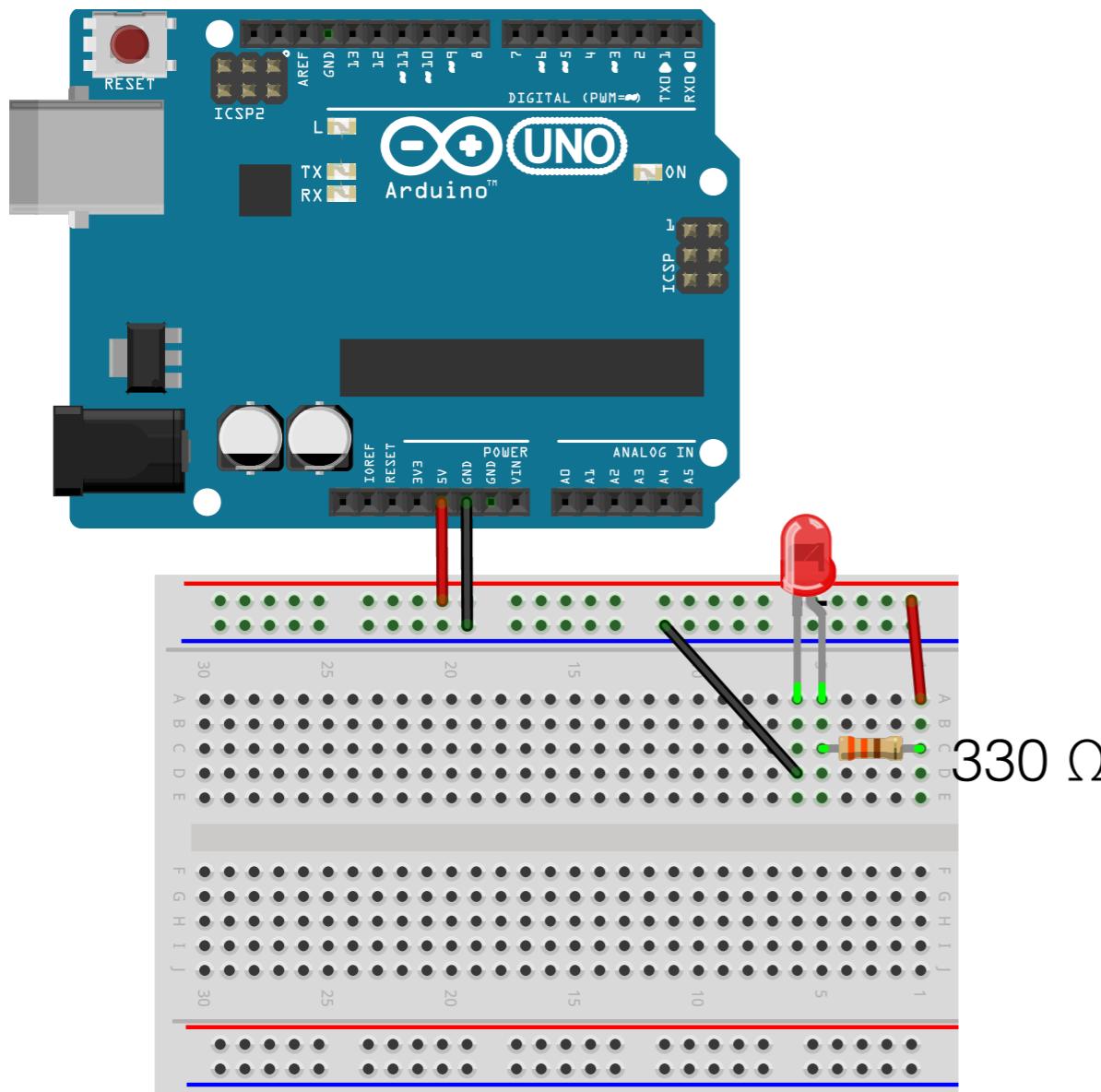


Exhausted charge particle

# Simple Circuit

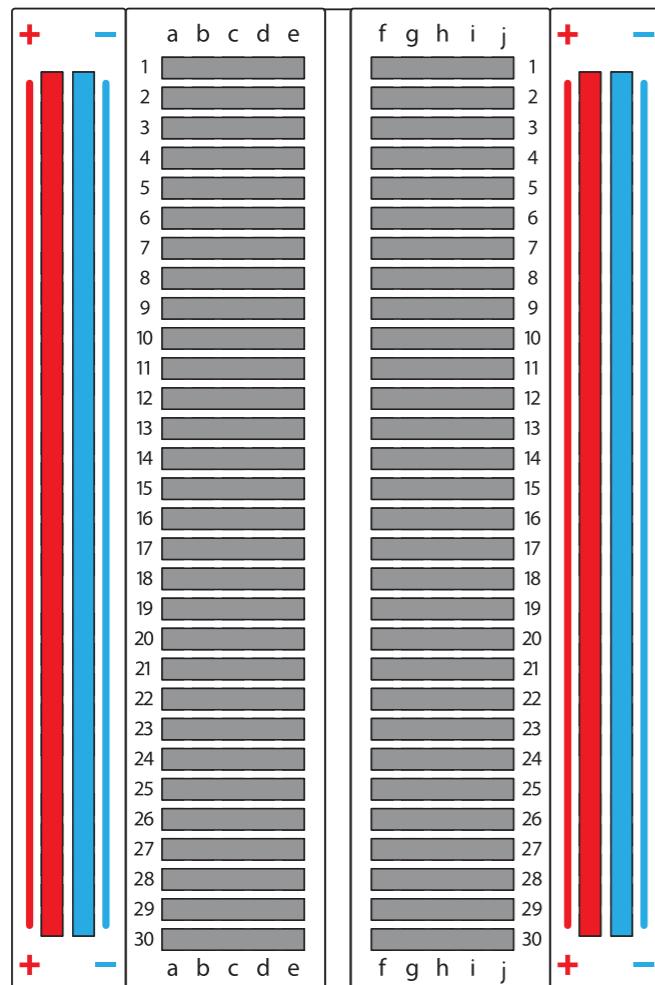


# A Happier LED

