

# Physical Computing

Designing Physical Interactions for a Digital World

DESN 265

Fall 2021

Thursday, 2PM – 5:50PM

Online and QC Makerspace

Professor Danne Woo

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[danne.woo@qc.cuny.edu](mailto:danne.woo@qc.cuny.edu)

# What I do

- Graphic Designer
- UX and UI Designer
- Product Designer
- Game Designer
- Woodworker
- Musician
- Programmer
- Engineer
- Hacker
- Maker
- Tinkerer
- Entrepreneur

Design Technologist

# How I got here

- Designer parents
- Youngest AIGA member
- First typeface at 10
- Named after designer
- 10 year design career
- Studied design and technology at NYU





datavisual

Data  
Designer

Community  
Gallery

About  
Us

Hey darren,  
Log Out



Visualizing your  
data your way



Design



Data



Output



### What is *datavisual*?

*datavisual* is a web-based tool for creating data visualizations. Perfect for designers and creatives with limited programming skills but a need to make beautiful charts and graphs. Once you design your chart style you can upload multiple data sets and output them as vector PDFs or SVGs as well as websafe PNGs.

MacBook Pro



# SPLAT

Join team two at [splat.in/2](http://splat.in/2)





www.BIGPLAY.ME presents

# SPLAT

1354  
TEAM 1

1575  
TEAM 2

0704  
TEAM 3

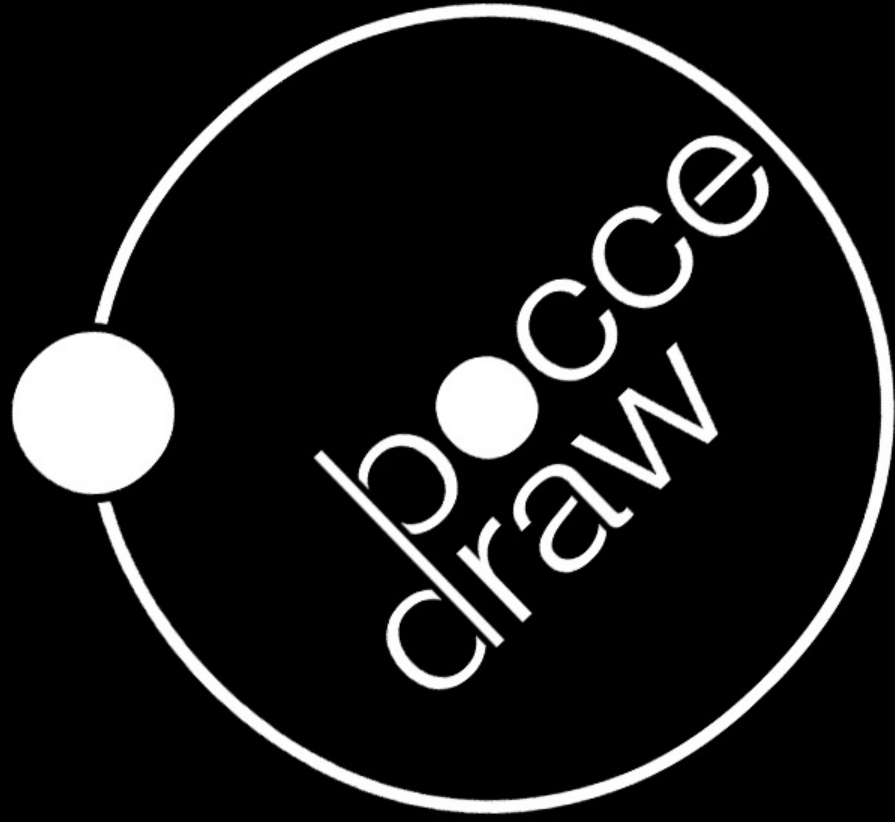
0111  
PLAYERS





# RFID Beat Box

Created by Danne Woo & Stefanie Kleinman



# table setting

*at the Tenement*

**circuit**

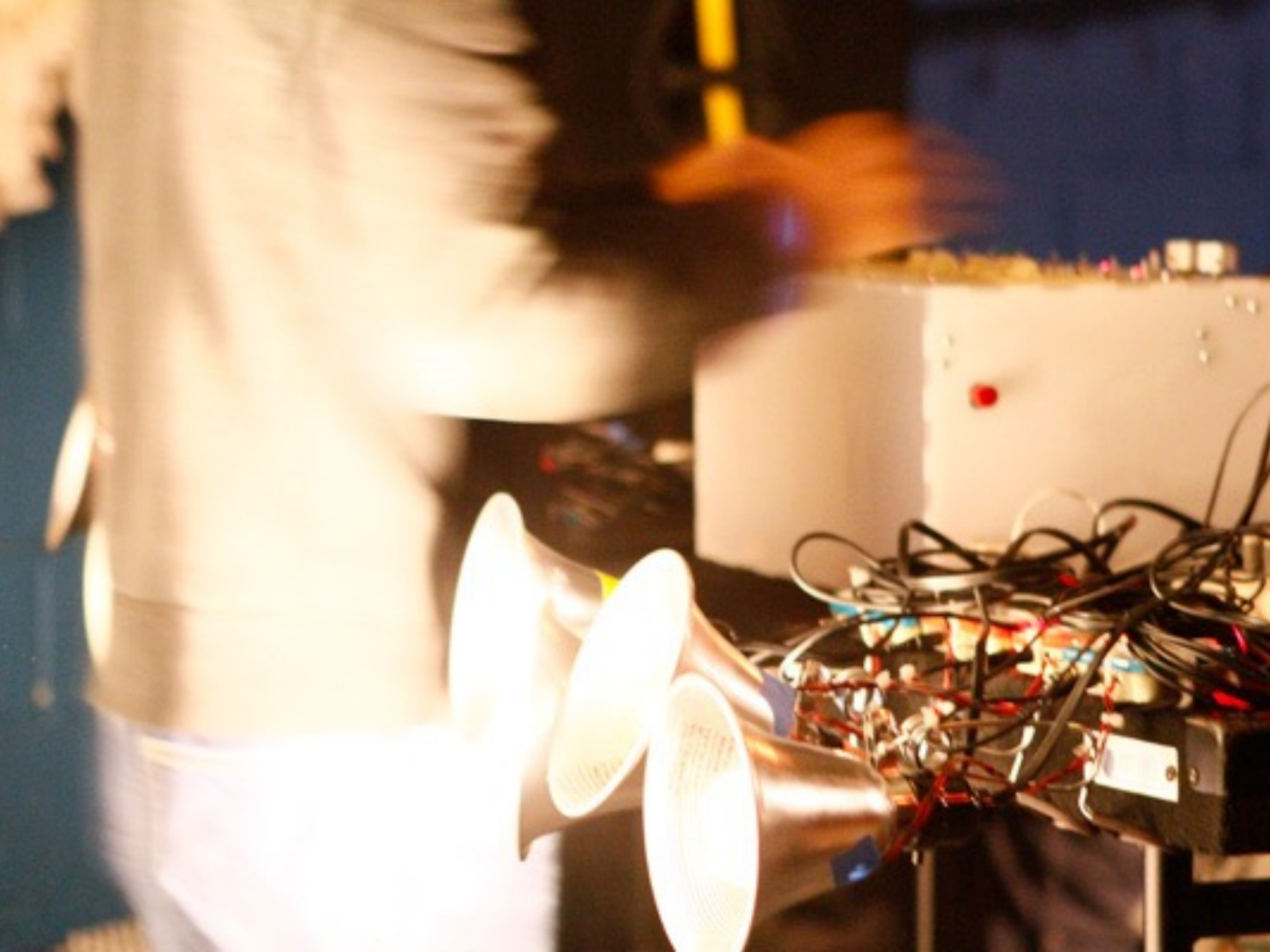


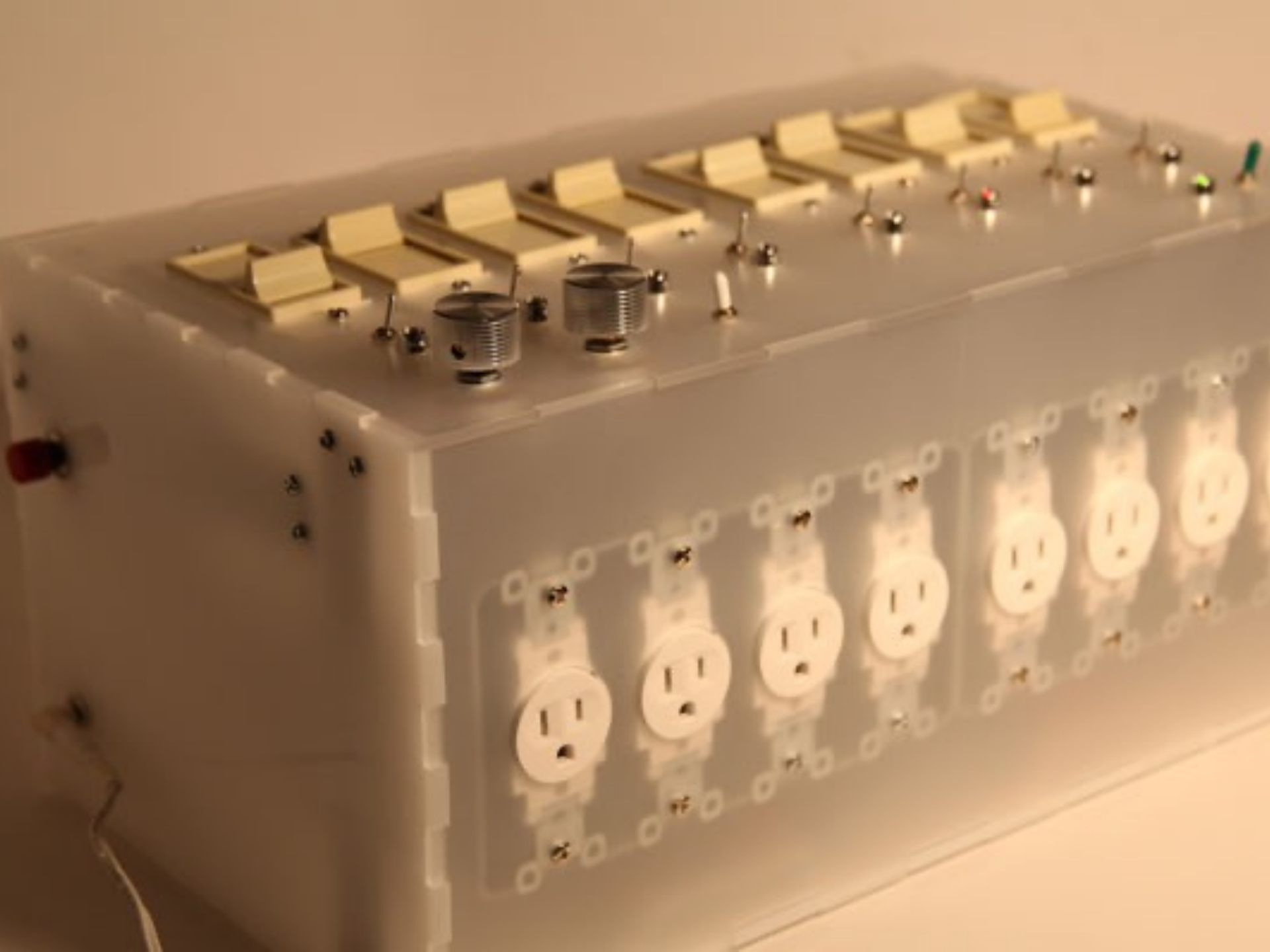
**board**



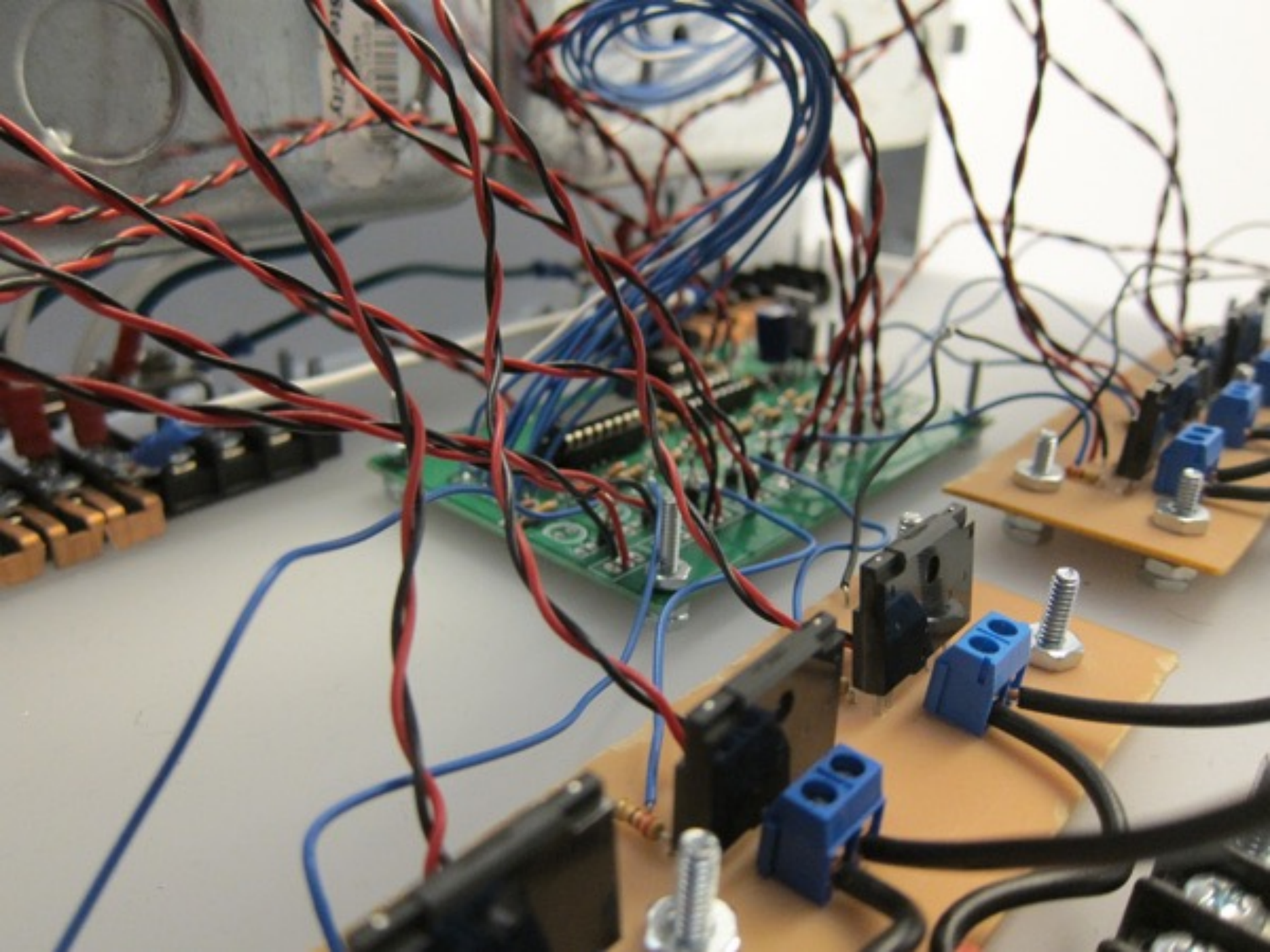
# Light Hum

Danne Woo















# AC Symphony

Danne Woo

**Your turn.**

Who are you?

Where are you from?

Why did this class interest you?

# Week 1-9

Week 1: What is Physical Computing?

Week 2: Introduction to Electronics

Week 3: Arduino, Hello World

Week 4: Analog Output

Week 5: Digital and Analog Review

Week 6: Enclosures

Week 7: Serial Communication, Processing and p5.js

Week 8: Soldering Workshop

Week 9: Midterm Presentation



# Week 10-15

Week 10: Final Project Ideas and Planning

Week 11: Designing, Prototyping and User Testing

Week 12: In Class Work Session

Week 13: Playtesting and Progress Report

Week 14: Final Presentations

# Class Objectives

## **All Semester**

Lectures, labs and guest speakers to better understand physical interaction design and computing as well as prototyping, user-testing and project planning.

