



waag society

institute for art, science and technology

Hack your Food

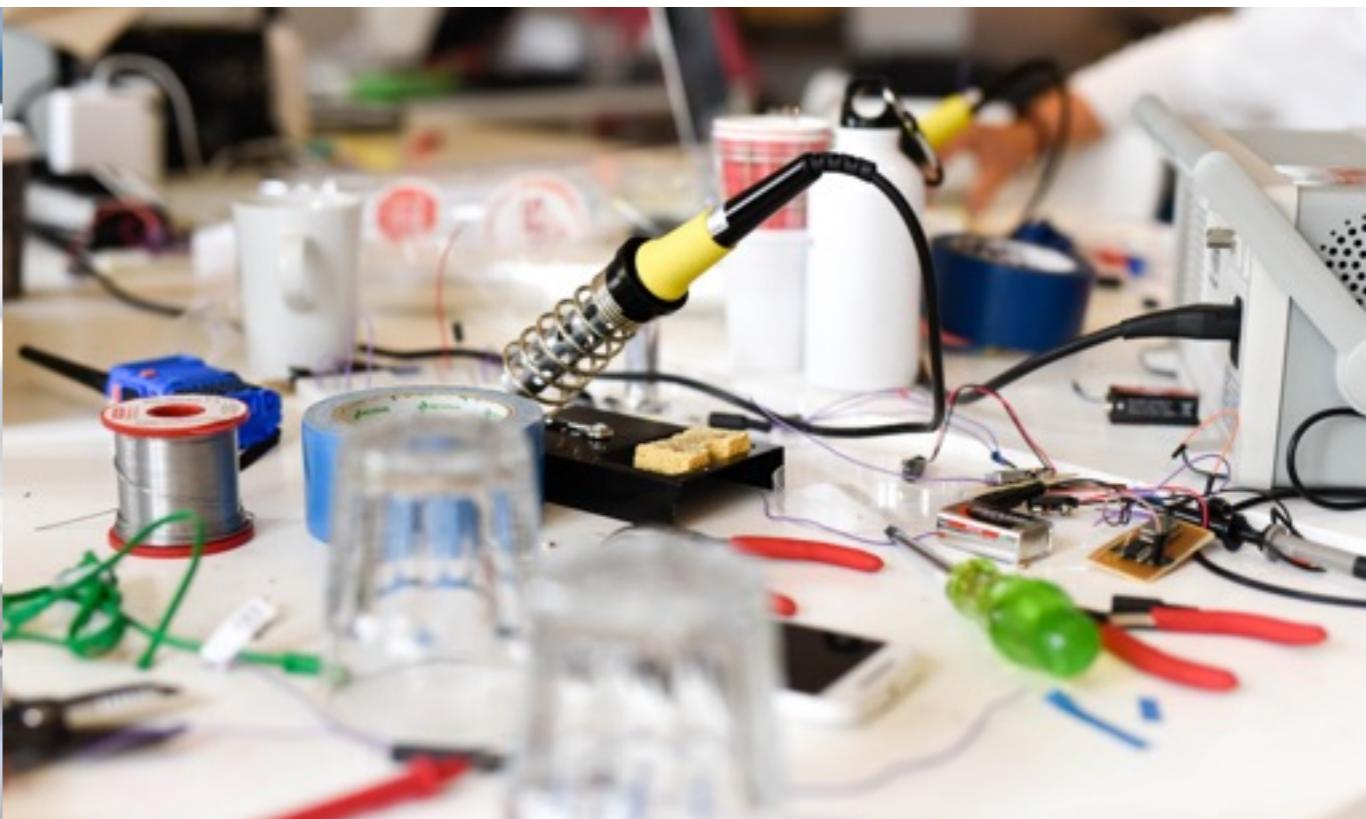
FOOD2030 Conference

Brussels 12-10-2016

Pieter van Boheemen & Iris de Vries



What's Waag?



Hackers & Designers Summer Camp / Teacher Maker Camp



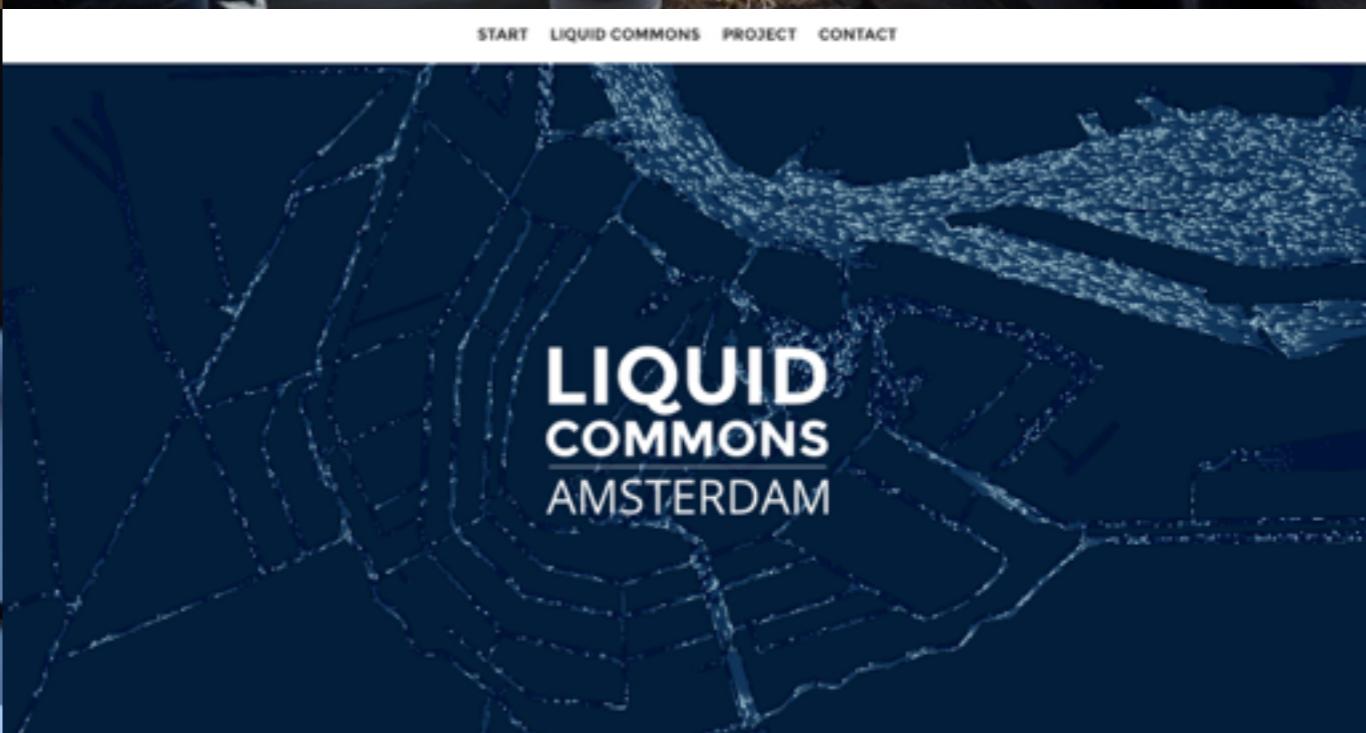
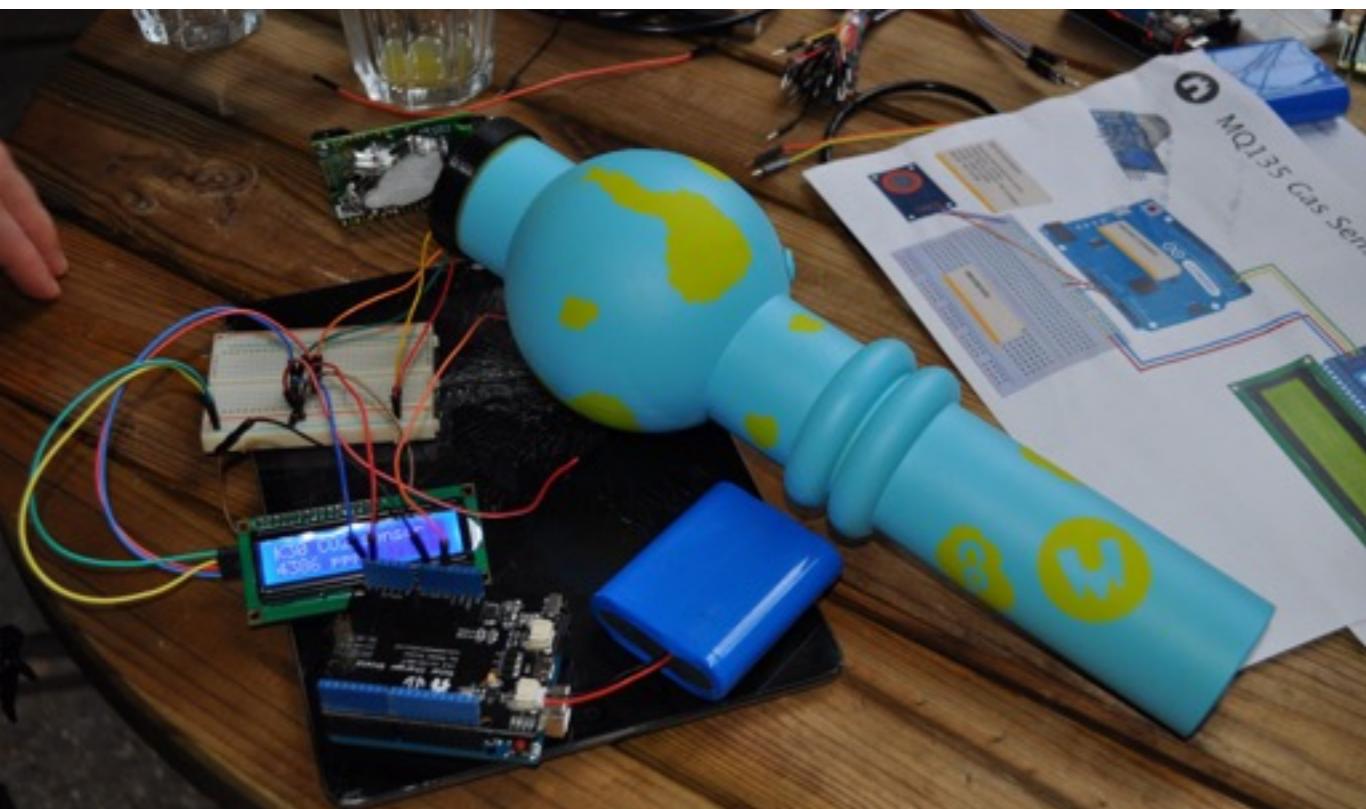
We're in Amsterdam



"Catch your pets in the wild"