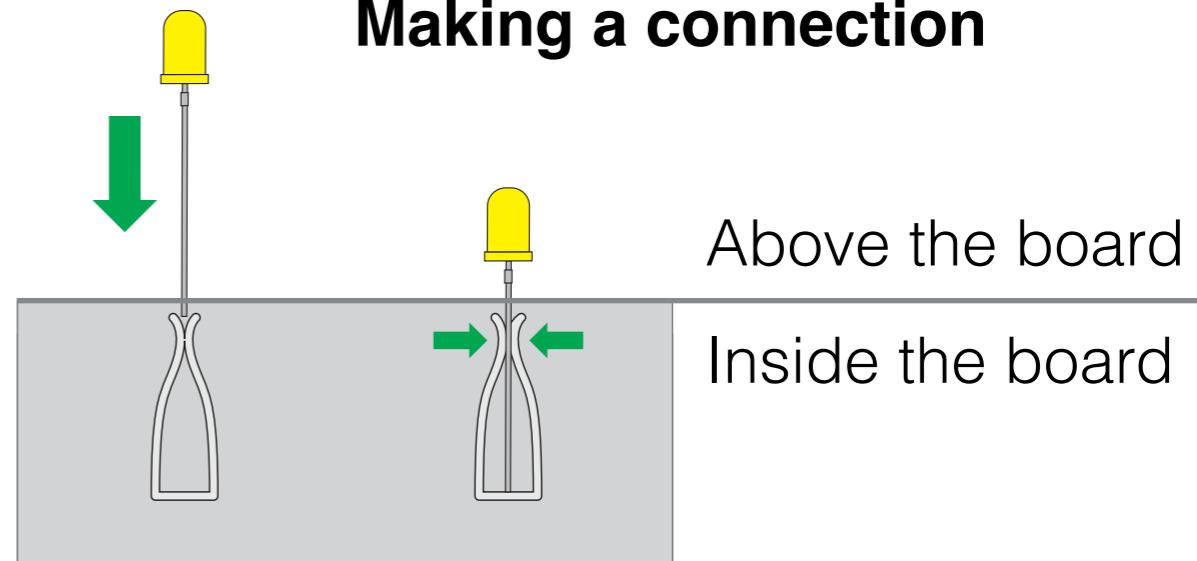


# The Breadboard

- + Runs power along column
- Runs ground along column
- Each numbered row has 5 connected sockets