## **Midterm**

Take what we covered thus far in the class and come up with a simple project to apply these technical skills.

## **Final**

Spend more time focusing on the concept, design, prototyping and user-testing for this project. The concept again is entirely up to you.

# Arduino Kits



# Suggested Equipment Purchases



Digital Multimeter  
(AstroAI or other brand)  
\$12 on Amazon



22 Gauge Solid Wire  
\$16 on Amazon



Wire Cutters  
\$10 on Amazon



Wire Strippers  
\$7 on Amazon

# Suggested Equipment Purchases



Tool Box  
\$10 at Home Depot



Soldering Iron  
\$35 on Amazon

# Sensors and Other Equipment

Maker Shed

SparkFun Electronics

Adafruit Industries

Jameco Electronics

Mouser Electronics

Digi-Key Electronics

Micro Center

Amazon

# Required Reading

Arduino Projects Book

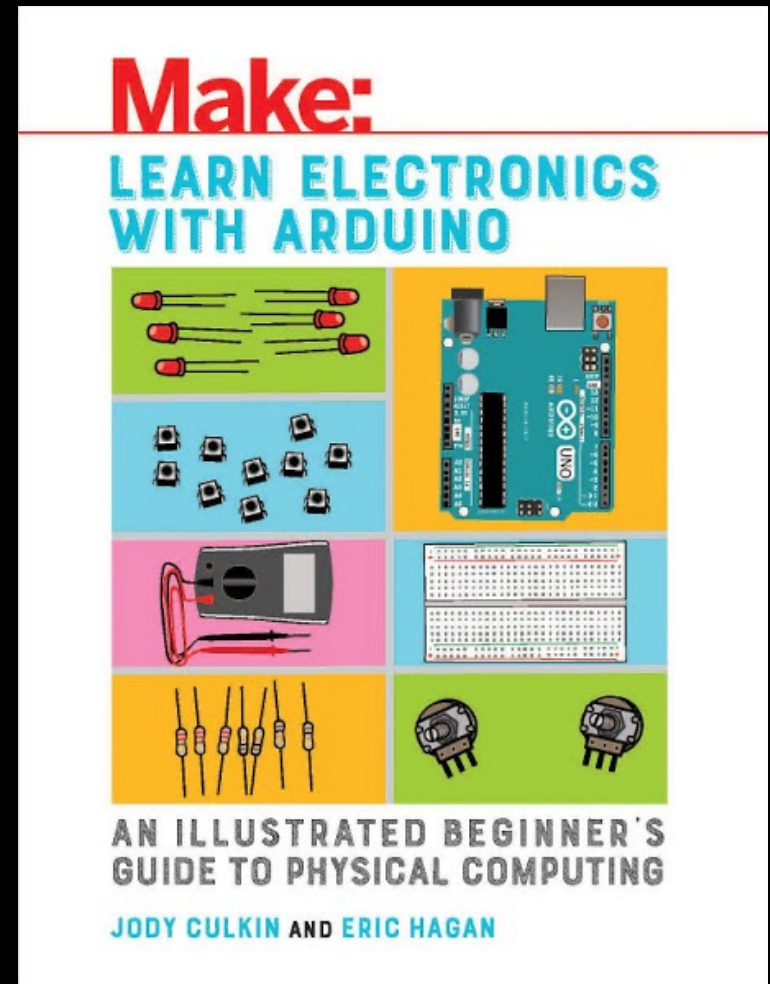
ARDUINO  
PROJECTS  
BOOK



# Suggested Reading

Learning Electronics with Arduino

By Jody Culkin and Eric Hagan





# Class Website

pcomp.dannewoo.com

Physical Computing – Designin x

Danne

pcomp.dannewoo.com

Apps ★ Bookmarks Personal ITP Scripts Materials Design DV CUNY CRISPR COC Every Day Data Residencys/Grants/F... » Other Bookmarks

## Physical Computing

Designing Physical Interactions for a Digital World

### MENU

- Introduction
- Helpful Resources
- Inspiration

### SYLLABUS

- Week 1: What is Physical Computing?
- Week 2: Introduction to Electronics

## Introduction

Queens College  
ARTS 370  
Physical Computing

Spring 2018  
Friday 2:00PM – 5:50PM  
Klapper 107

No Class: 3/30 (Spring Break), 4/6 (Spring Break)  
Wednesday follows Friday Schedule: 4/11

### Class Description

Using a keyboard and mouse is not how we communicate with

0

# Blog

You will be required to keep a blog to post your projects and progress throughout the entire semester. Use either Medium, Wordpress or Tumblr to setup your blog. See the links below for examples of good blogging habits. Makes sure to include images, videos and detailed descriptions.

Examples:

- [itp.dannewoo.com](http://itp.dannewoo.com)
- [medium.com/@venegu.design](https://medium.com/@venegu.design)
- [electrosquirrel.wordpress.com](http://electrosquirrel.wordpress.com)
- [aepeng.tumblr.com](http://aepeng.tumblr.com)

# For Class

1. Sketchbook (Moleskin or similar)
2. Laptop or Thumb Drive
3. Arduino Kit and Supplies
4. Be prepared to talk about your work and blog posts

# Grading

**80% Assignments**

**20% Class Participation**

**Check the class website for a detailed description on how to achieve each grade.**

# **Attendance**

**BE HERE AND DON'T BE LATE!**

**2 unexcused absences will mean a drop in your grade**

**3 will drop again**

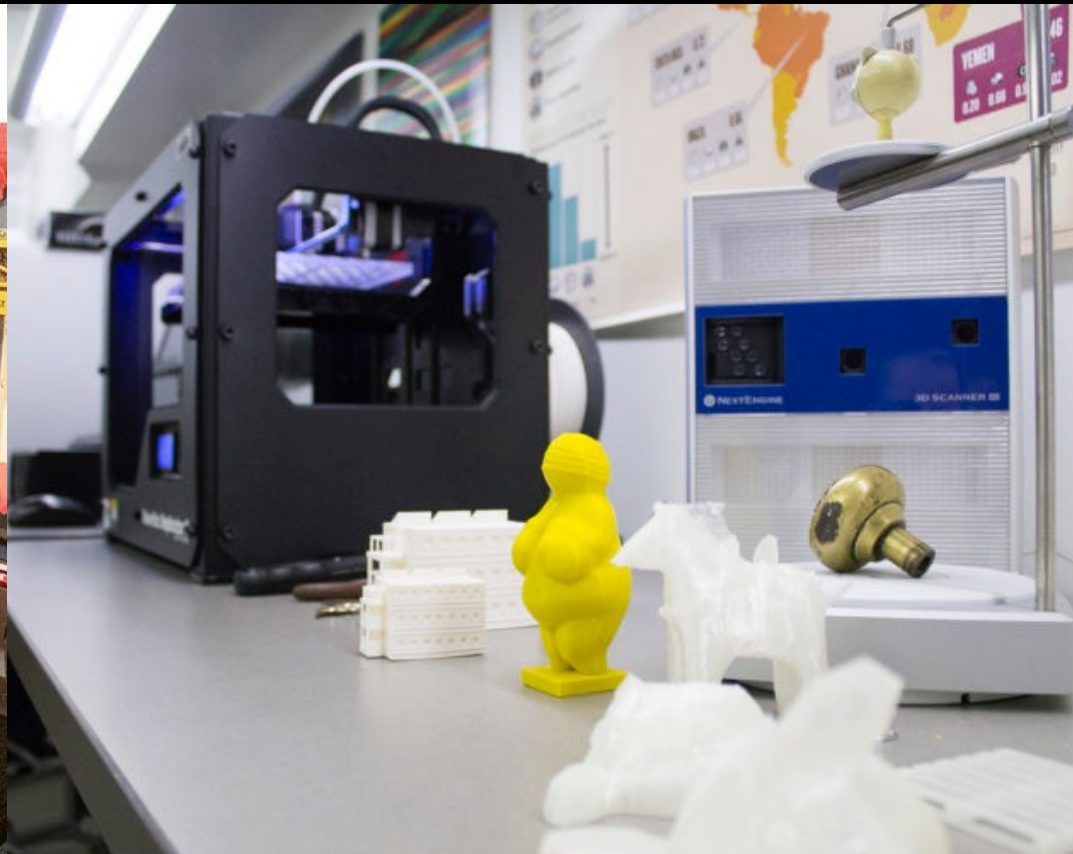
**4 will be an F**

# Queens College Makerspace

Rosenthal Library, Floor 1, Room 101

[library.qc.cuny.edu/makerspace](http://library.qc.cuny.edu/makerspace)

