By Jeunes Scientifiques Cools

@SimoonFr @CaporalClement @FdvJulie
@JSC_Biosensors

Egeria densa chloroplasts

Carolina biological supply company

VS

Arduino LDR sensor

Wikimedia

Compare LDR sensor and chloroplasts light sensitivity

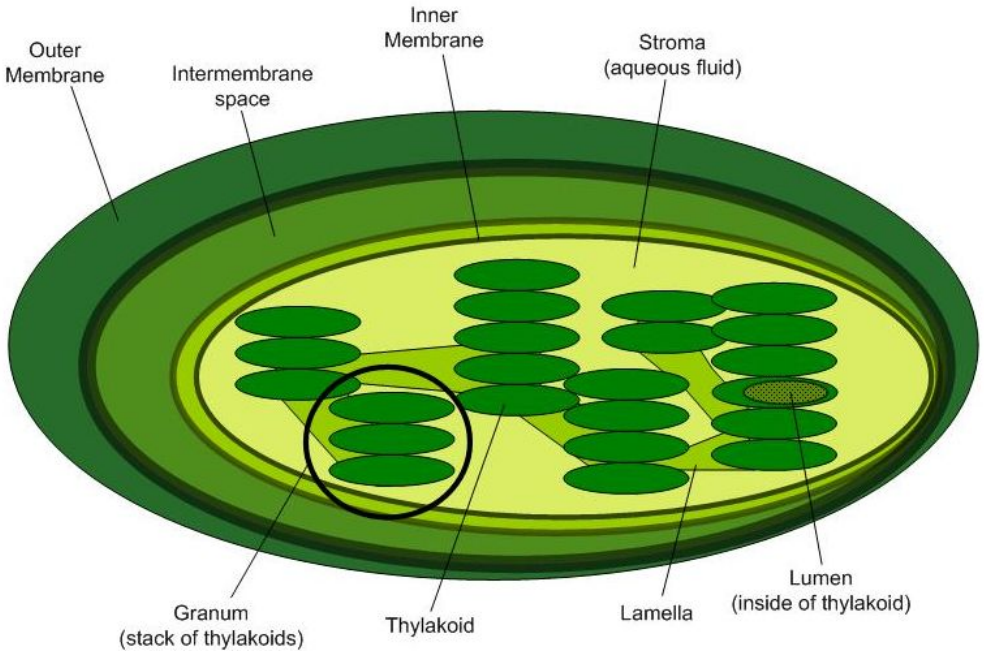
Biological sensor

From *Egeria densa*