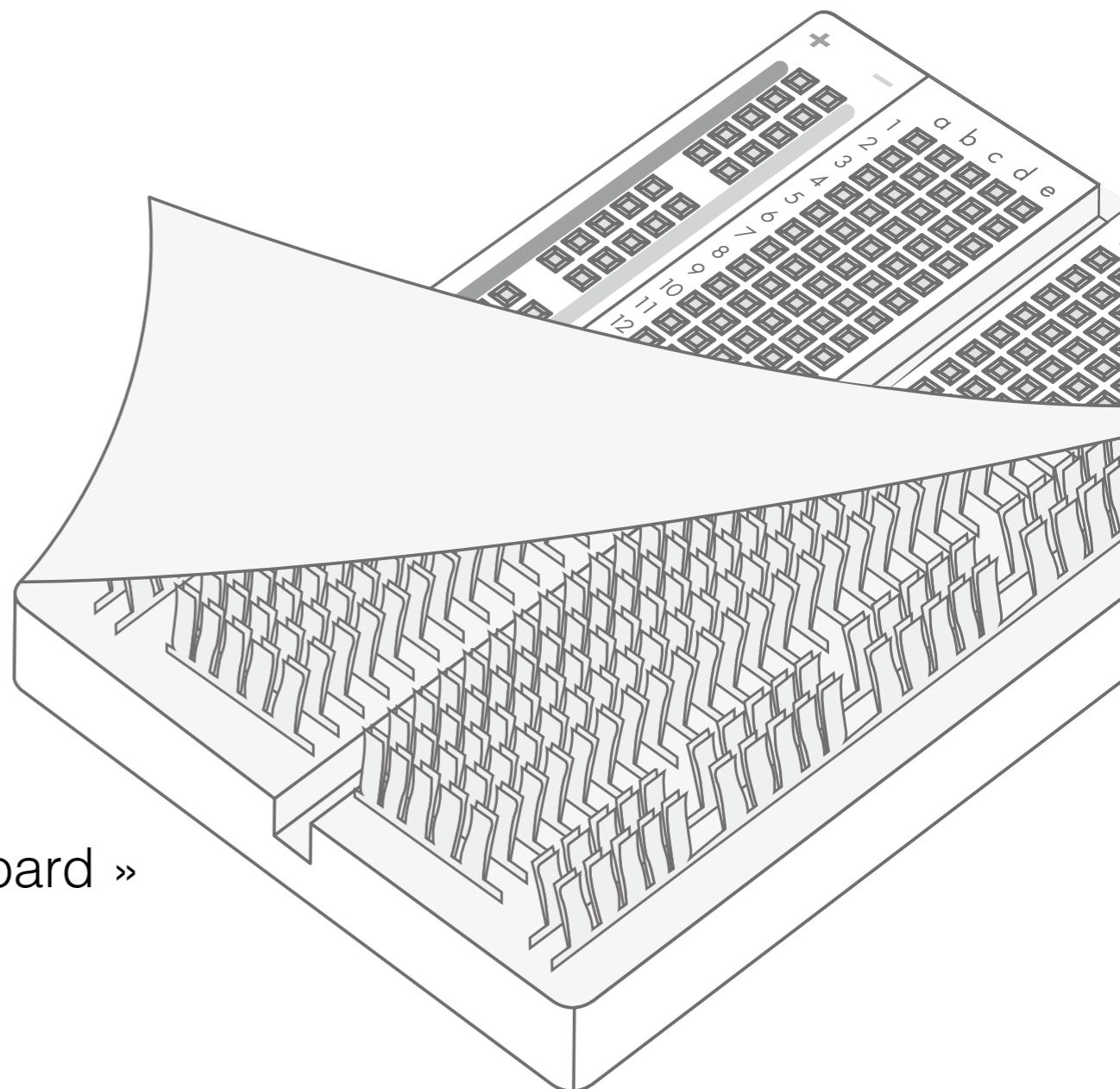


## Making a connection