Head of Makerspace: Nick Normal

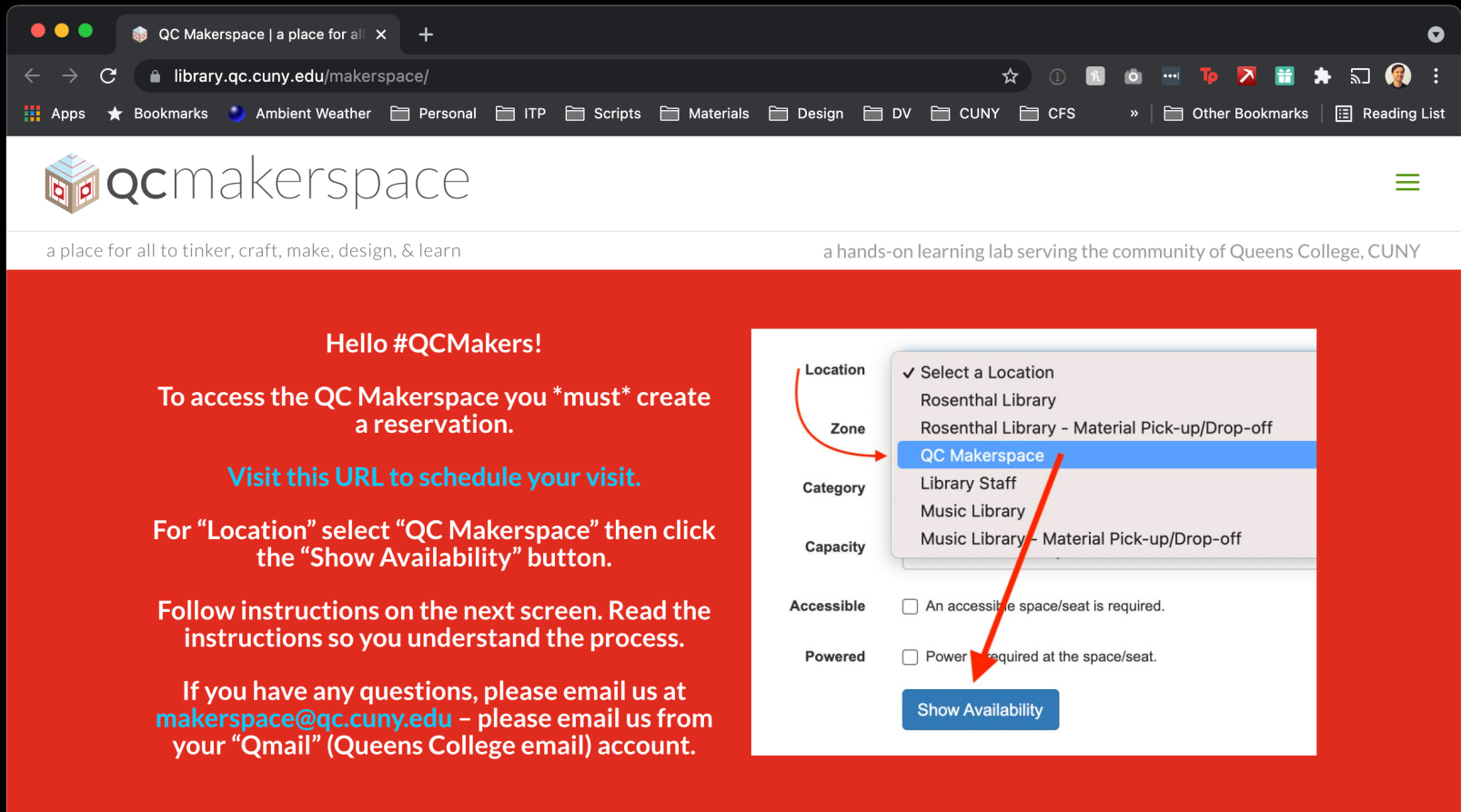


# Queens College Makerspace

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[library.qc.cuny.edu/makerspace](http://library.qc.cuny.edu/makerspace)

Head of Makerspace: Nick Normal



The screenshot shows a web browser window with the URL [library.qc.cuny.edu/makerspace/](http://library.qc.cuny.edu/makerspace/). The page features the QC Makerspace logo and tagline "a place for all to tinker, craft, make, design, & learn". Below this, a red banner contains instructions for users. To the right, a reservation form is displayed with a dropdown menu open for the "Location" field, showing options like "Rosenthal Library" and "QC Makerspace". A red arrow points to the "QC Makerspace" option. Below the form, a blue "Show Availability" button is visible.

**Hello #QCMakers!**

To access the QC Makerspace you *\*must\** create a reservation.

Visit this URL to schedule your visit.

For "Location" select "QC Makerspace" then click the "Show Availability" button.

Follow instructions on the next screen. Read the instructions so you understand the process.

If you have any questions, please email us at [makerspace@qc.cuny.edu](mailto:makerspace@qc.cuny.edu) – please email us from your "Qmail" (Queens College email) account.

**Location** ☒ Select a Location  
Rosenthal Library  
Rosenthal Library - Material Pick-up/Drop-off  
**QC Makerspace**  
Library Staff  
Music Library  
Music Library - Material Pick-up/Drop-off

**Zone**

**Category**

**Capacity**

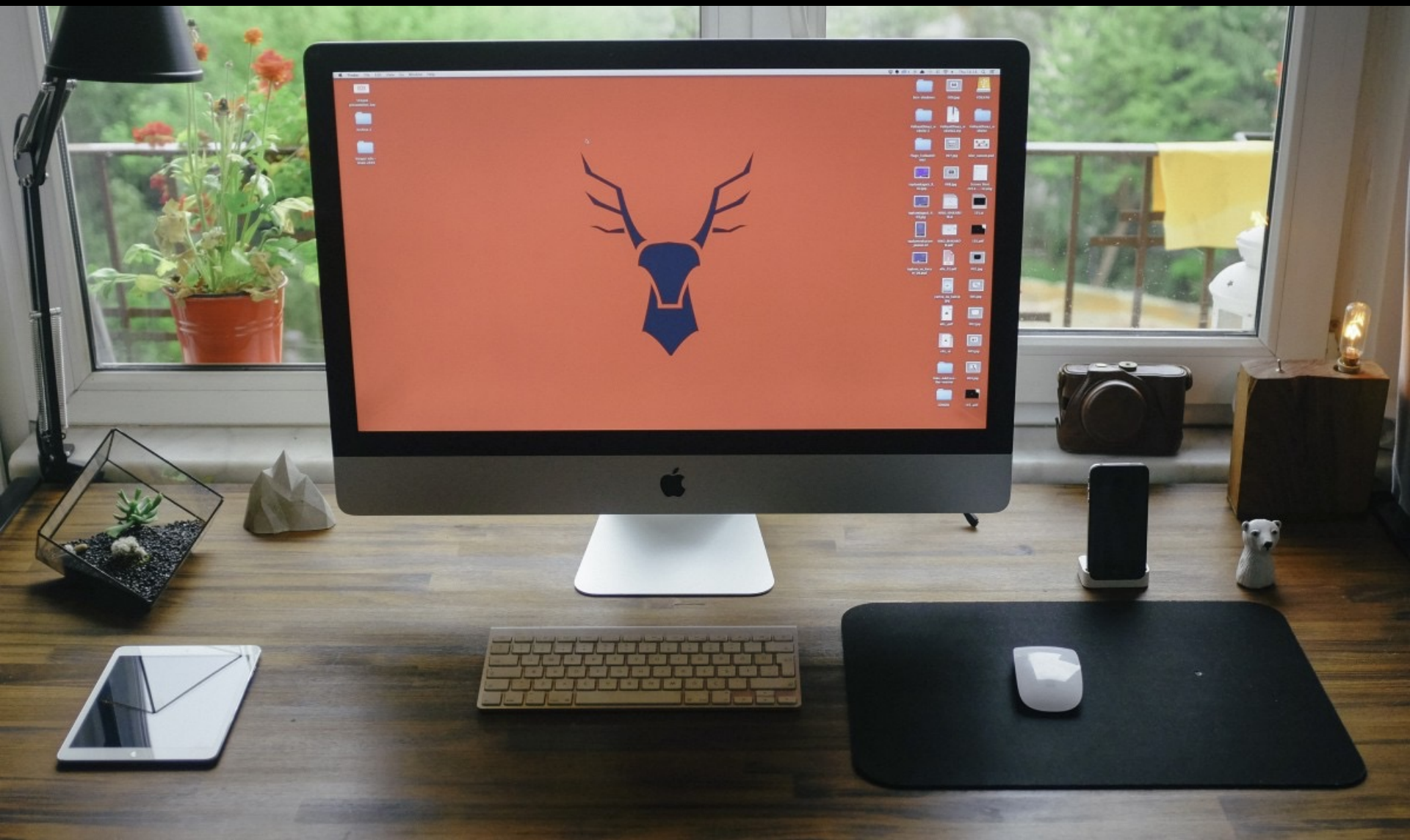
**Accessible** ☐ An accessible space/seat is required.