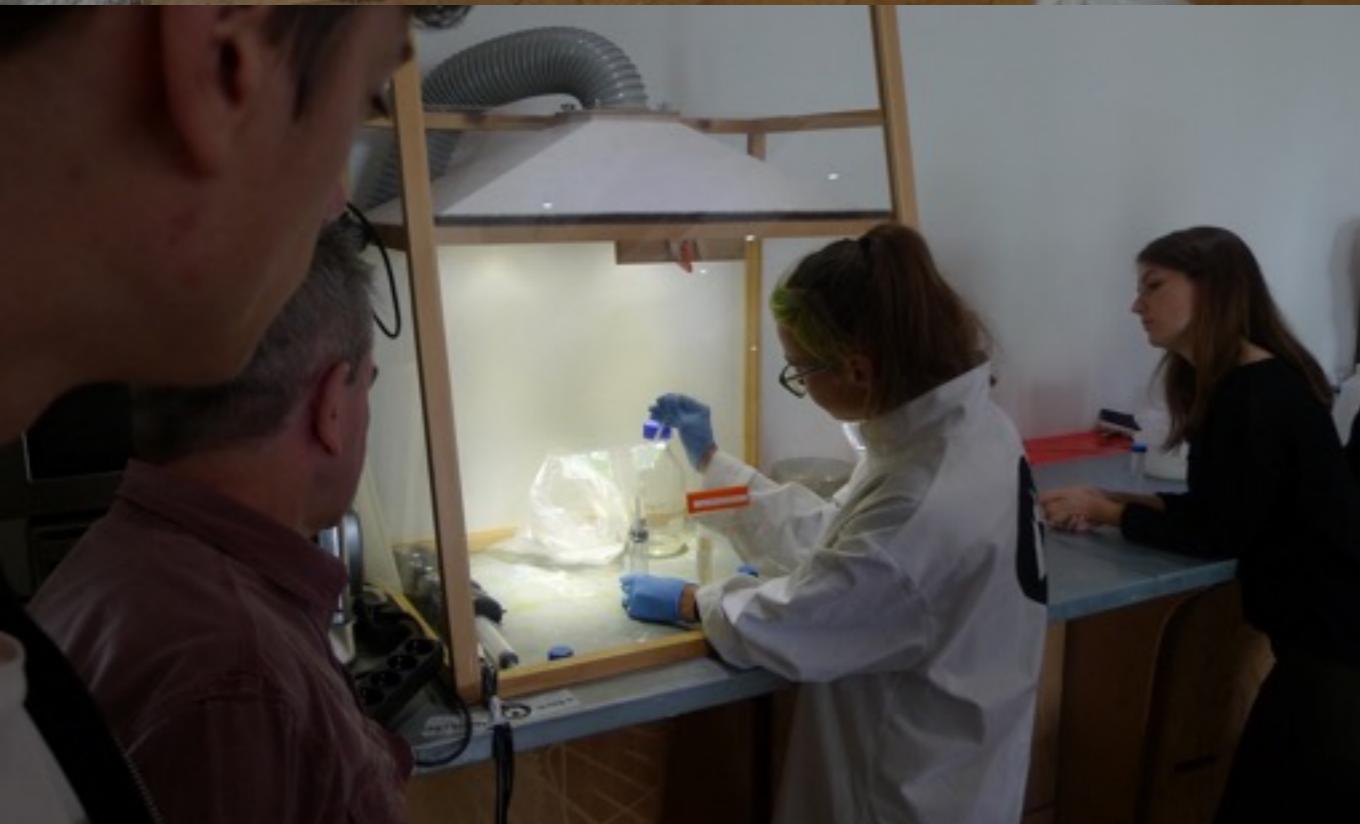
We're Smart Citizens



MakingSense - CAPs - EU H2020



We're DIY (to the extreme)



DIY Human Enhancement Clinic



We're open



Petshop @ Dutch Design Week



We take responsibility



DIY Antibiotics @ Eureka Festival



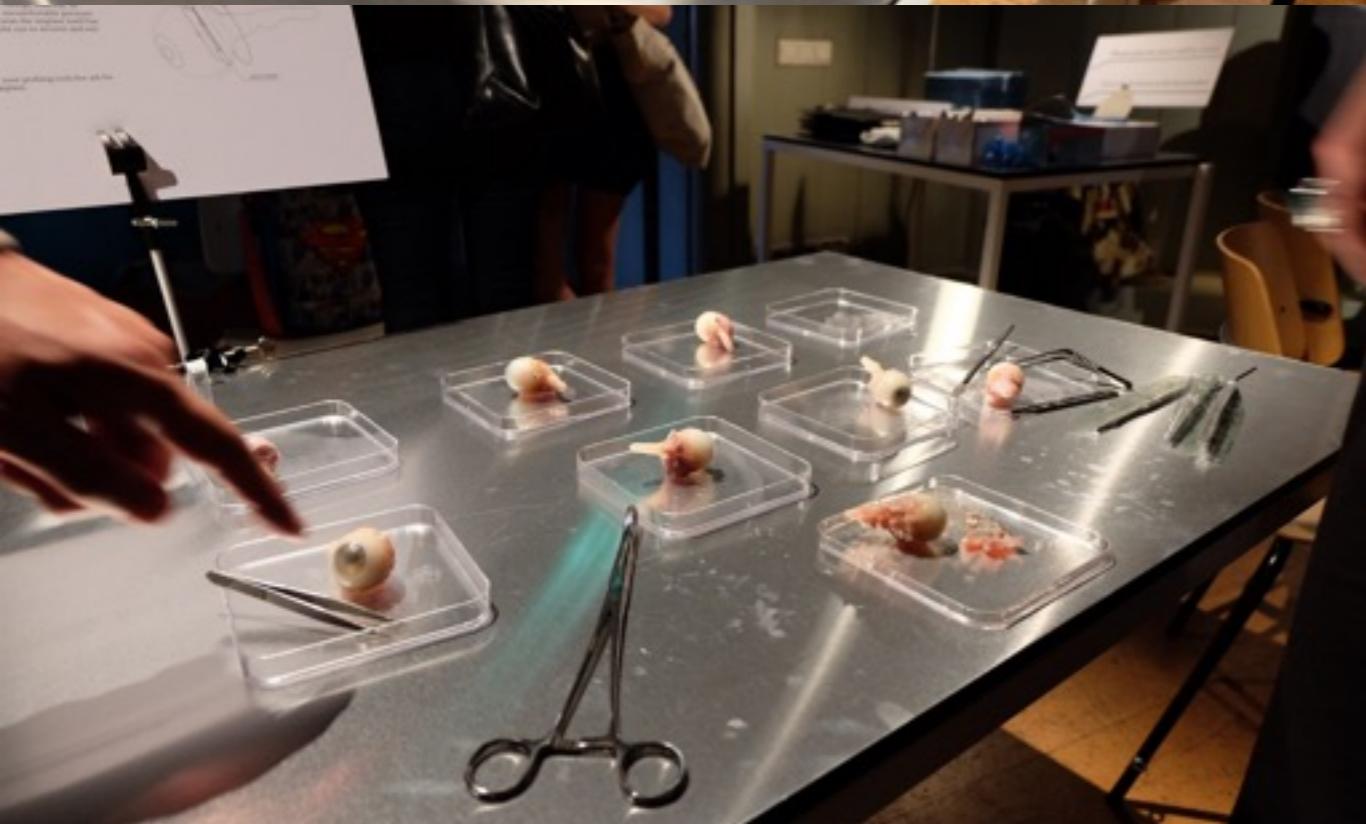
We create civic technology



BioHack Academy & Urban AirQ & Zelfie



We're artists



"Dissecting Medical Futures" – Agi Haines



We're technology



Hack the Brain 2016 Hackathon



research

Creative Learning
Creative Care
Future Heritage
Future Internet
Open Design
Open Wetlab

academy

BioHack Academy
Code Power
Fab Academy
FabSchool
Minors
Teacher maker Camp

waag open

Bootcamps
Fablab Amsterdam
Festivals
Hacking Heritage
Open Wetlab
Smart Citizens Lab





