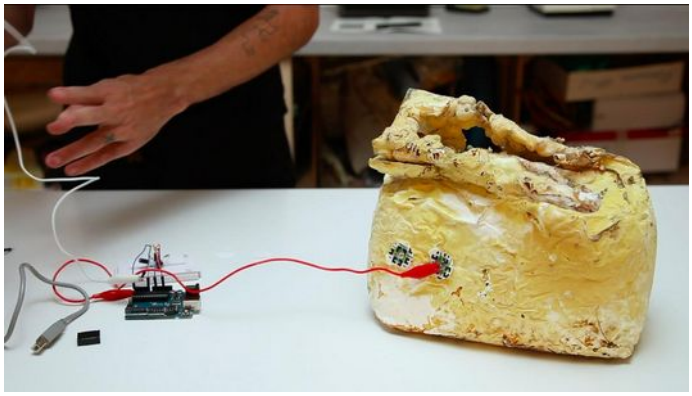
Measurement of Electric Potentials in Plants

This experiment offers insight into the electrochemical activity of living organisms such as plants, fungi, or even humans. By tracking a specimen over time—especially across the day—you may observe fluctuations in its bioelectric activity, reflecting internal and environmental changes. The experiment builds on Martin Howse's *Interspecies Communication Platform* (See for details: Kuni, V., Landwehr, D. *Home Made Bio-Electronic Art*).

Materials Needed



- Arduino microcontroller
- Breadboard
- 100 µF capacitor
- 1 kΩ resistors (×3)
- Jumper wires
- USB cable
- Electrode patches
- AD620 instrumentation amplifier chip

Experiment Setup

1. Preparing the Amplifier Circuit

- Place the **AD620 amplifier chip** on the breadboard so that its legs bridge the central gap.
- Insert the **100 µF capacitor** between **pin 4** (GND) and **pin 7** (VCC) to stabilize the power supply from the Arduino.
- Place a **1 kΩ resistor** between **pin 1** and **pin 8** to set the gain (amplification factor) to approximately 50.
- Connect **pin 7** to the **5V power** of the Arduino and **pin 4** to **GND**.

2. Establishing the Reference and Inputs

- Connect **pin 5** (reference) to the organism being measured (e.g., plant or mycelium). This sets the amplifier's reference ground.
- Add the two remaining **1 kΩ resistors** to **pin 5**:
    - One connects to **pin 7** (power),
    - The other to **pin 4** (ground), forming a voltage divider that stabilizes the reference voltage.

3. Signal Input & Output

- Connect **pin 6** (output of the amplifier) to **analog input A0** of the Arduino.
- Attach **electrode patches** to the organism and connect them to **pins 2 and 3** of the AD620 chip (the differential input channels).

4. Arduino Connection and Software Setup

- Use the **USB cable** to connect the Arduino to your computer.
- Open the **Arduino IDE**, select your **board** and **port** under the "Tools" menu.
- Load the analog signal reading sketch:
    - Navigate to **File > Examples > Basics > AnalogReadSerial**.
    - Click the **Upload** button (right-pointing arrow) to upload the sketch to the board.

Viewing the Data

- Once the sketch is uploaded:
    - Go to **Tools > Serial Plotter**.
    - Set the baud rate to **9600**.
    - Observe the **variation in electric potentials** from your organism, plotted in real time.

Working with Data

Once you've begun collecting electric potential data from your organism, you can start interpreting and visualizing it using visual programming environments.

A quick and accessible entry point is to use platforms like Pure Data, Max/MSP, or TouchDesigner. These frameworks allow you to process and map analog signals into visual, auditory, or interactive outputs—without requiring extensive coding experience.

If you're new to Max/MSP, a concise tutorial on sensing and working with physical parameters is available here: (Max and I, Max and Me – Sensing Physical Parameters)

These tools can help you explore the expressive potential of bioelectric signals—whether for scientific insight or artistic experimentation.