**Powered** ☐ Power required at the space/seat.

**Show Availability**



# What is Physical Computing?





# What is Physical Computing?

Body as a Controller

- **Gestures/Movement**
- **Touch**
- **Speech**
- **Strength/Pressure**
- **Biometrics**



# What is Physical Computing?

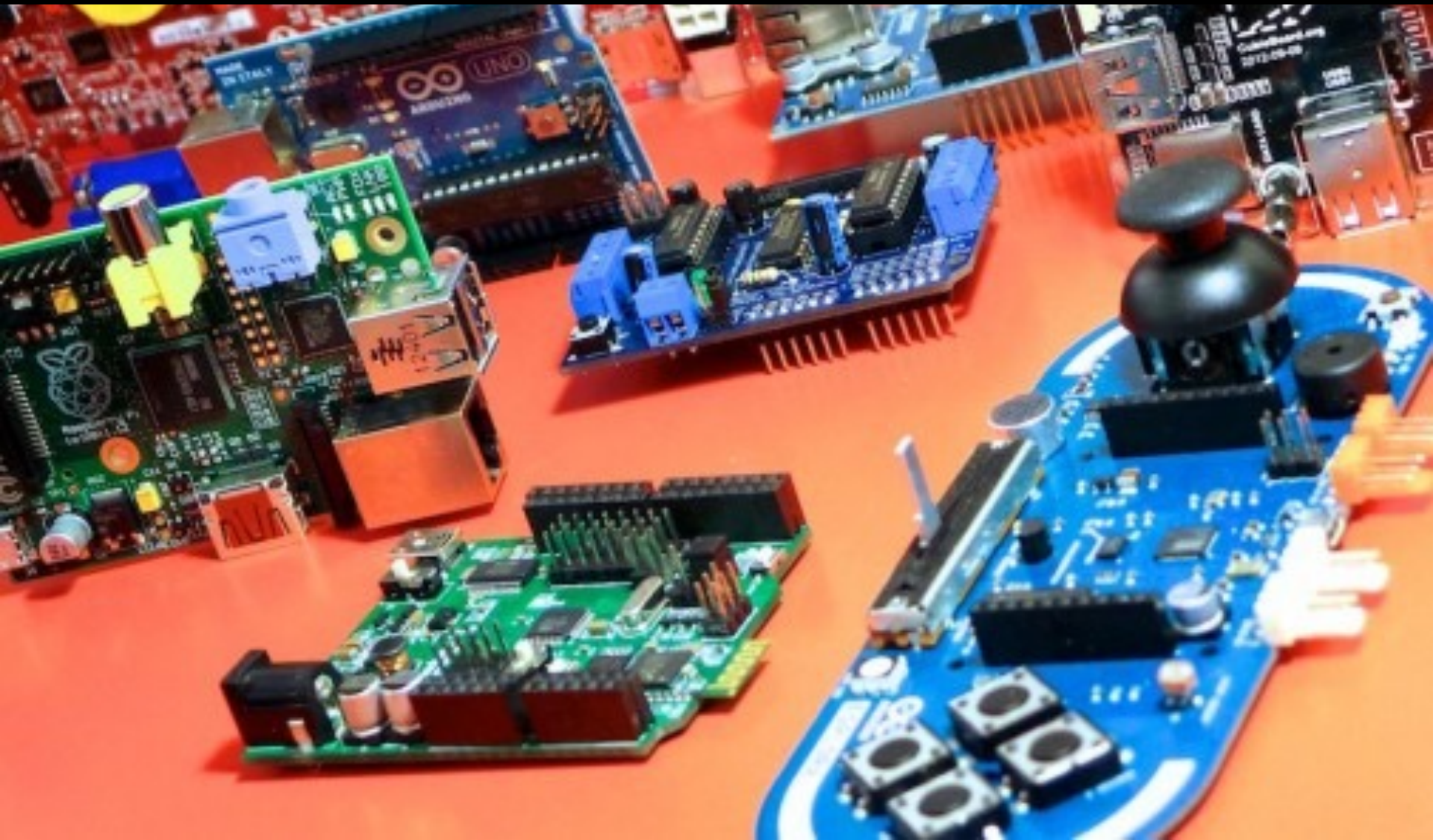
Sensing the Environment

- **Moisture**
- **Temperature**
- **Weight**
- **Motion**
- **Wind**
- **Light**
- **Sound**
- **Color**
- **Distance**
- **Digital Inputs**