5 microns

Carry out photosynthesis

Interact with actin and myosin



Wikimedia commons

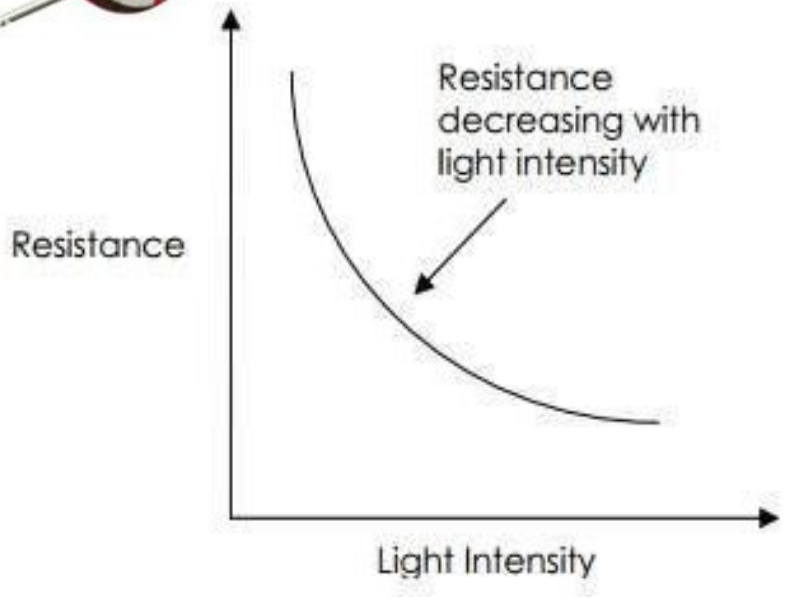
Light Dependant Resistor

Response time : ~ 10 ms

Resistance drop with light

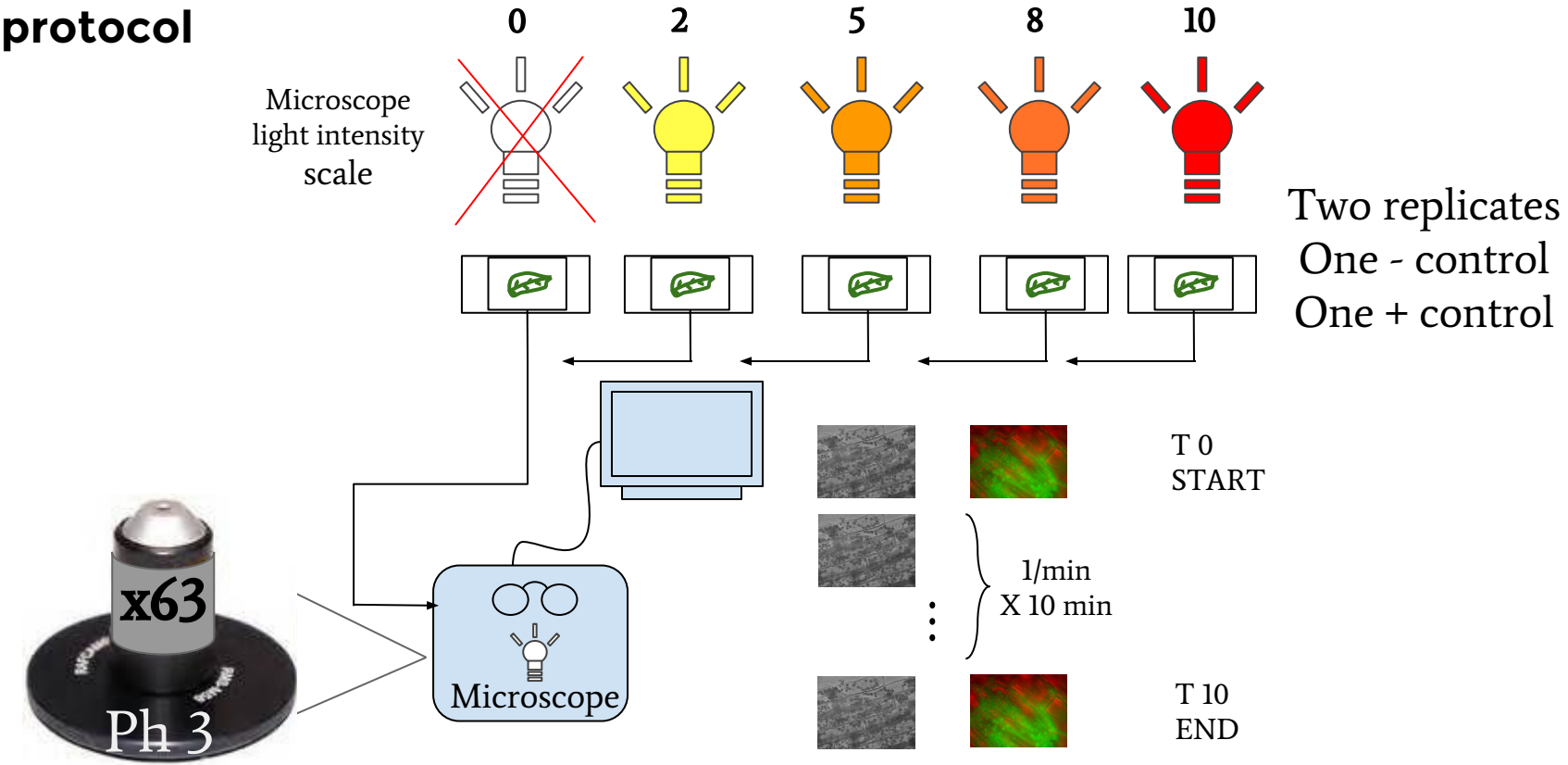
Passive sensor

Number of zigzag = resistance