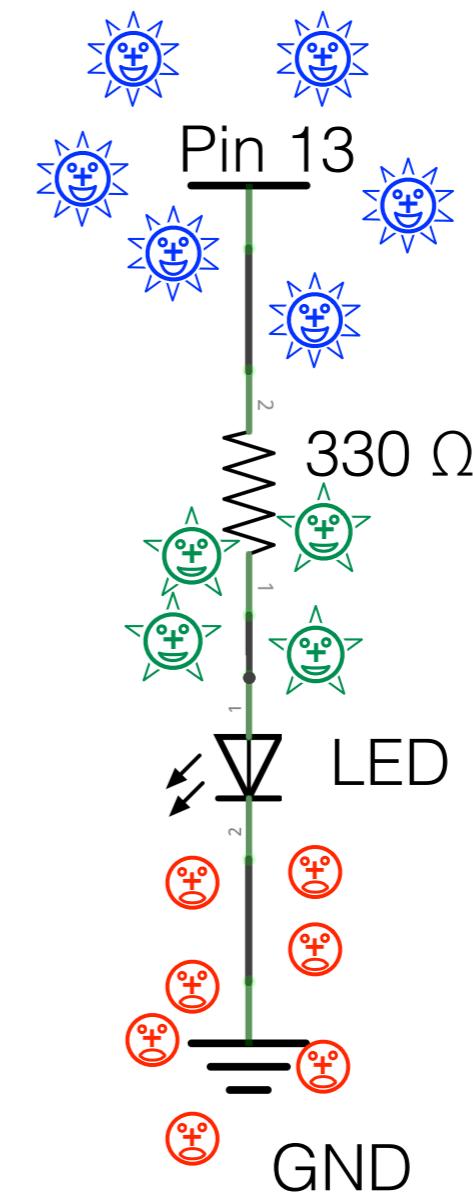
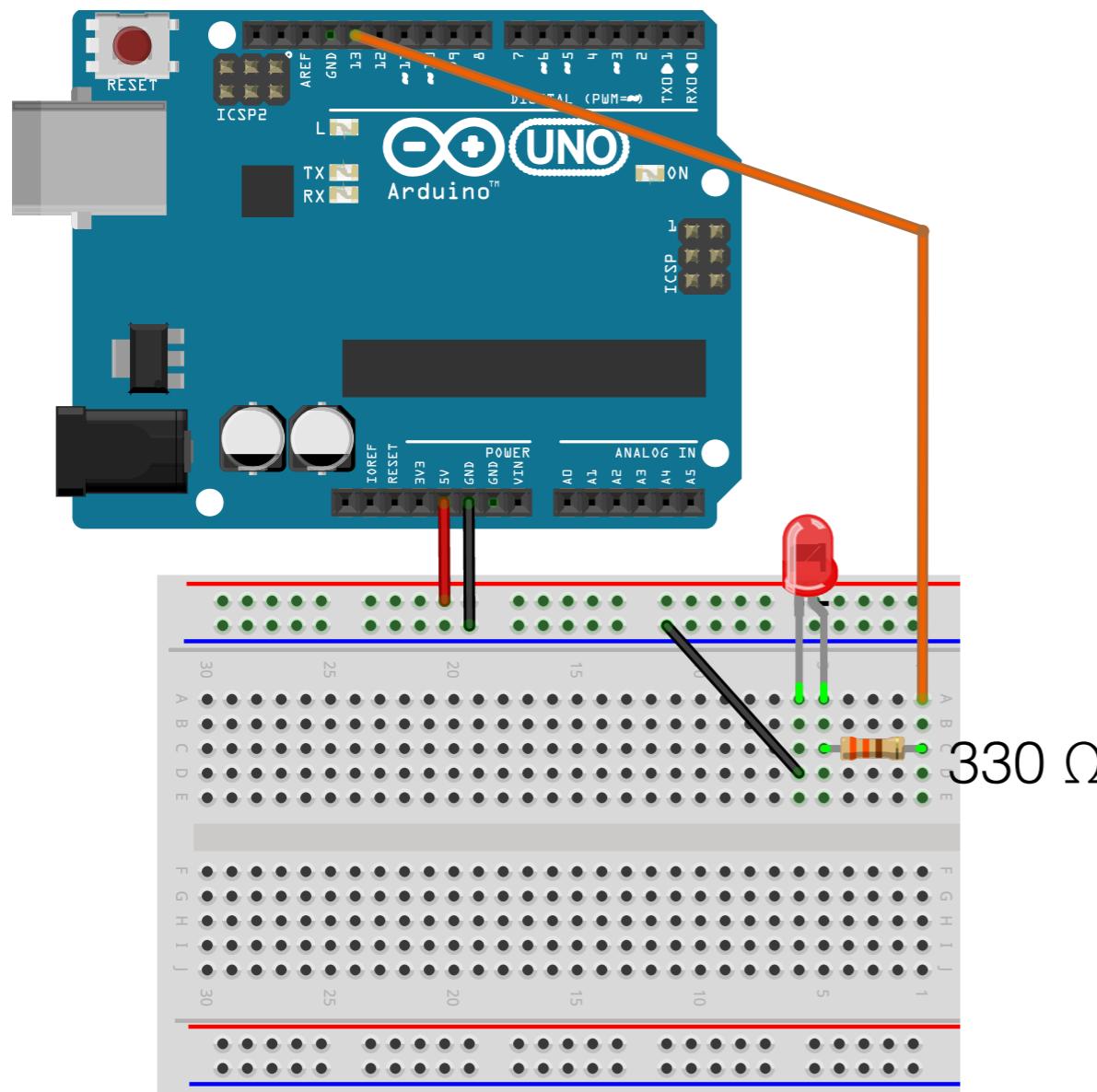