# What is Physical Computing?

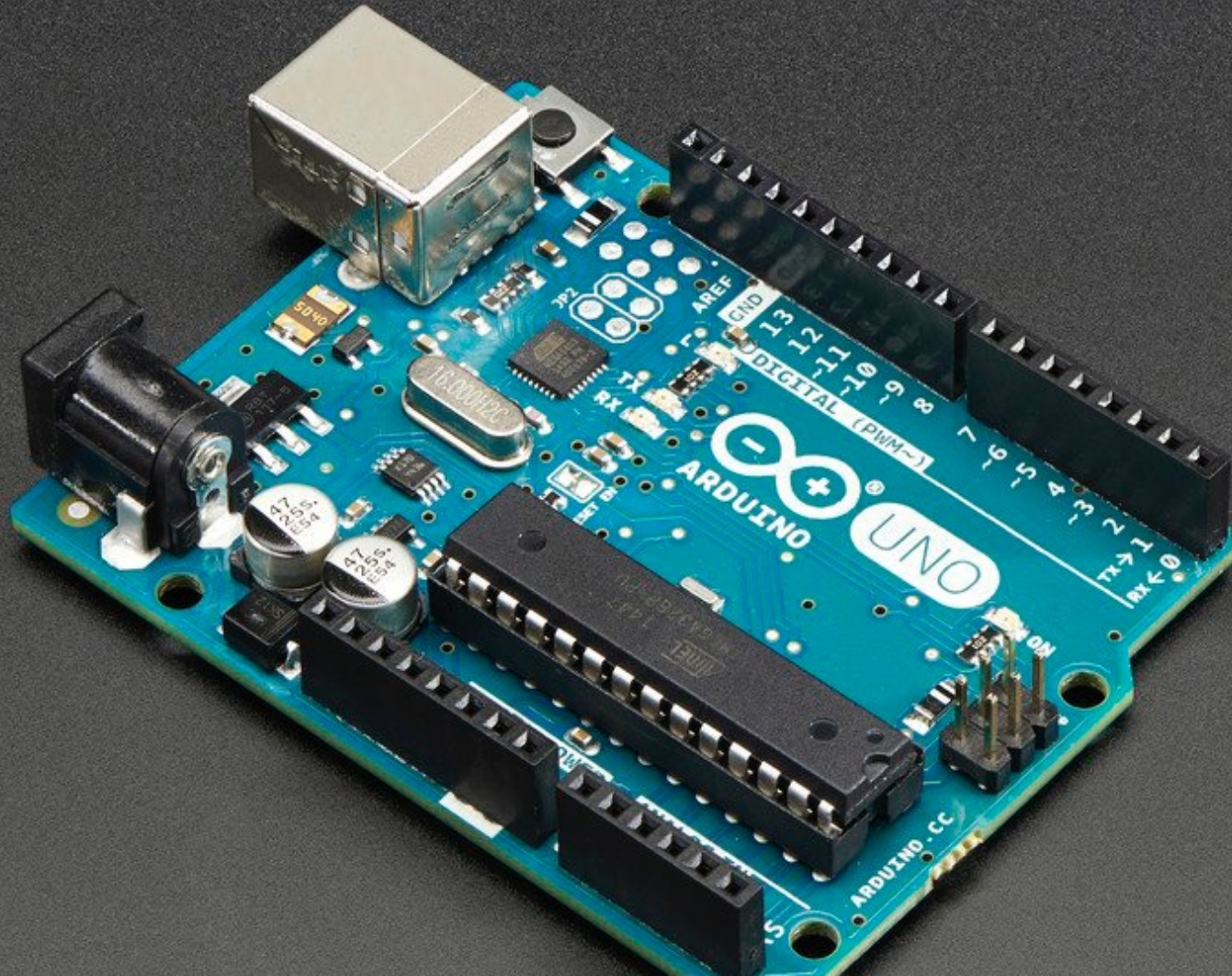
Microprocessors





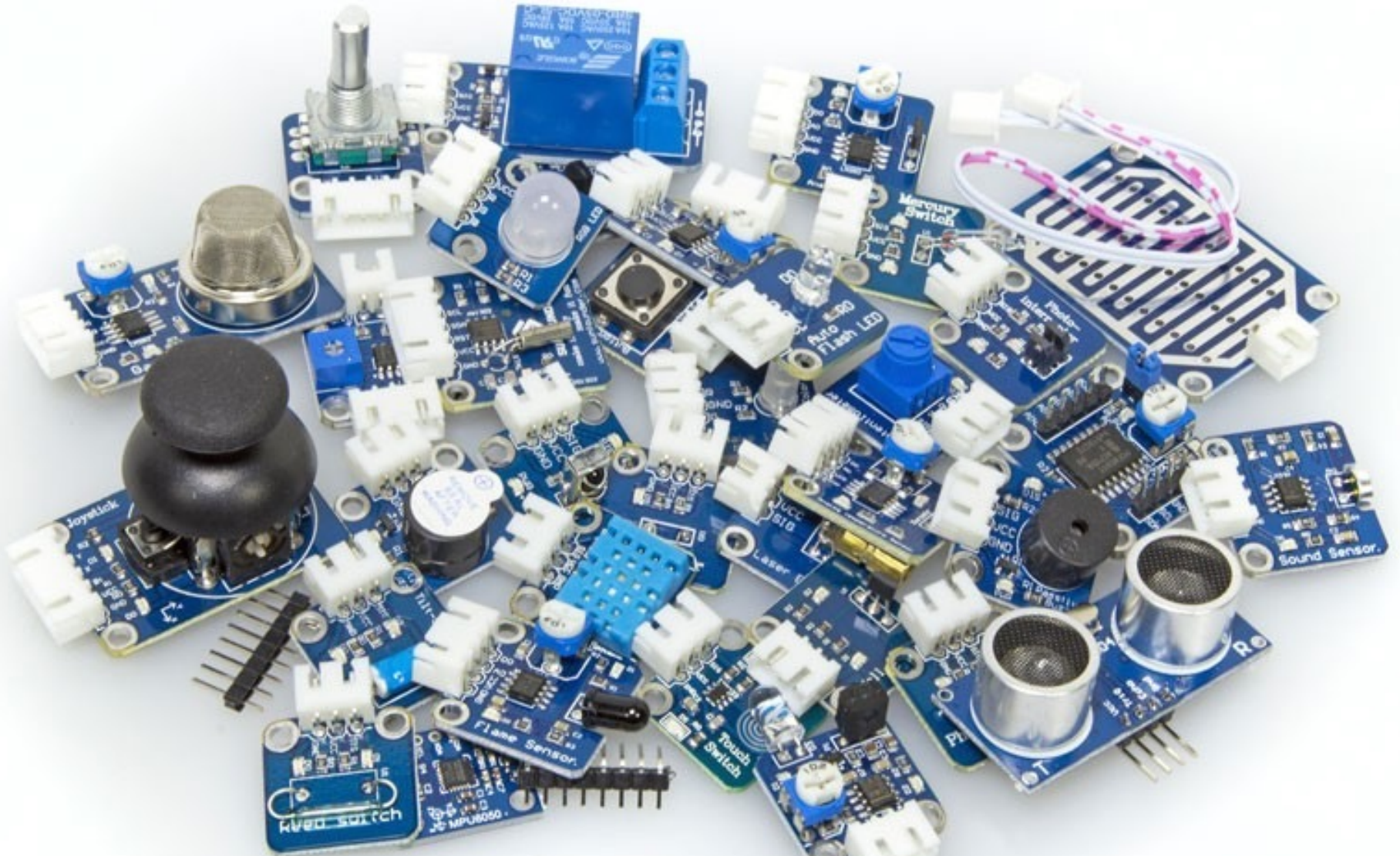
# What is Physical Computing?

Arduino





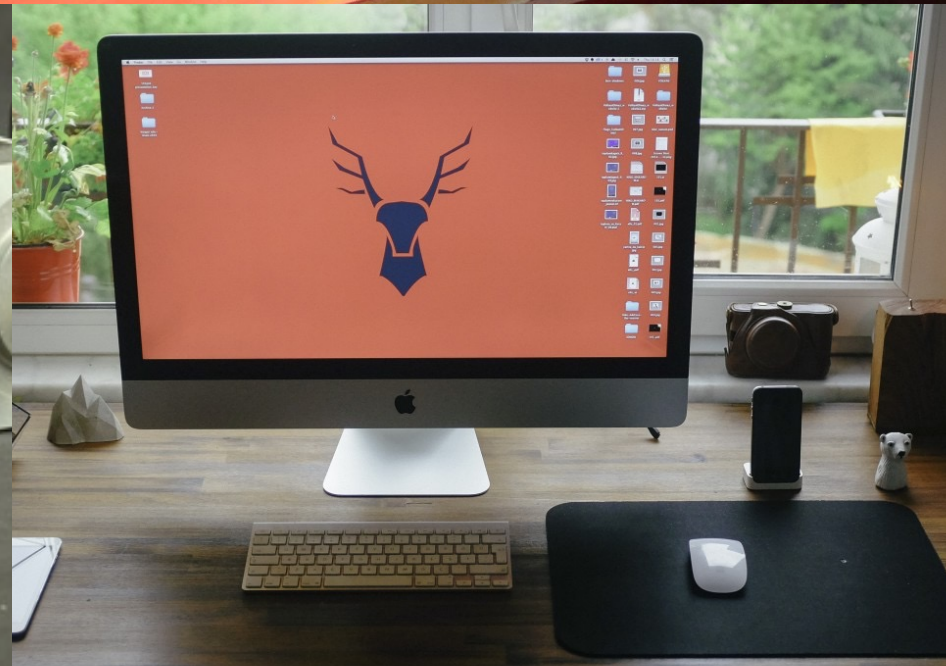
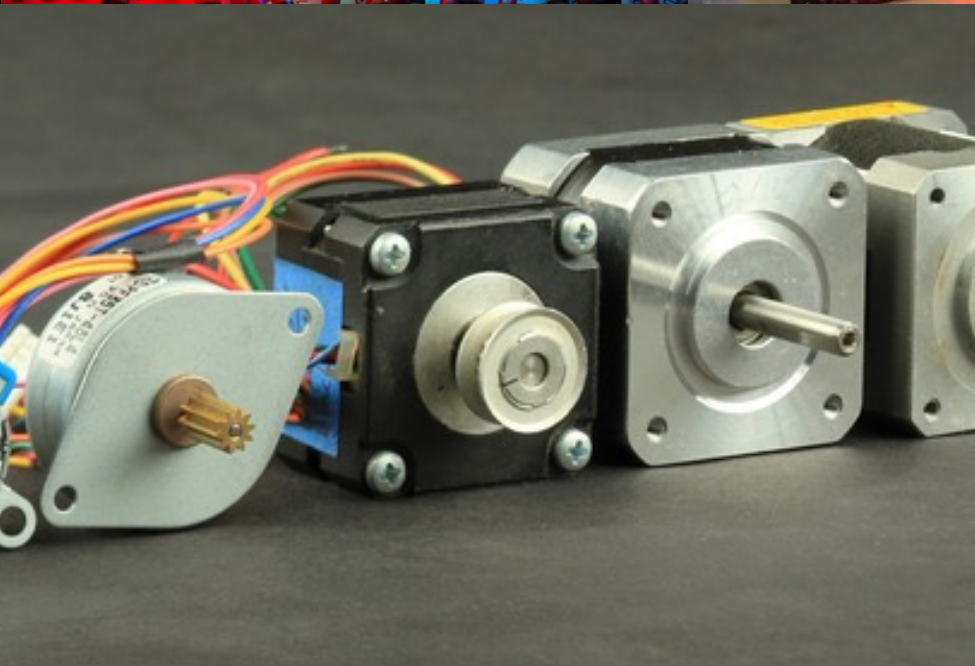
## Input - Sensors