We're European

FEAT



KNOWLEDGE
INCUBATION IN INNOVATION
AND CREATION FOR SCIENCE



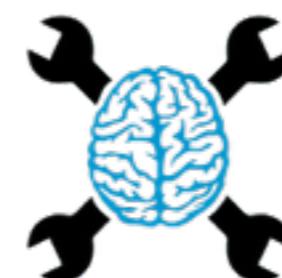
DOING IT TOGETHER
SCIENCE



BigPicnic

Making
Sense

APPS
FOR
EUROPE





House rules



Why you need to Hack your Food





OWN YOUR OWN

**IF YOU CAN'T
OPEN IT,
YOU DON'T OWN IT**

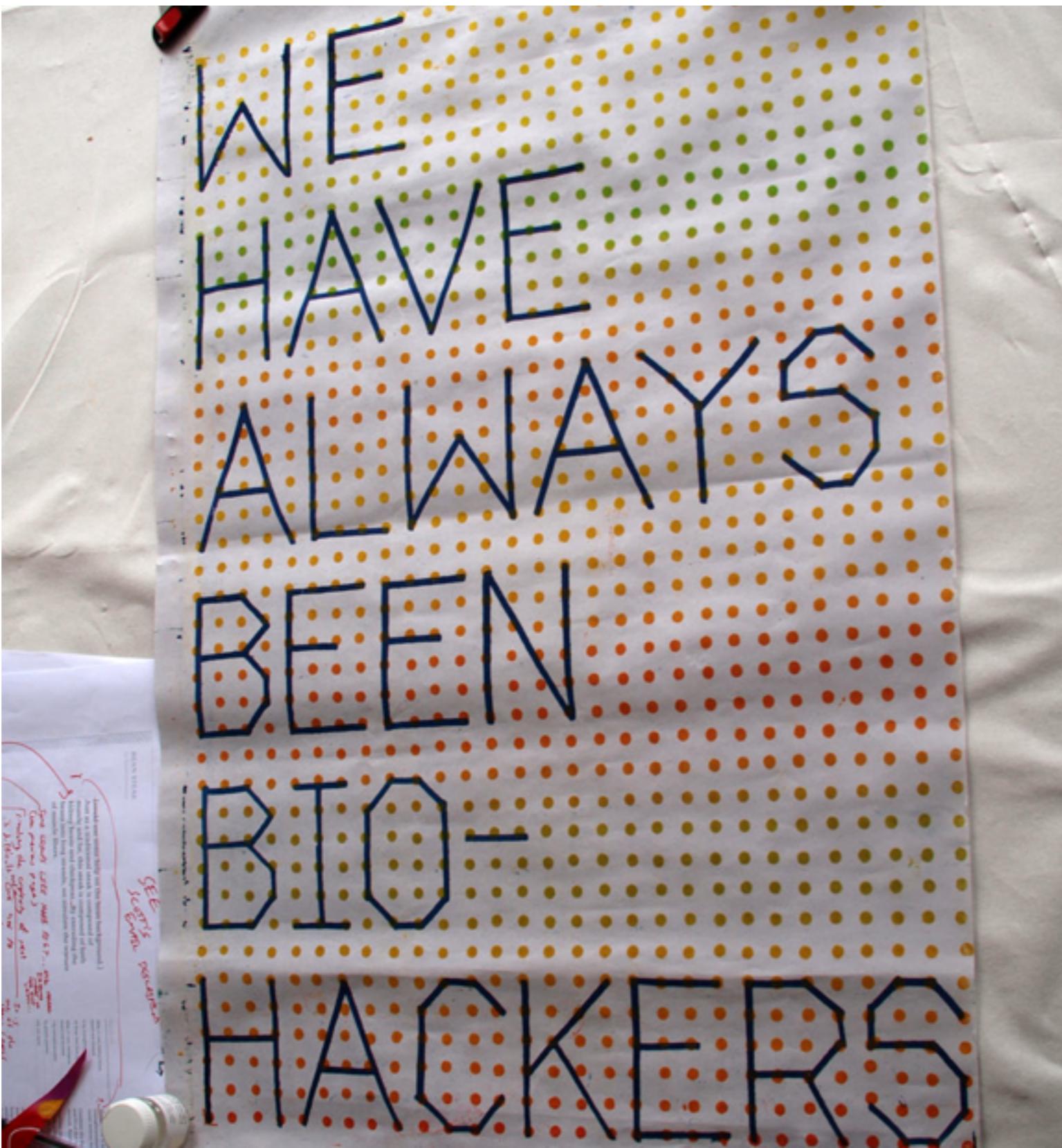


Critical Art Ensemble – Free Range Grain 2003





We have always been biohackers





Smog Tasting





Soylent Banquet





Food Computing





Food Computing





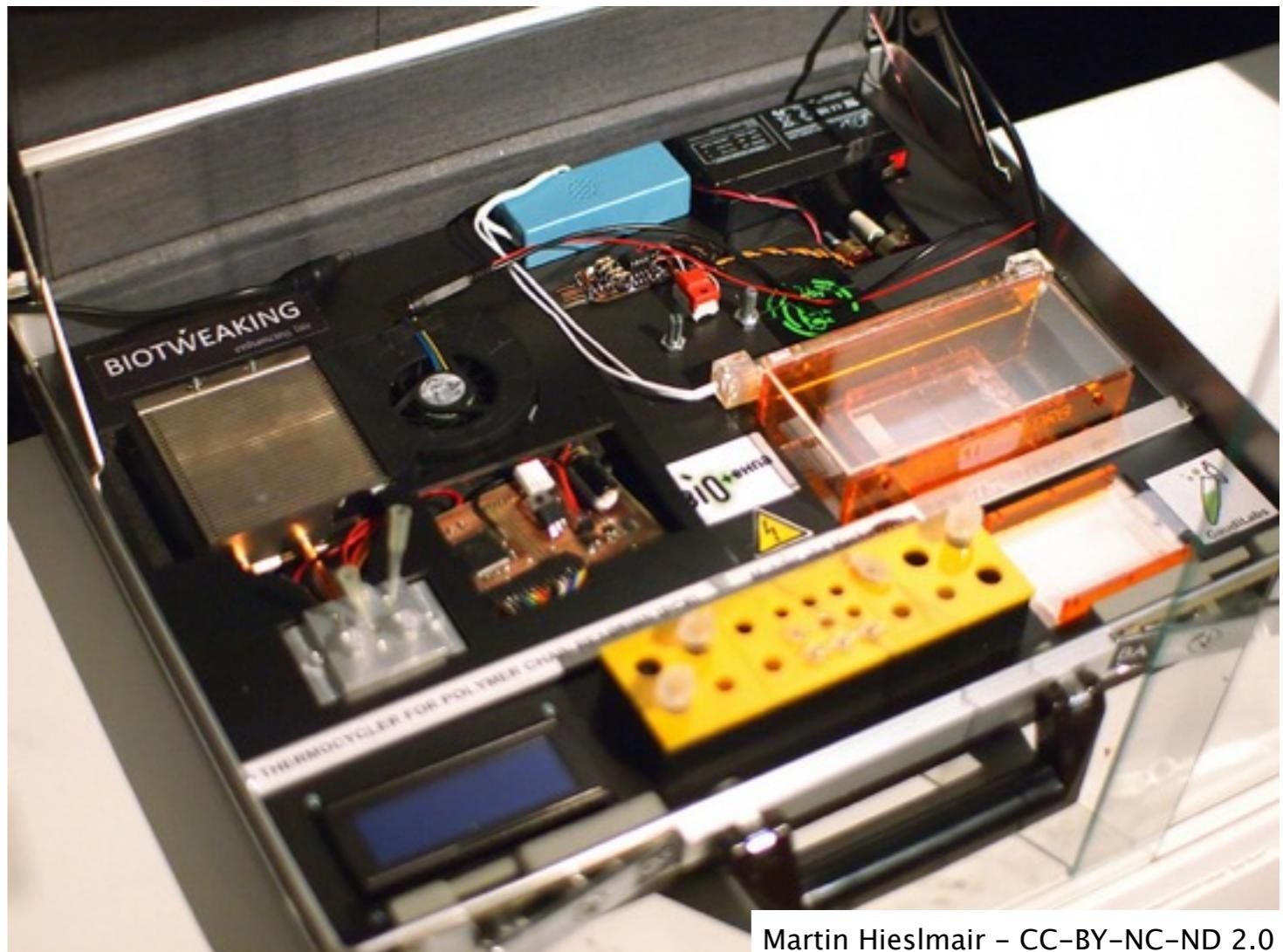
Food Computing @ Home





What it means to be a hacker

- Create & Share
- Freedom of inquiry
- Hostility to secrecy
- Sharing as ideology and strategy
- The right to fork
- Emphasis on rationality
- Distaste of authority
- Playful cleverness





Open Wetlab





More than just a space

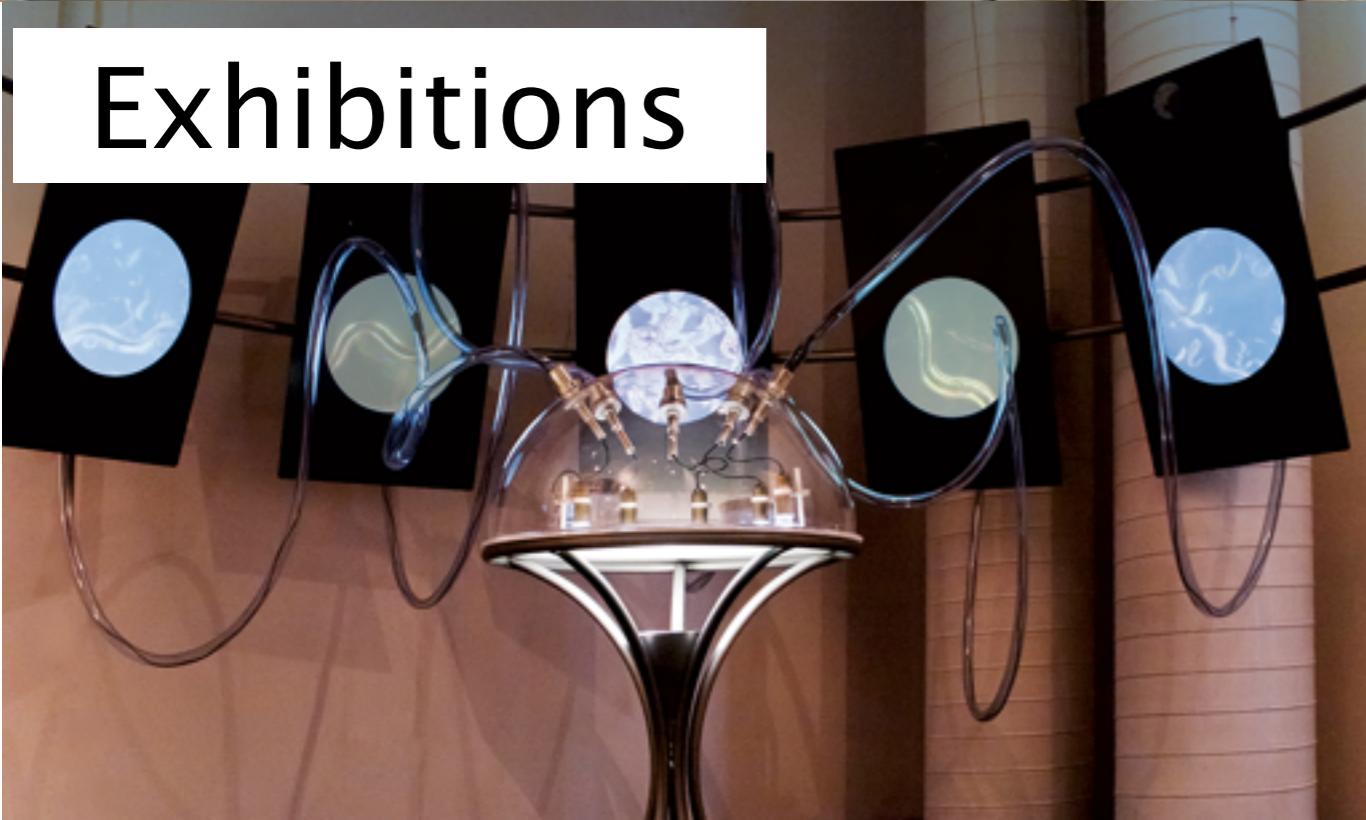
Laboratory



Workshops



Exhibitions



Performance



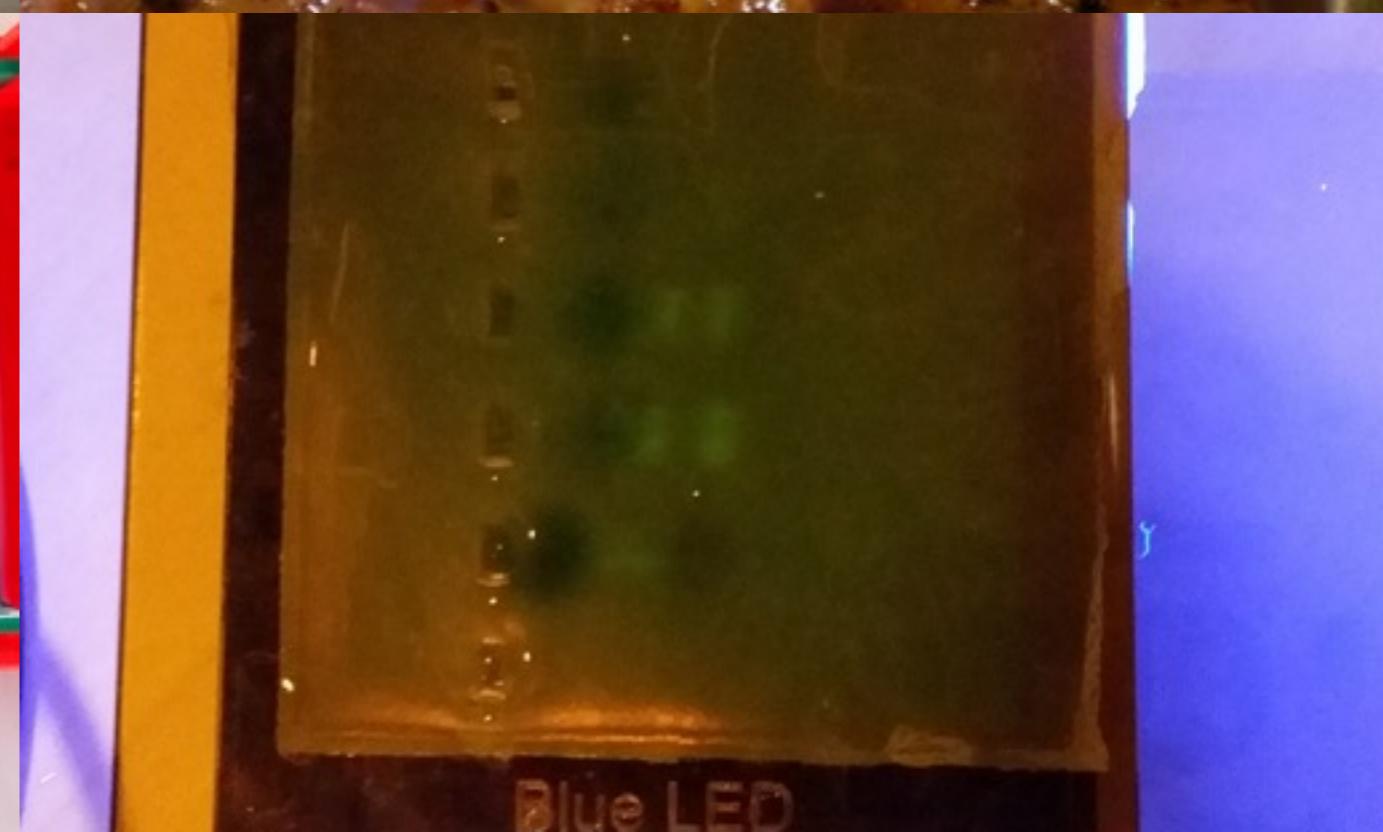


The Other Dinner





Open Evenings: Mystery Meat





DIY fermentation



**Morality will not change
the food industry**

Perhaps technology will?

Spirulina Maxima

Today's hero



Cyanobacteria (algae)





Green algae





Curly phenotype





Available in stores



waag society
institute for art, science & technology

Tropical Spirulina-Smoothie

500 ml yogurt

2 teaspoons spirulina powder

250 ml orange juice

250 grams mixed berries

Blend until smooth and enjoy!