Above the board

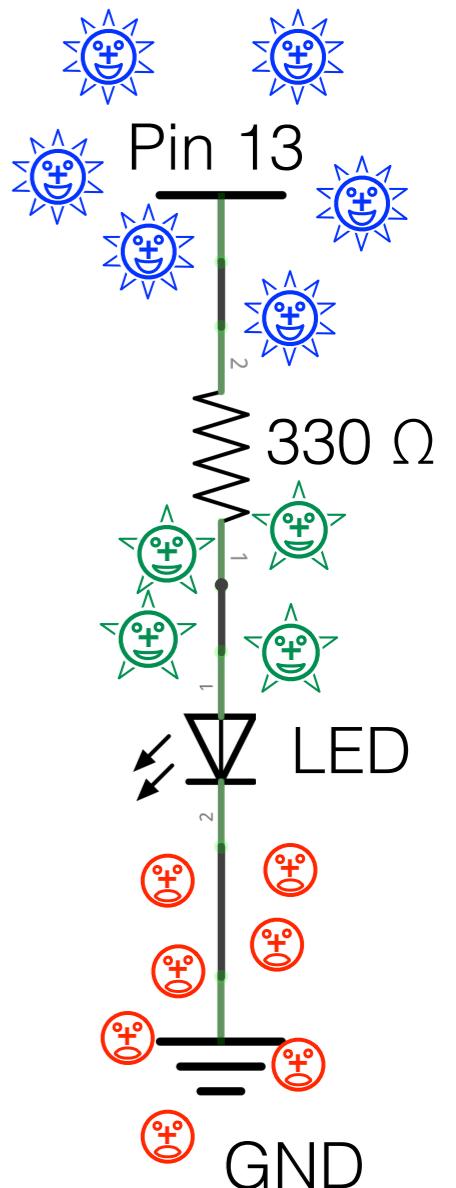
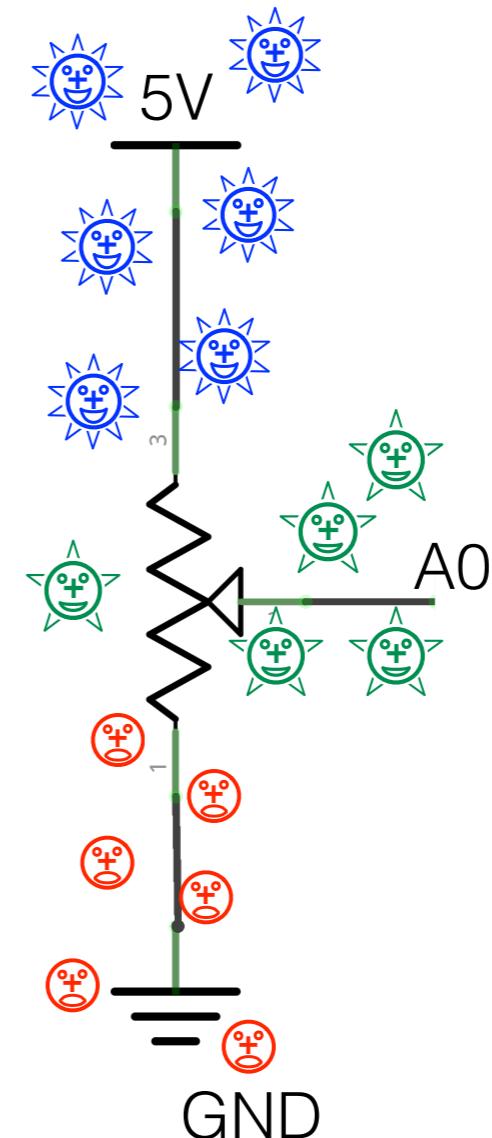