# What is Physical Computing?

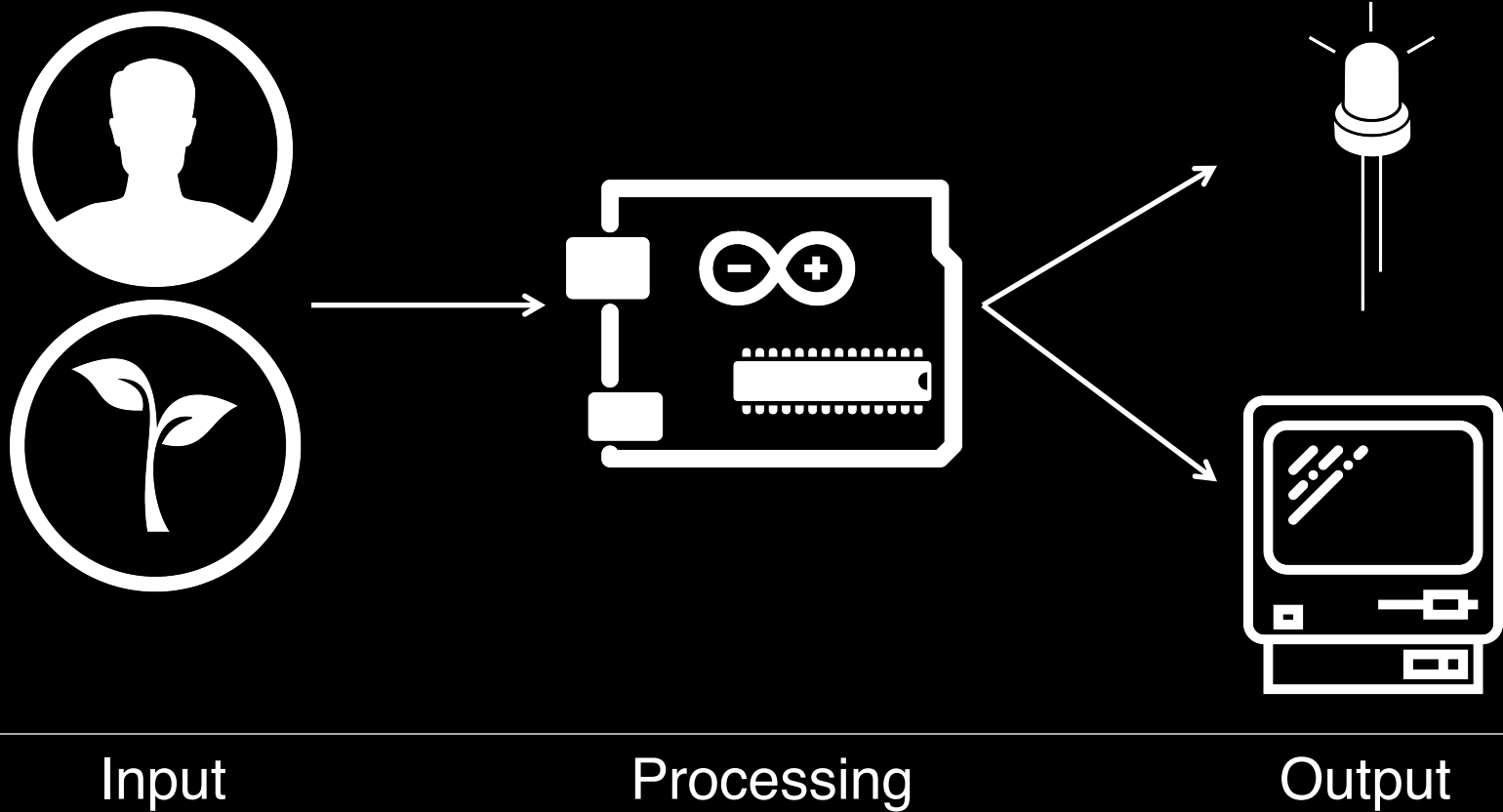
Output





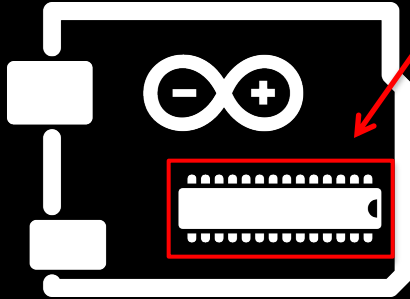
# What is Physical Computing?

Flow



# What is Physical Computing?

# Code



sketch\_jan17a | Arduino 1.0.4

✓ ↻ 📄 ⬆ ⬇

sketch\_jan17a §

```
void setup() {
  pinMode(2, INPUT);    // set the switch pin to be an input
  pinMode(3, OUTPUT);   // set the yellow LED pin to be an output
  pinMode(4, OUTPUT);   // set the red LED pin to be an output
}

In the main loop, first you need an if-then-else statement to read the
switch input.

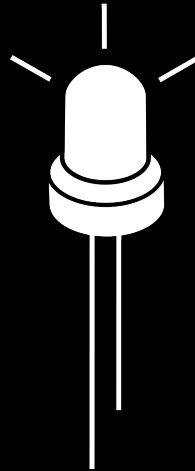
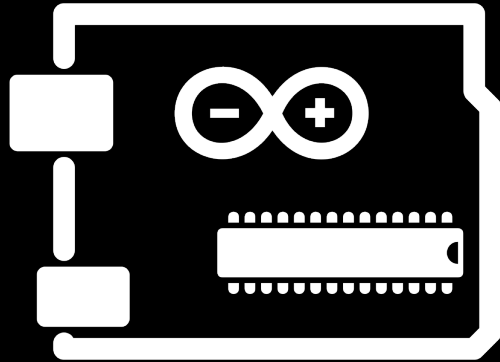
void loop() {
  // read the switch input:
  if (digitalRead(2) == HIGH) {
    // if the switch is closed:
    digitalWrite(3, HIGH); // turn on the yellow LED
    digitalWrite(4, LOW);  // turn off the red LED
  }
  else {
    // if the switch is open:
    digitalWrite(3, LOW);  // turn off the yellow LED
    digitalWrite(4, HIGH); // turn on the red LED
  }
}
```

java.awt.EventQueue.dispatchEvent(EventQueue.dispatchEvent.java:100)
)
at
java.awt.EventQueueDispatchThread.run(EventDispatchThread.java:122)