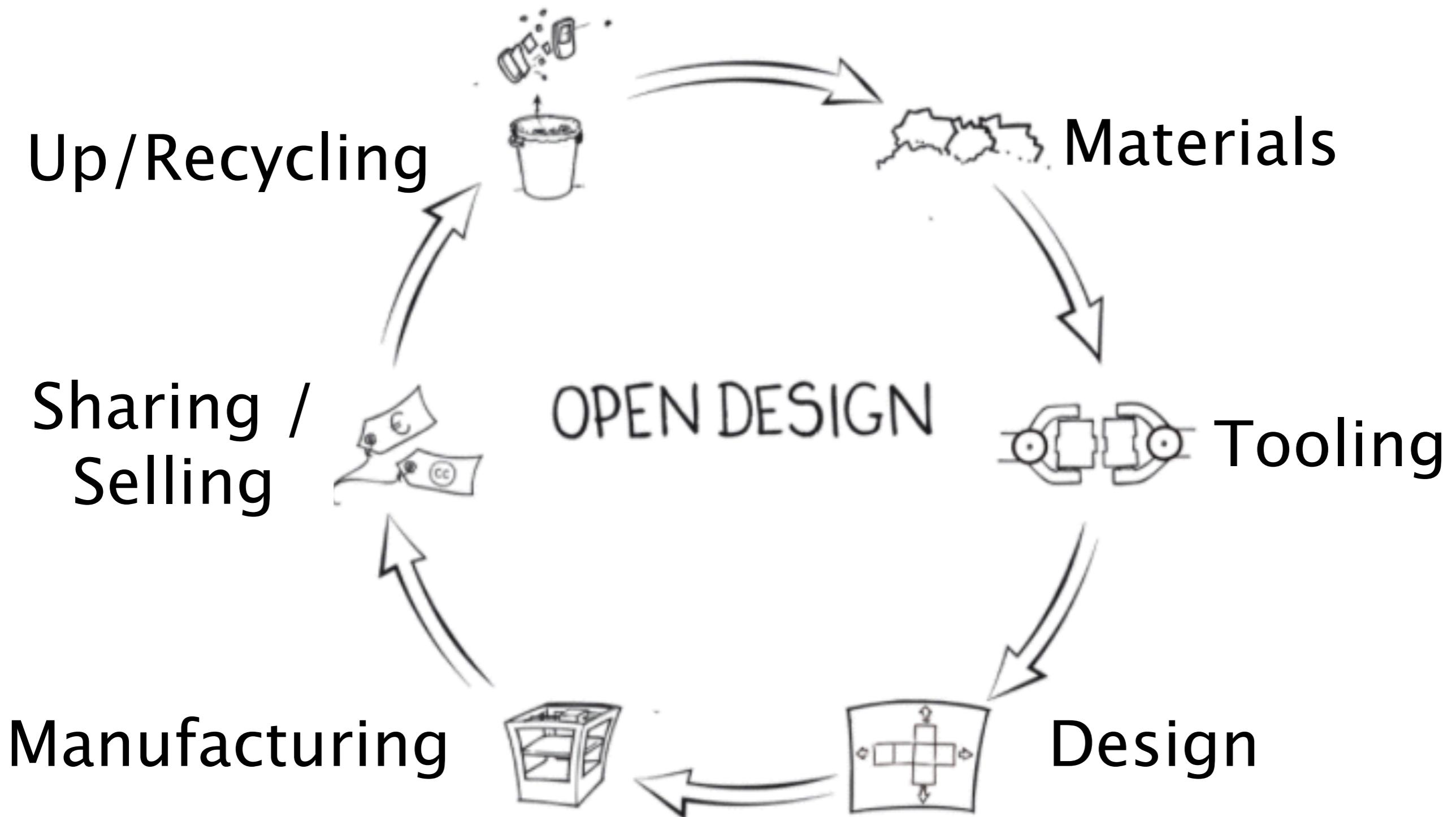
Best mixed with something sweet



What we are going to do



Open Design Process





Plan

- Make photobioreactors
 - Foldable cardboard
 - Assemble electronics
 - Prepare growth conditions
 - Analyse medium and sample
 - Make tasty smoothies
- Document your hacks!
- Discussion

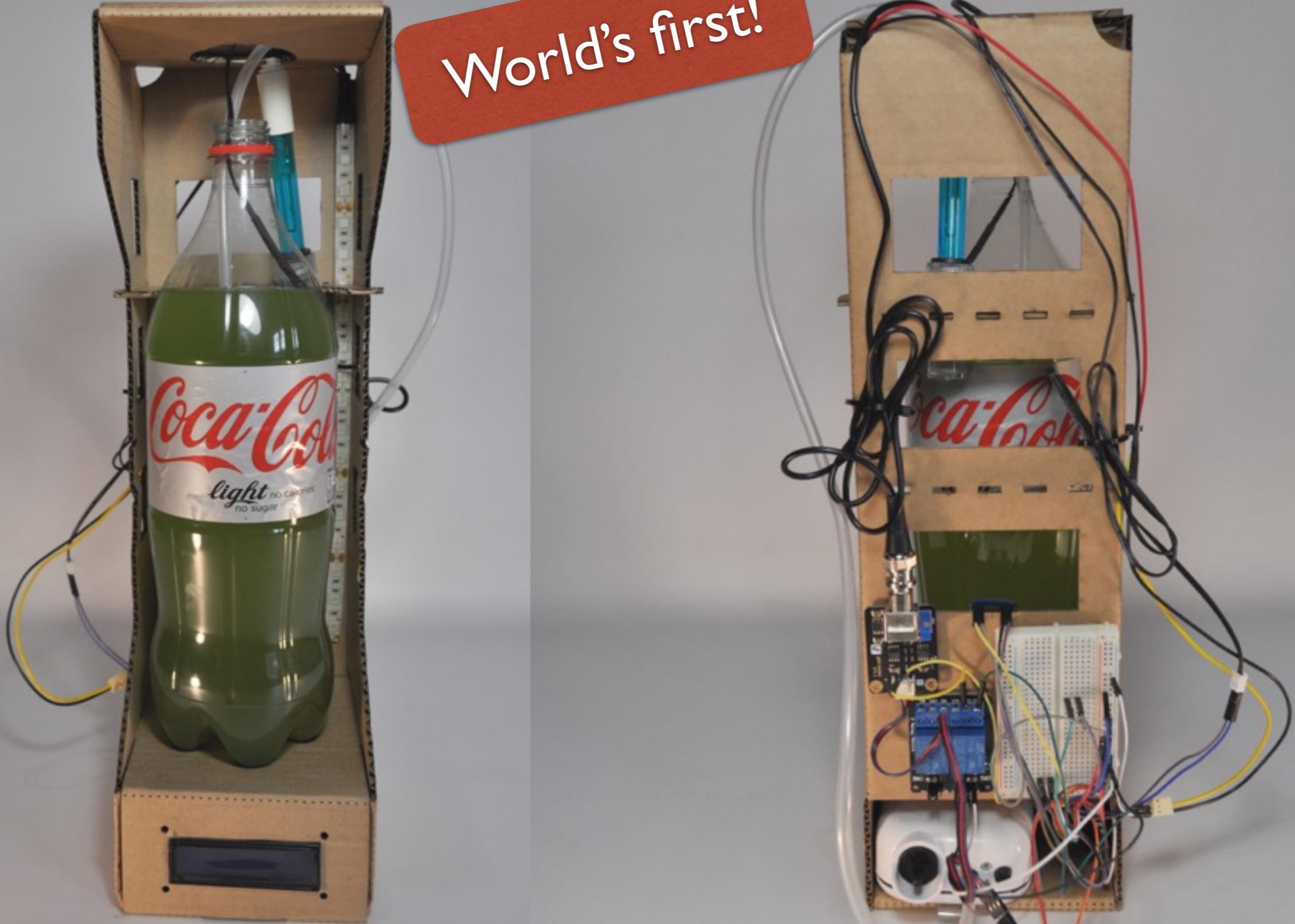


Photobioreactor



Foldable photobioreactor

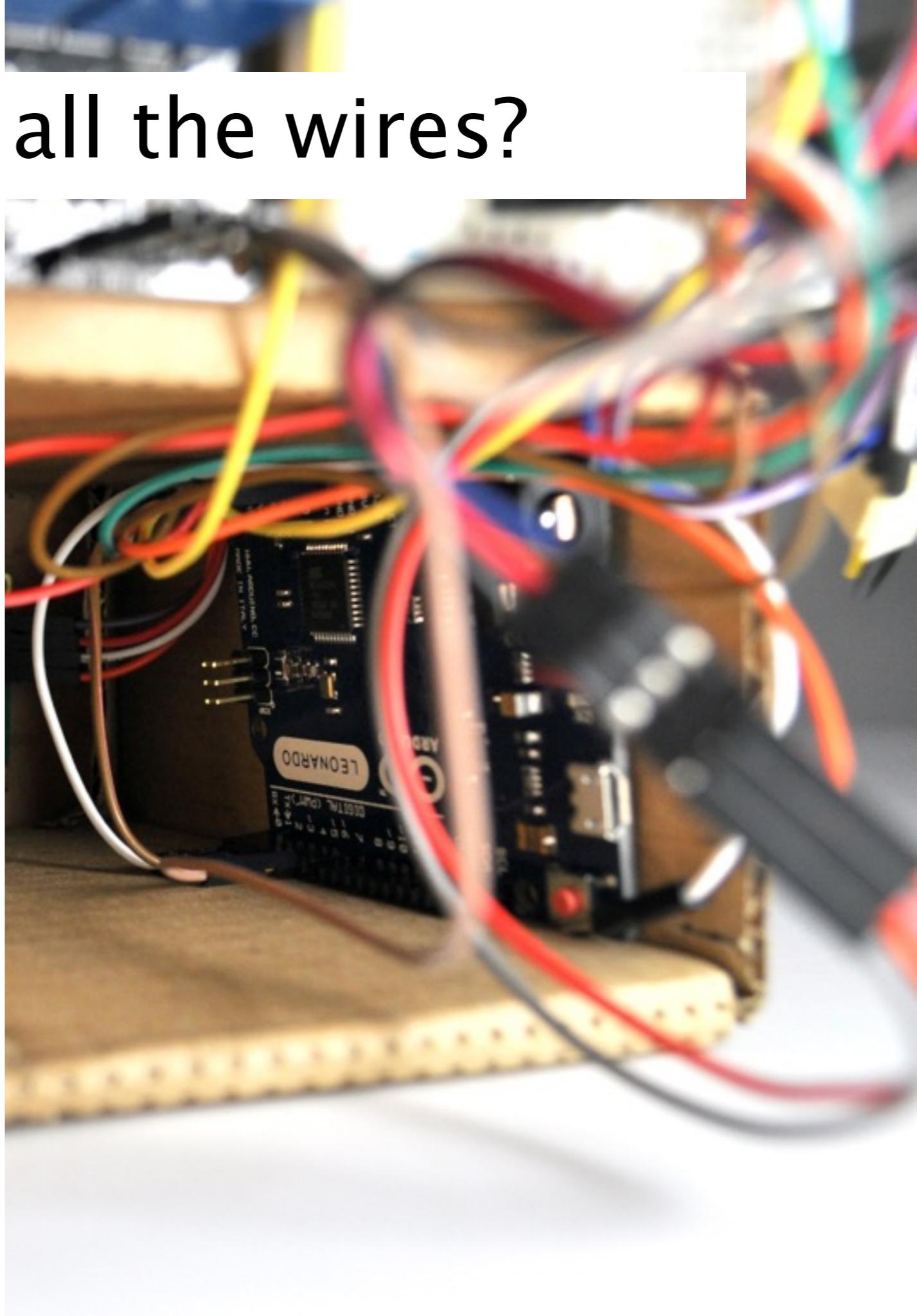
World's first!





What's up with all the wires?