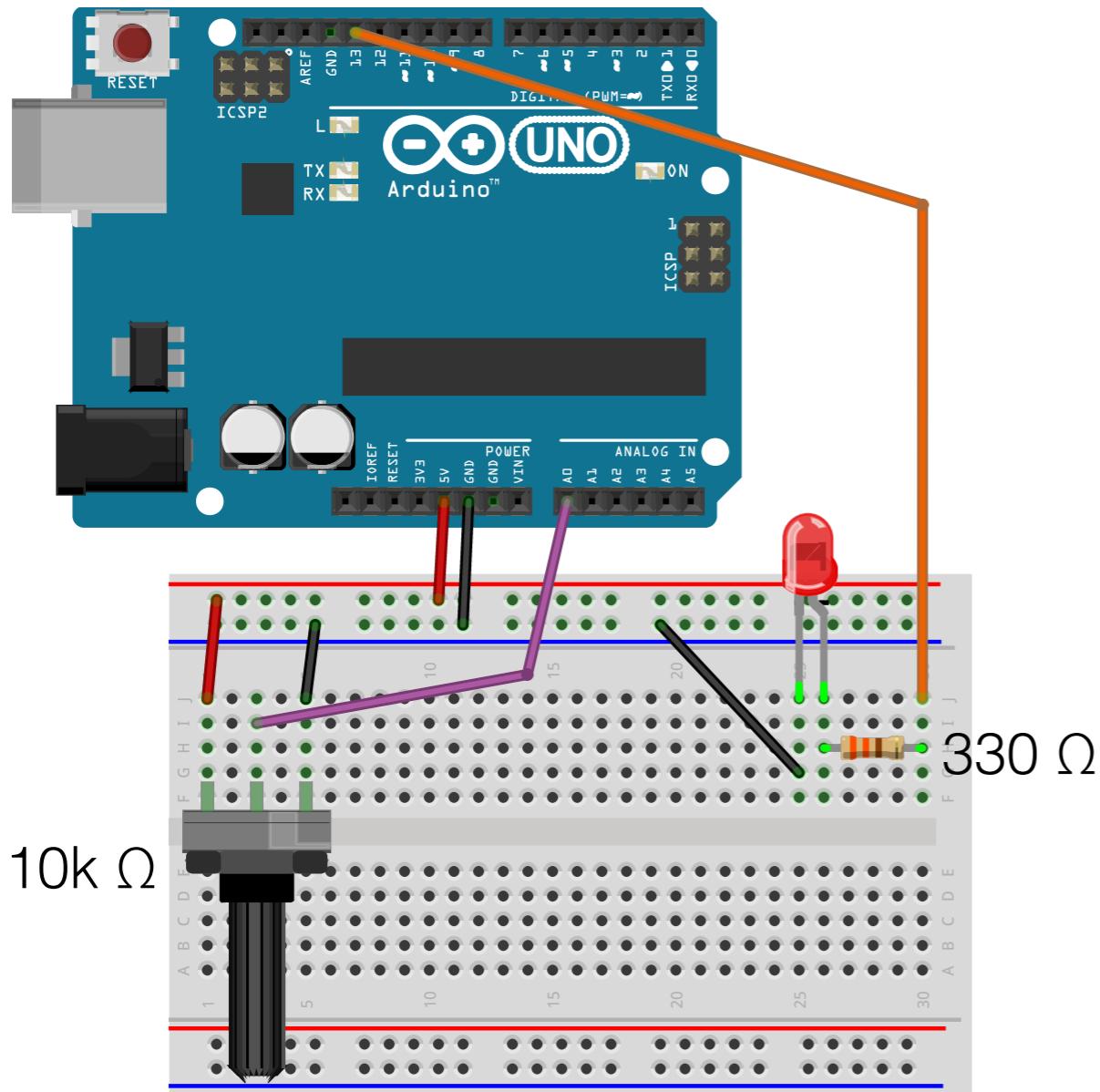
Inside the board