20 Arduino Mega 2560 or Mega ADK on /dev/tty.usbmodem1411

# What is Physical Computing?

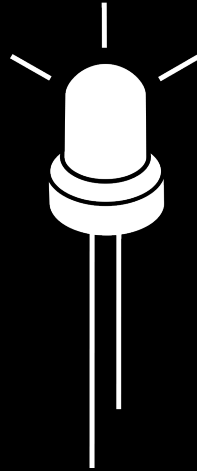
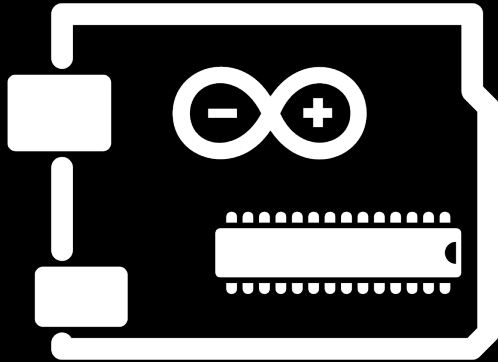
Pseudocode – Blink LED every 3 seconds



Turn on LED  
Delay 1 second  
Turn off LED  
Delay 3 seconds  
Repeat

# What is Physical Computing?

Code – Blink LED every 3 seconds



```
void loop() {  
    digitalWrite(3, HIGH);  
    delay(1000);  
    digitalWrite(3, LOW);  
    delay(3000);  
}
```

# What is Physical Computing?

Nerd Door Bell – Danne Woo



# What is Physical Computing?

Matt Richardson – The Descriptive Camera



**THE  
DESCRIPTIVE  
CAMERA**



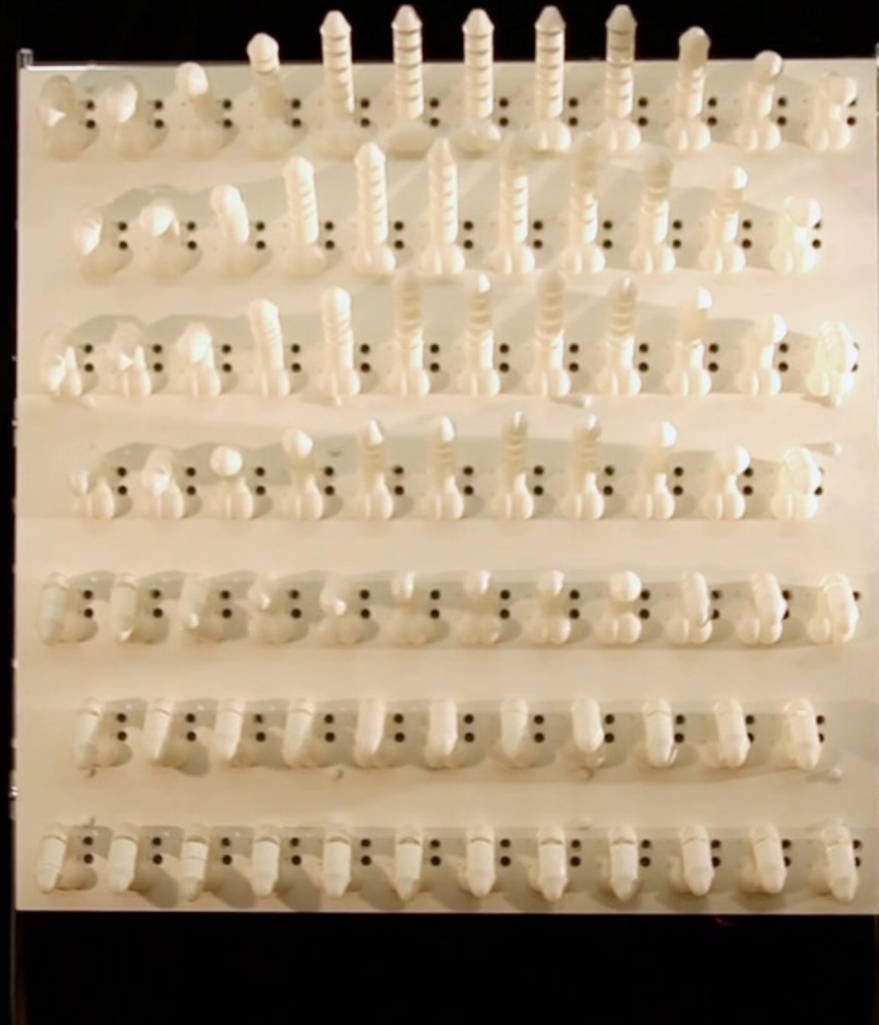
# What is Physical Computing?

Daniel Rozin – Wooden Mirror



# What is Physical Computing?

Peiqi Su – The Penis Wall



Mode 3  
dance to the music

# What is Physical Computing?

Nick Yulman – Bricolo





# What is Physical Computing?

Scott Garner – BeetBox



# What is Physical Computing?

Scott Garner – Still Life



# What is Physical Computing?

Rafael Lozano-Hemmer – Pulse Park





# What is Physical Computing?

Mark Kleback and Others – DBA Arcade and Wonderville Bar



# What is Physical Computing?

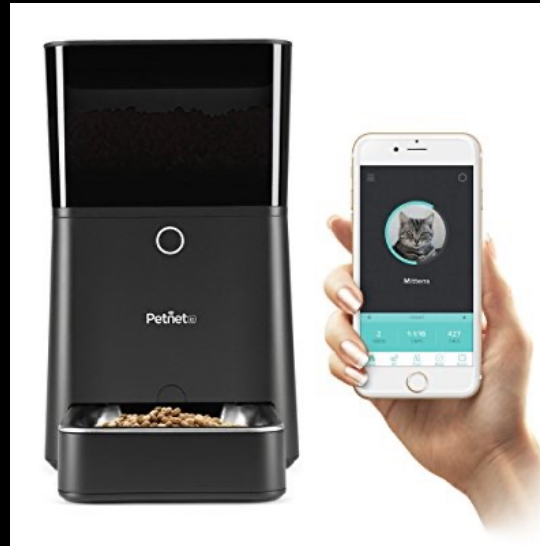
Simone Giertz / Queen of the Sh\*tty Robots

Simone Giertz | YouTube





# What is Physical Computing?



# Fantasy Device

What device is missing from your life?

# Fantasy Device Prototype

Choose one device on this list and design a prototype out of paper, cardboard and anything else you can find laying around your house.

# In Class Assignments

1. Choose a fantasy device that does not exist yet and design a prototype out of paper, cardboard and anything else you can find.
2. Sign up for Slack and send an email using the email address you use for Slack to danne.woo@qc.cuny.edu so I can add you to the class Slack channel.
3. Setup your blog (use either Medium, Wordpress or Tumblr) and add the link to the Slack channel. Check out Danne's ITP Blog, Lisa Maldonado, Andy Poon and Anne Peng's blogs for good examples on how to document your assignments for this class.
4. Post pictures, videos and descriptions of your fantasy device you created in class to your blog.



# Homework

1. Order your Arduino Starter Kit and familiarize yourself with the Arduino kit, the sensors, devices and book that come with it.
2. Other suggested (not required) tools and materials to purchase for this class. **If you go to the QC Makerspace you will have access to all of this for FREE:**  
Digital Multimeter, (~\$10), 22 Gauge Solid Wire, (~\$15), Wire Cutters, (~\$10), Wire Strippers, (~\$7), Tool Box (~\$10) and Soldering Iron (~\$35)
3. Find a physical computing project online that you find interesting and post it to your blog with a description as to why you like it and what makes it successful. Many can be found on the Arduino blog ([blog.arduino.cc](http://blog.arduino.cc)).
4. Sign up for a time to go to the QC Makerspace to get a tour and do safety training before we meet next week. Take pictures and post your experience to the blog.

# **Physical Computing**

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