- Digital control
 - Day / night light cycle
 - Light monitor
 - Temperature monitor
 - pH monitor (bonus)
 - LCD display

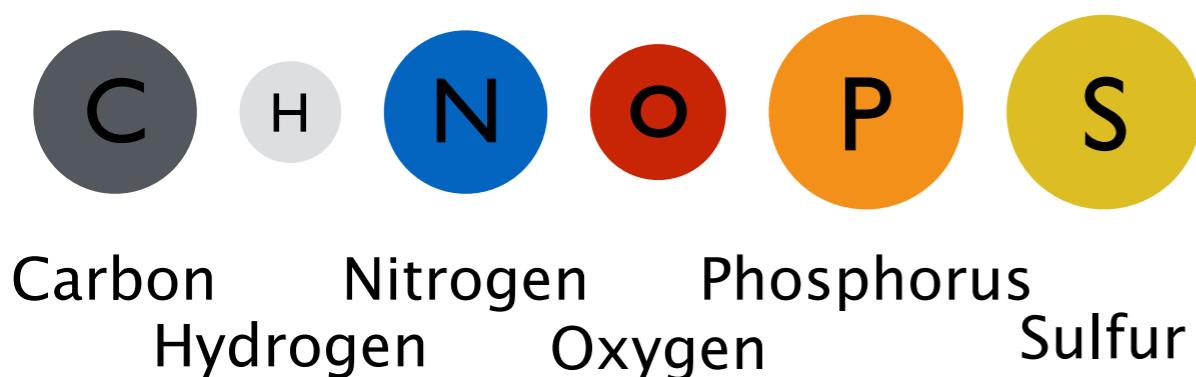


Growth Conditions

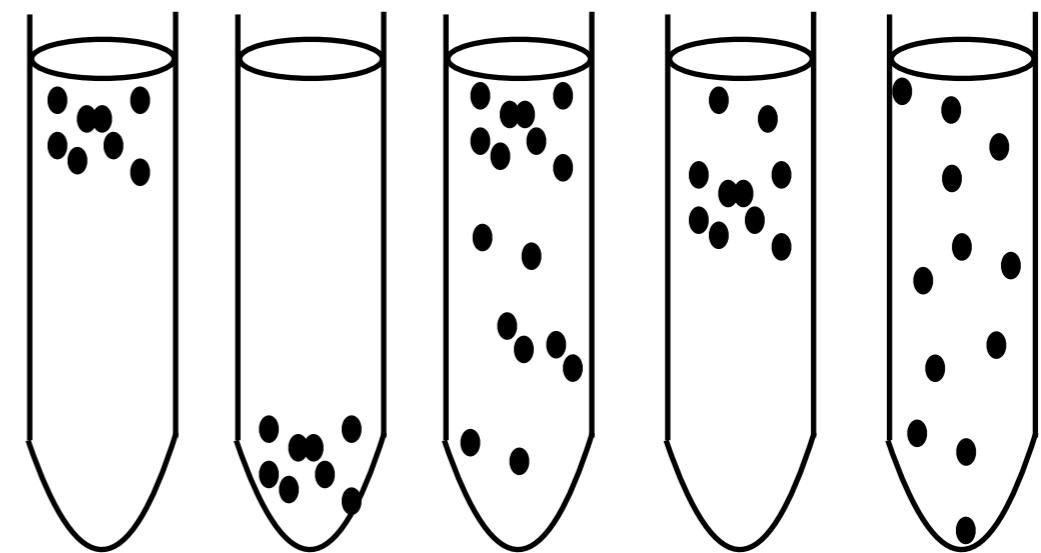


Growth conditions

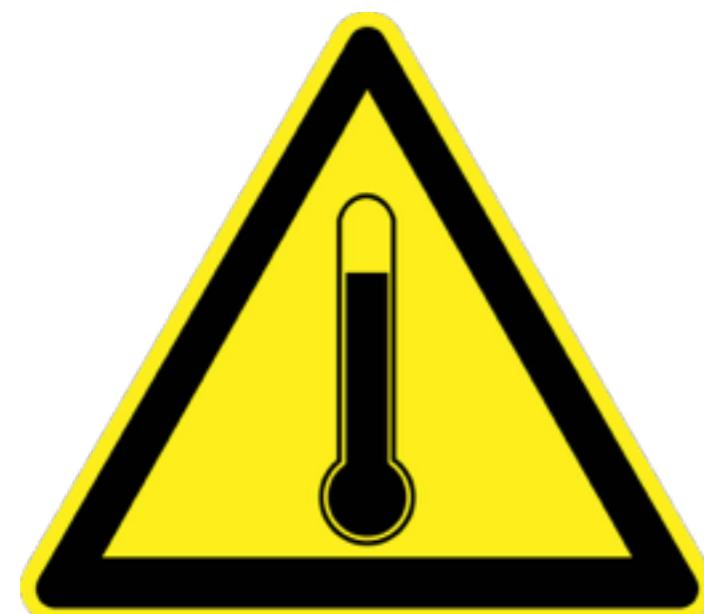
Nutrients



Atmosphere

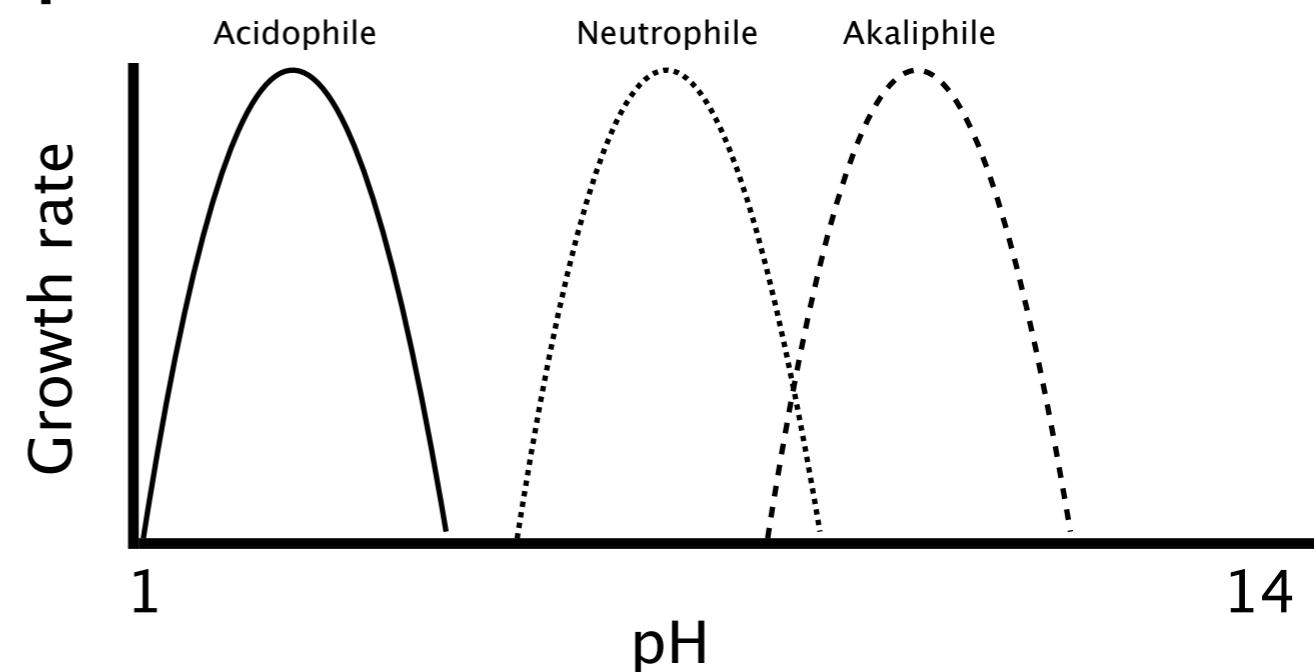


Temperature



Pixabay - CC0

pH

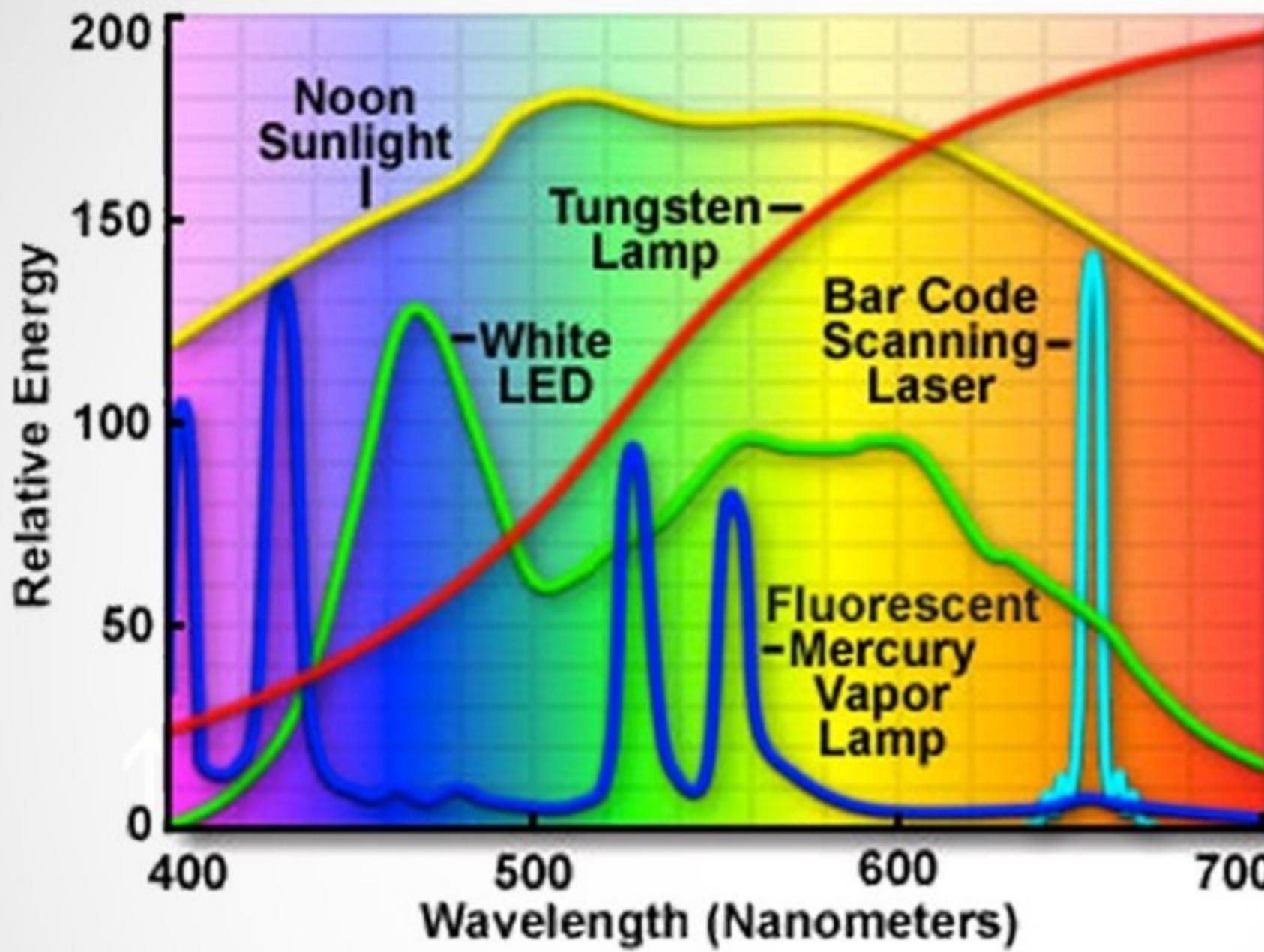


14

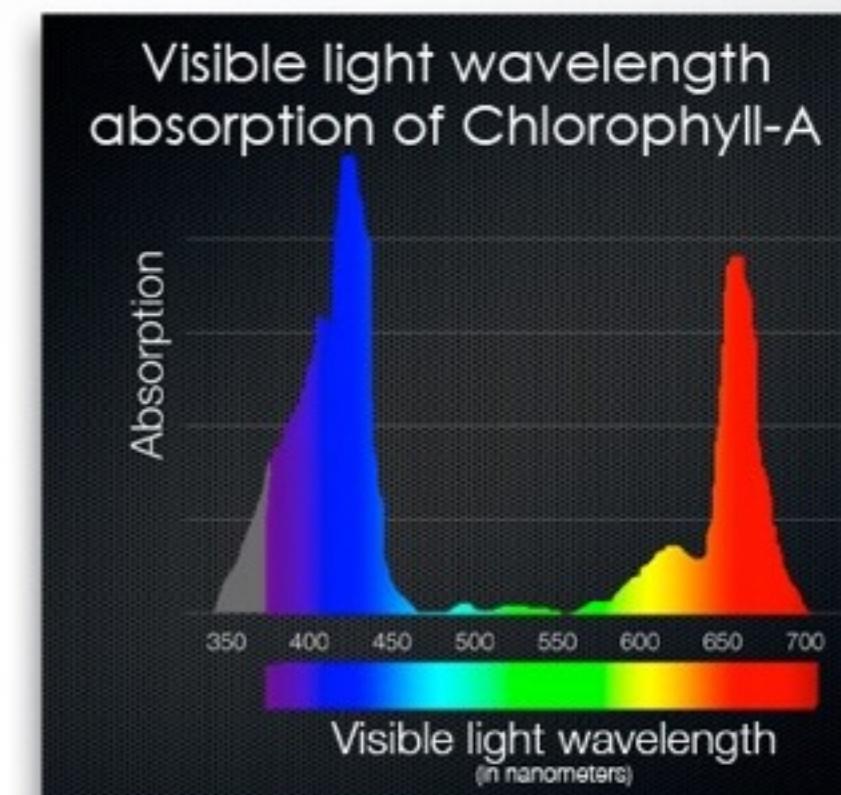


Light source

VISIBLE LIGHT WAVELENGTH COMPARISON OF VARIOUS LIGHT SOURCES AND ANTIOXIDANT PIGMENTS



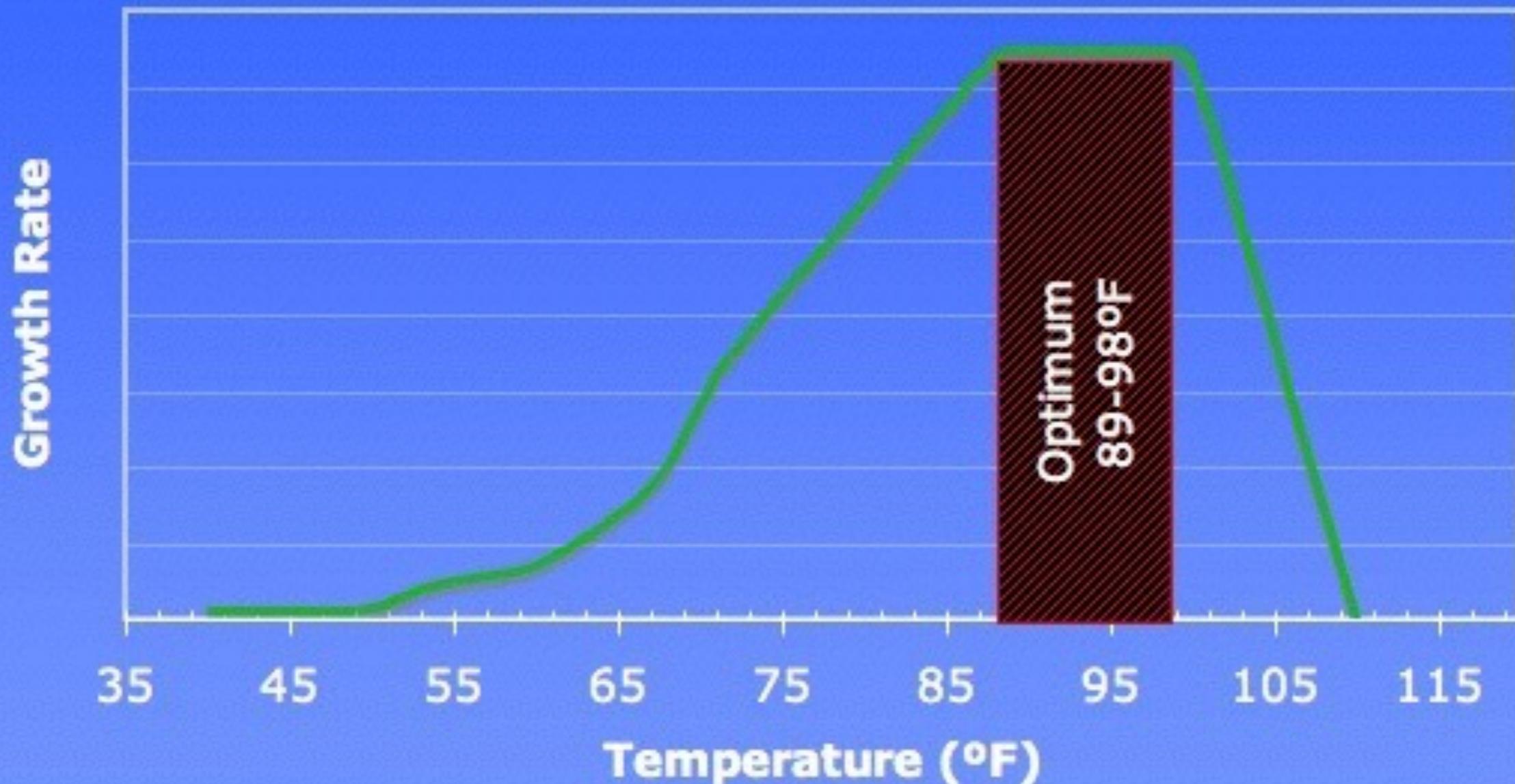
Spectra from Common Sources of Visible Light





Temperature

Spirulina
Growth Rate in function of the Temperature (F°)