# A Blinking LED



# Control the Blinking



# Control the Blinking, Code

```
/*
Analog Input
[ ... ]

This example code is in the public domain.

*/
int sensorPin = A0;      // select the input pin for the potentiometer
int ledPin = 13;         // select the pin for the LED
int sensorValue = 0;     // variable to store the value coming from the sensor

void setup() {
  // declare the ledPin as an OUTPUT:
  pinMode(ledPin, OUTPUT);
}

void loop() {
  // read the value from the sensor:
  sensorValue = analogRead(sensorPin);
  // turn the ledPin on
  digitalWrite(ledPin, HIGH);
  // stop the program for <sensorValue> milliseconds:
  delay(sensorValue);
  // turn the ledPin off:
  digitalWrite(ledPin, LOW);
  // stop the program for for <sensorValue> milliseconds:
  delay(sensorValue);
}
```

# Debug the Blinking

```
/*
Analog Input
[...]

This example code is in the public domain.

*/

int sensorPin = A0;      // select the input pin for the potentiometer
int ledPin = 13;         // select the pin for the LED
int sensorValue = 0;     // variable to store the value coming from the sensor

void setup() {
  // declare the ledPin as an OUTPUT:
  pinMode(ledPin, OUTPUT);
  // open a 9600-baud serial connection:
  Serial.begin(9600);
}

void loop() {
  // read the value from the sensor:
  sensorValue = analogRead(sensorPin);
  // write the sensor value to the serial interface:
  Serial.println(sensorValue);
  // turn the ledPin on
  digitalWrite(ledPin, HIGH);
  // stop the program for <sensorValue> milliseconds:
  delay(sensorValue);
  // turn the ledPin off:
  digitalWrite(ledPin, LOW);
  // stop the program for for <sensorValue> milliseconds:
  delay(sensorValue);
}
```

# Examples!

- Make the potentiometer control brightness instead of blink rate. *Hint: try flashing the LED really quickly! The **analogWrite** function might help!*
- Wire up 8 LEDs to 8 digital output pins. Use the potentiometer to control how many of the LEDs are on — a level meter!
- Control the red, green, and blue components of an RGB LED using three potentiometers.
- *Challenge:* Blink two LEDs, controlling the rate of each independently with its own potentiometer. *Hint: You can't use **delay()** anymore! Look at **millis()** instead.*