SpirulinaAcademia.com





Selective medium

Per liter

NaHCO₃ – 16 g

KNO₃

NH₄PO₄

K₂SO₄

MgSO₄

Trace metals

Set to pH 14





Analyse it



biohack academy
waag society

Open Source BioHack Kit



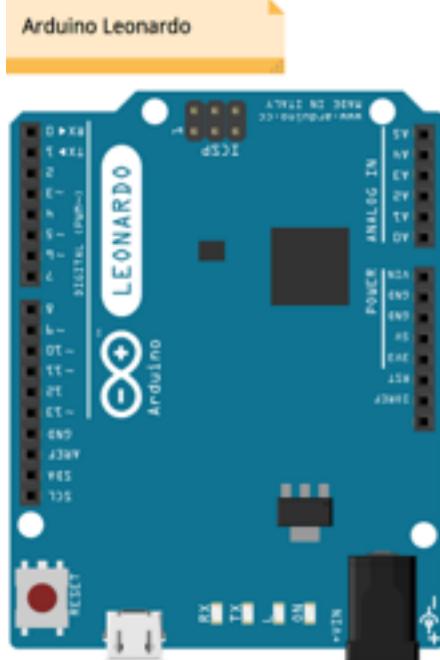
Wiring



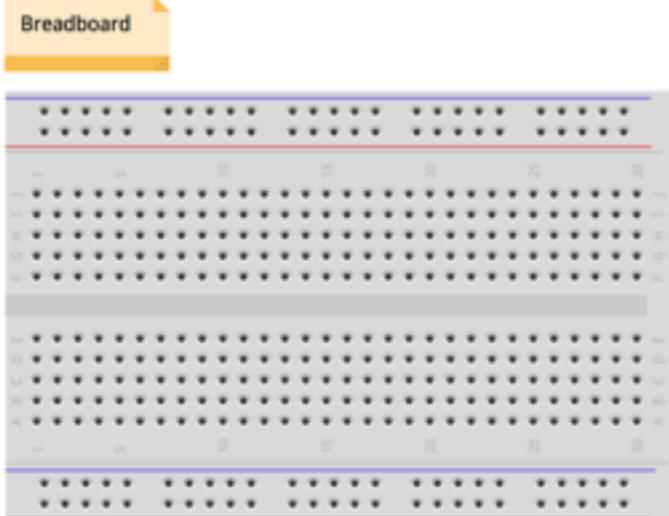
Step 0

Start with collecting all the parts

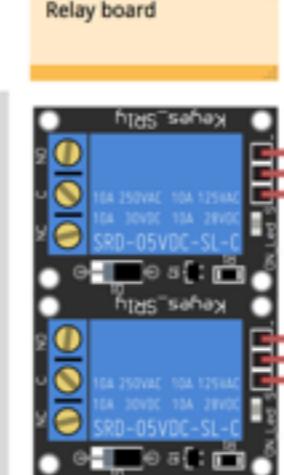
Arduino



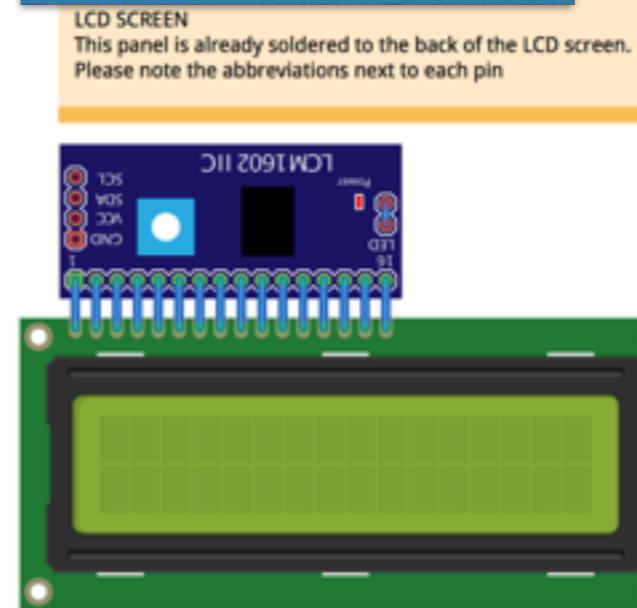
Breadboard



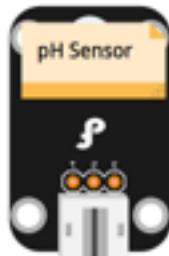
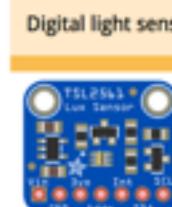
Relay



LCD Screen



Light
sensor



fritzing

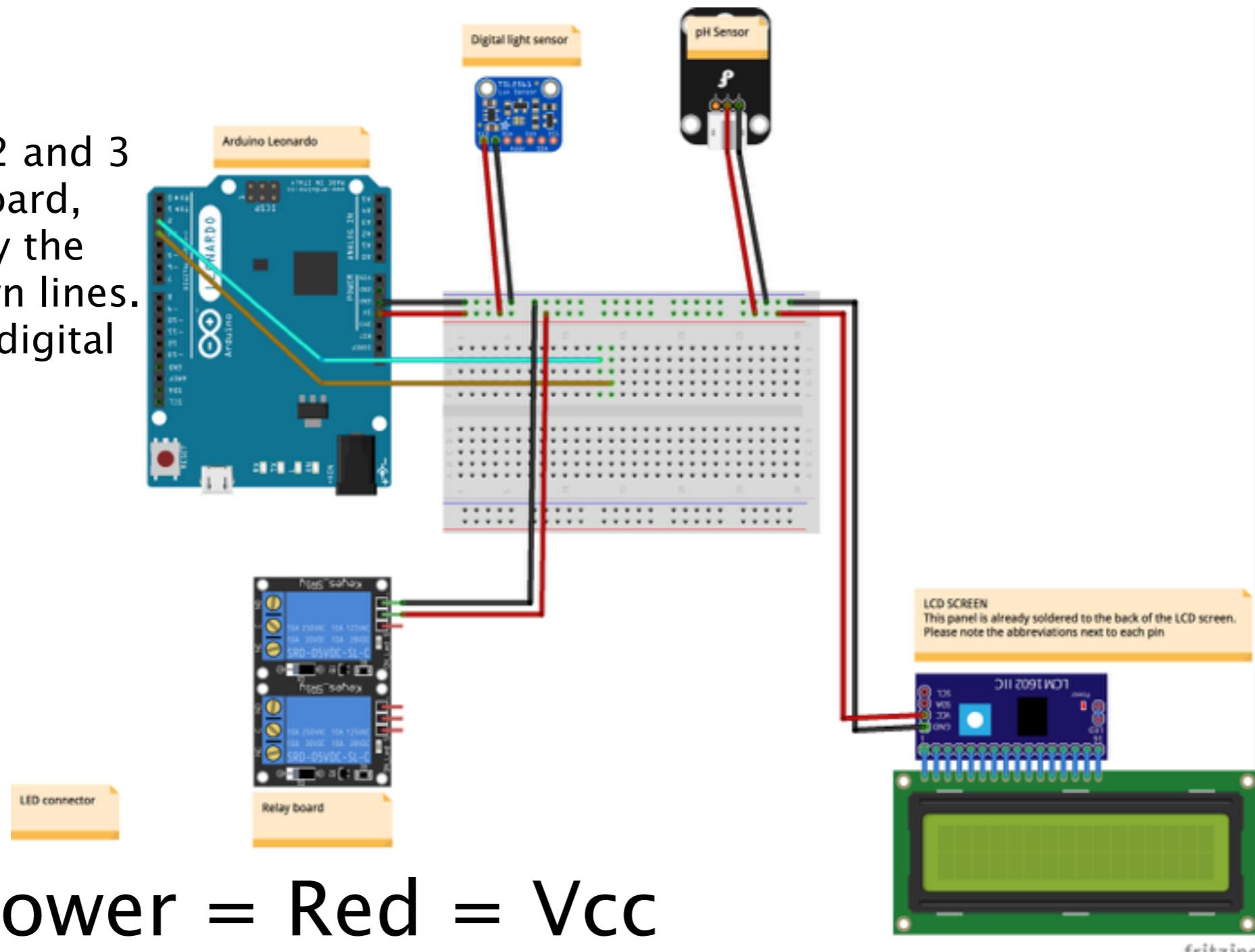
You should also have an LCD strip and a bunch of wires. The pH sensor is a non-essential bonus.



Step 1

Wire up the Power and Ground lines

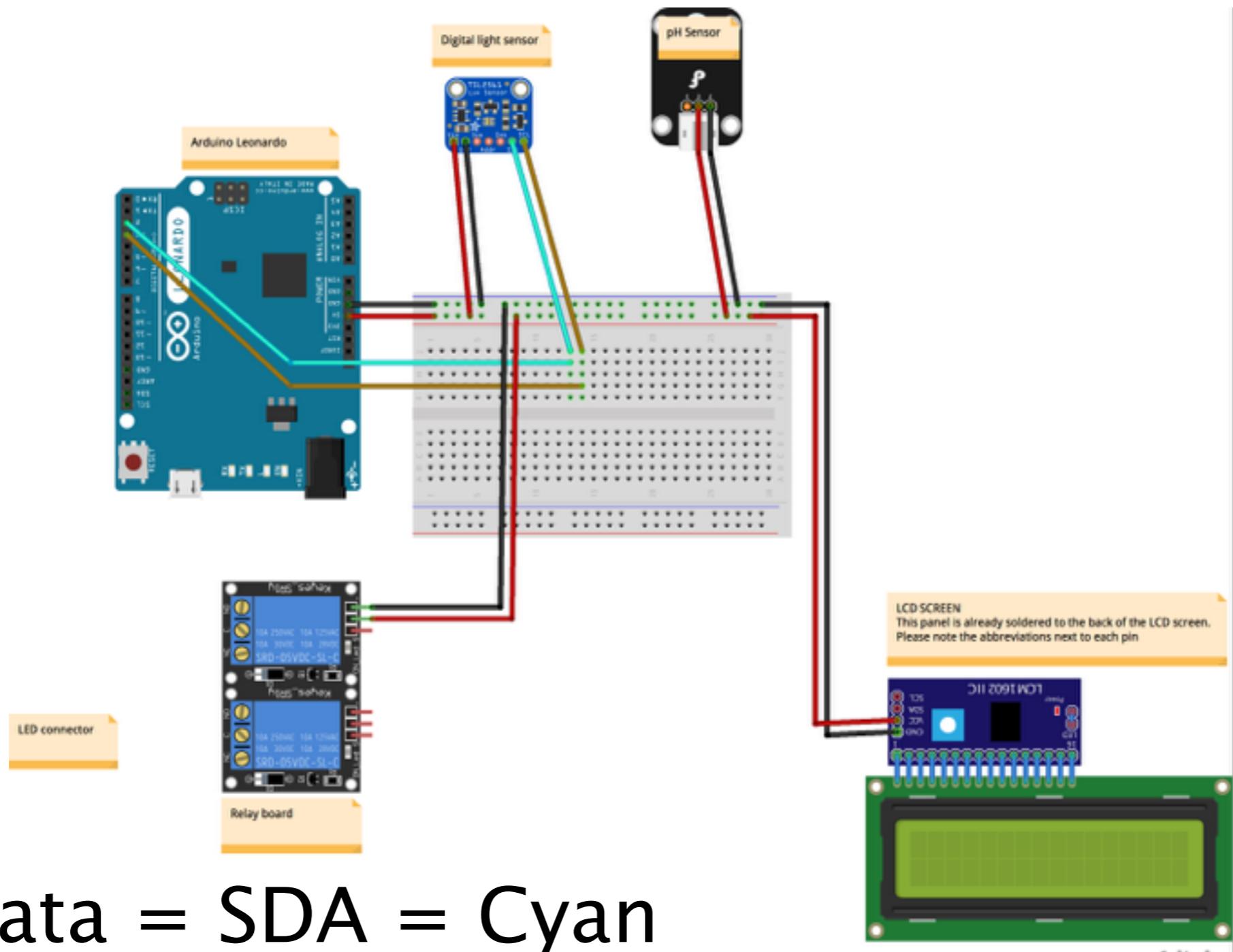
Connect port 2 and 3 to the breadboard, as indicated by the cyan and brown lines. These are the digital “data lines”.





Step 2

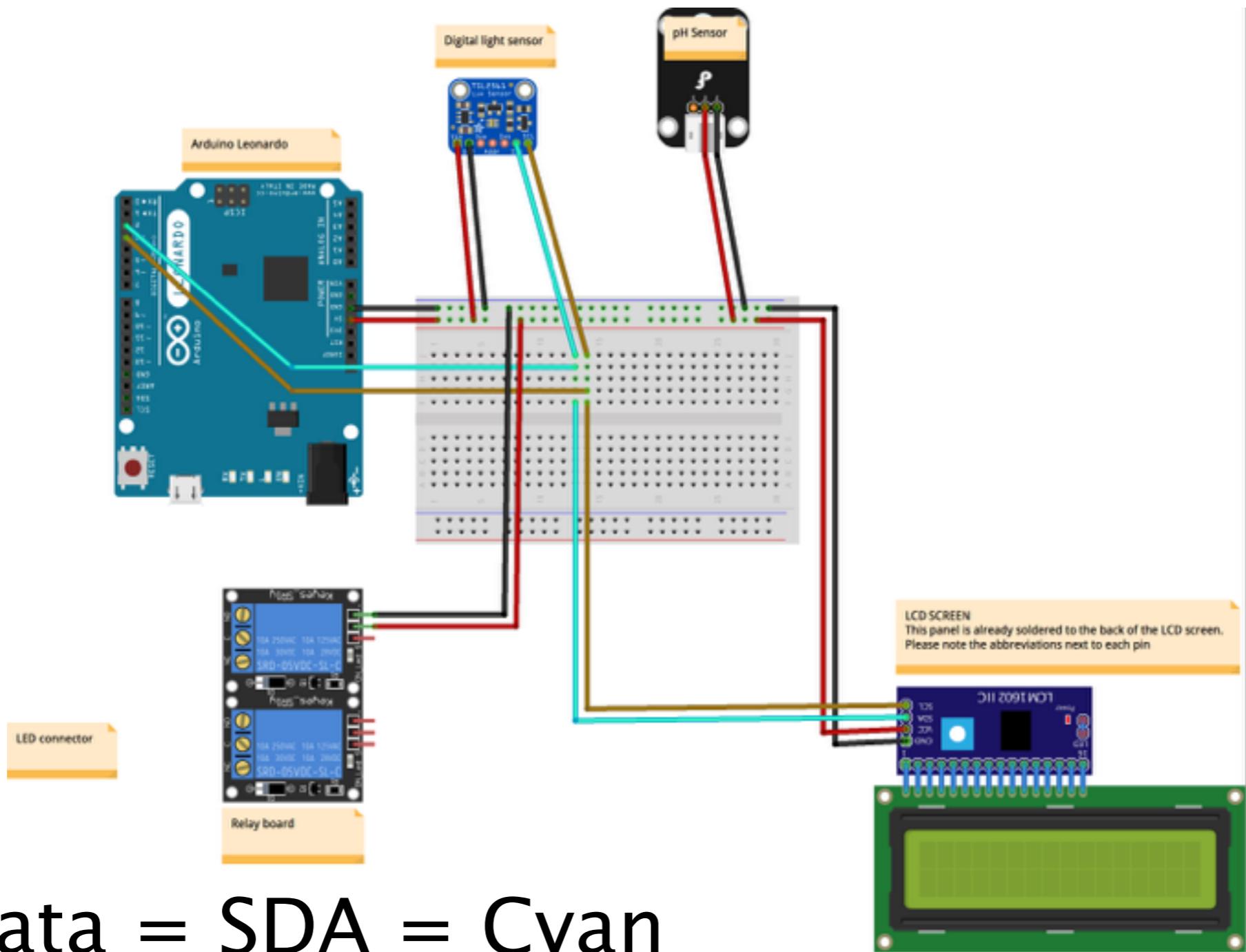
Connect the light sensor to the data lines





Step 3

Connect the LCD to the data lines



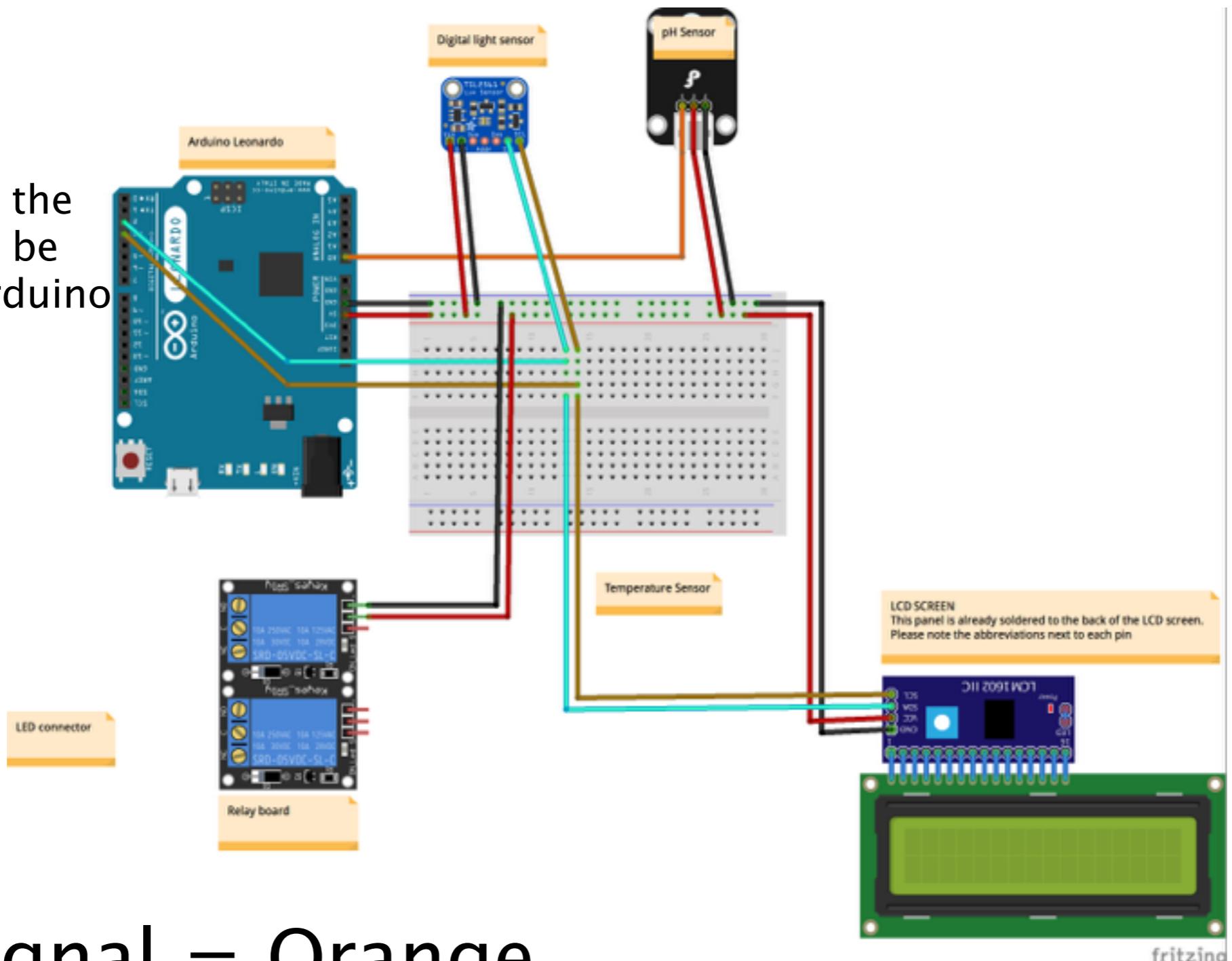
Data = SDA = Cyan
Clock = SCL = Brown



Step 4 (Bonus step)

Connect the pH sensor

The signal from the pH sensor must be connected to Arduino port A0



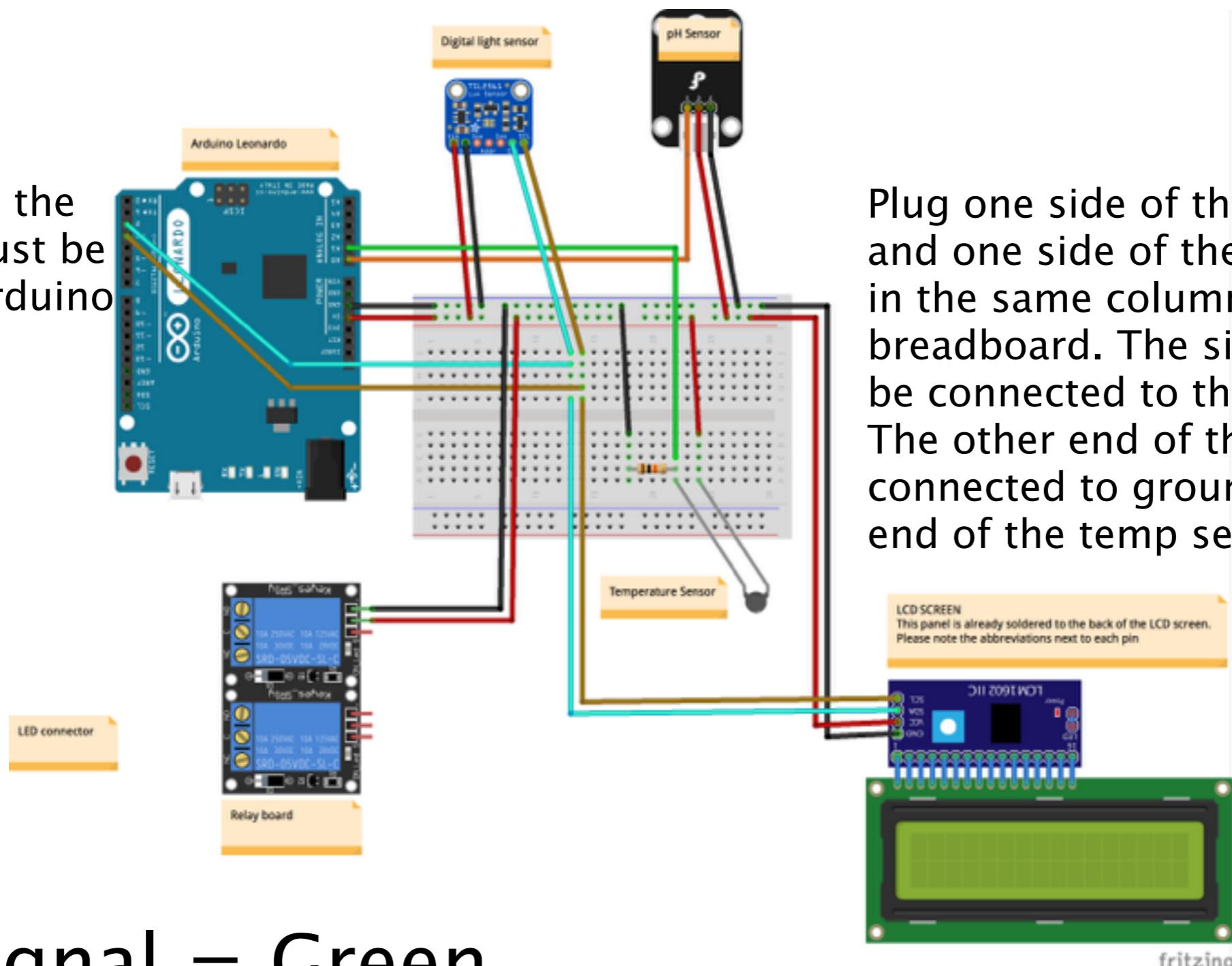
Signal = Orange



Step 5

Connect the temperature sensor

The signal from the temp sensor must be connected to Arduino port A1

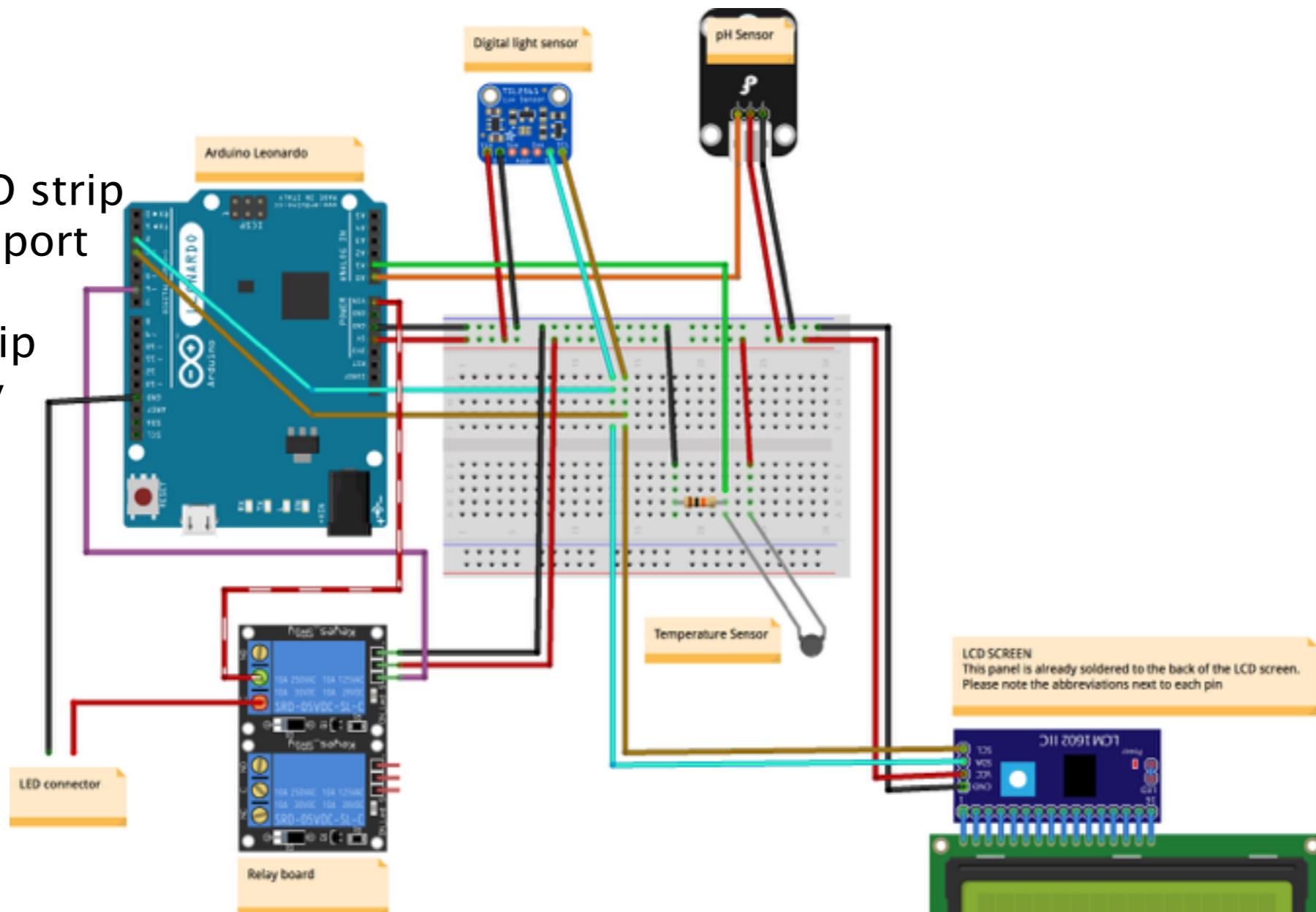




Step 6

Connect the LED strip to the relay

Connect the LED strip ground to GND port on the Arduino.
And the LED strip Vcc to the Relay

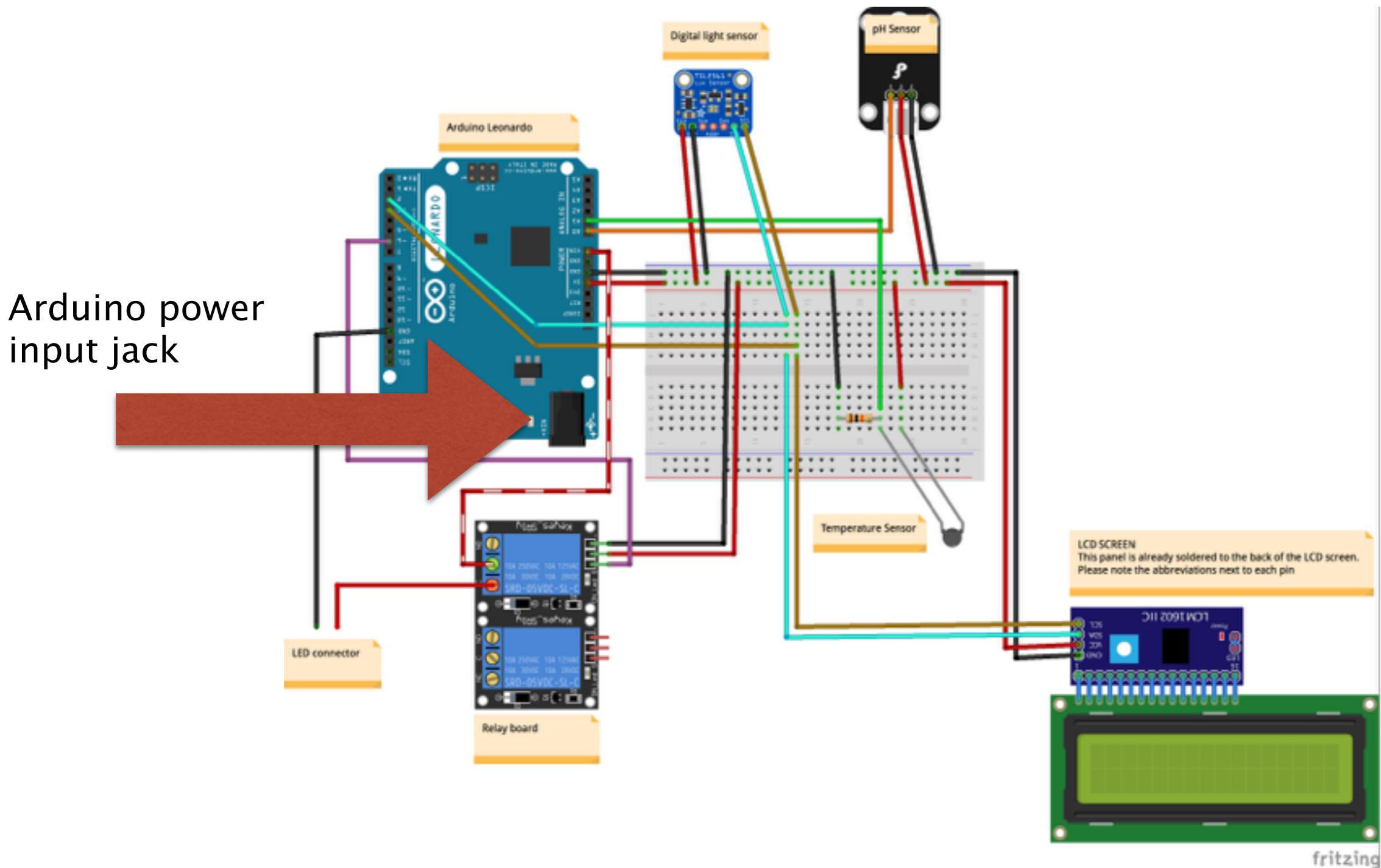


Digital signal = Purple
12V Power = Banded Red = Vin (arduino)



Power it up

Connect the 12V adapter to the Arduino



Smoothies



What to mix

One teaspoon is enough

Try to mix with sweet flavours (or not)



Discussion

Thank you!

Keep in touch
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@pietervboheemen



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Mede mogelijk gemaakt door:

**stimuleringsfonds
creatieve industrie**

AFK
amsterdams
fonds voor de
kunst