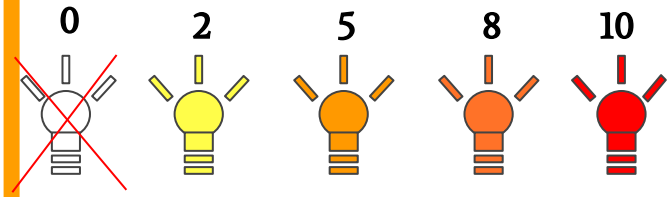


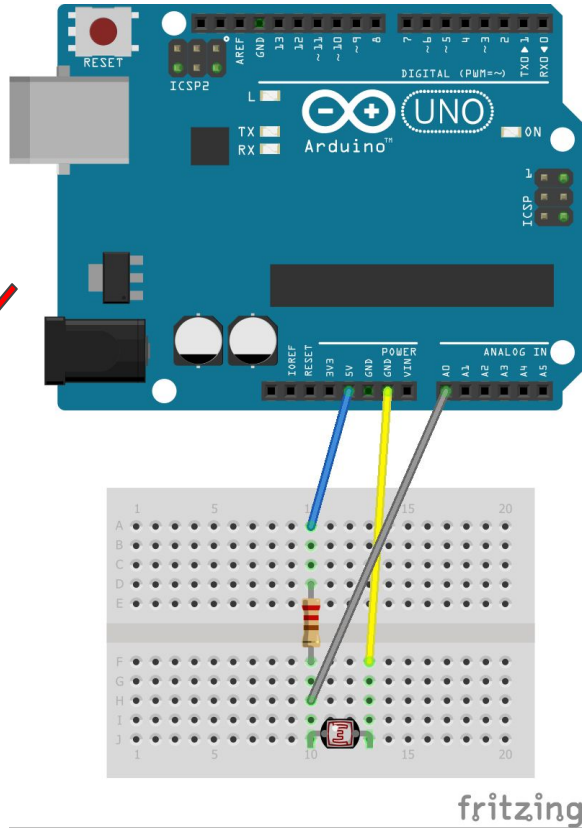
Kitronik

Biological sensor protocol



Electronic sensor protocol



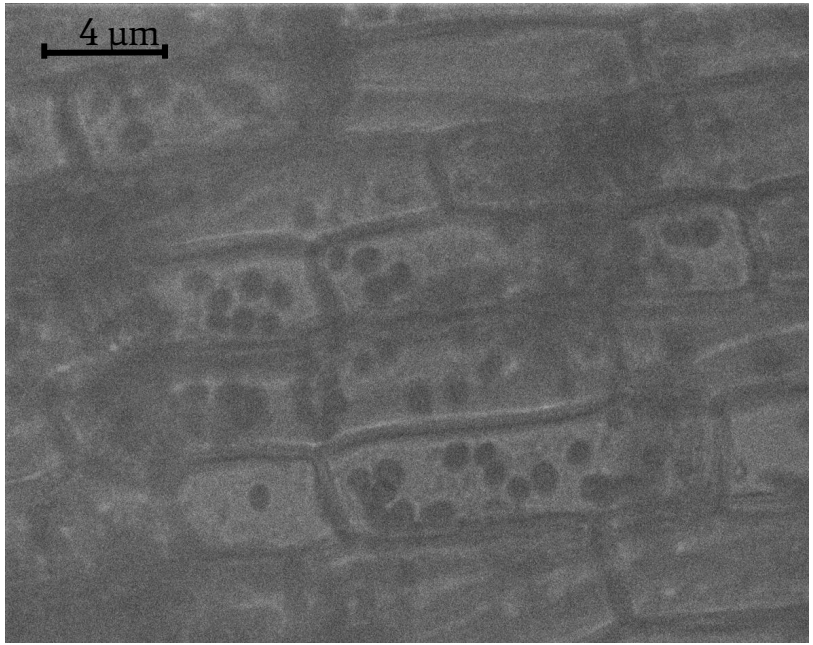


- Photoresistor LDR
- Resistance 10kΩ
- Arduino Leonardo

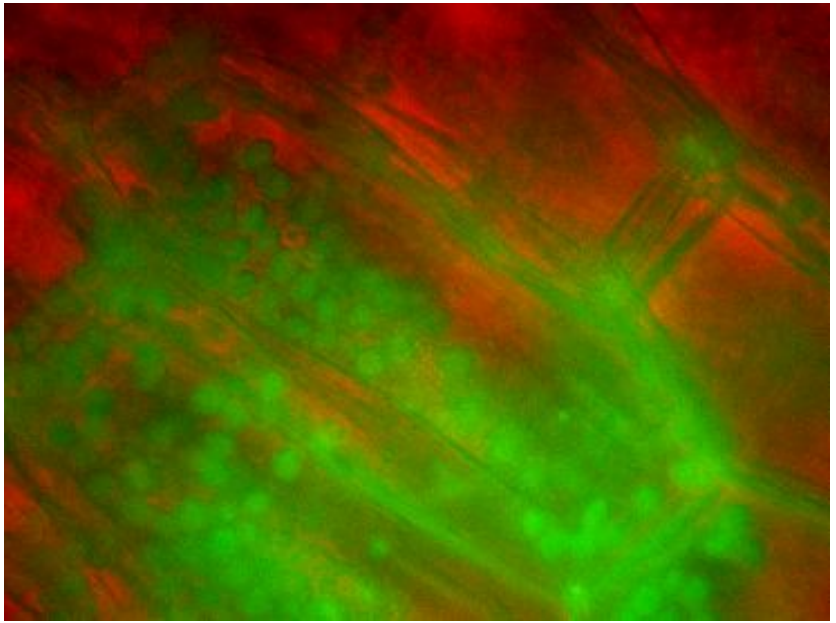
Two replicates

One - control

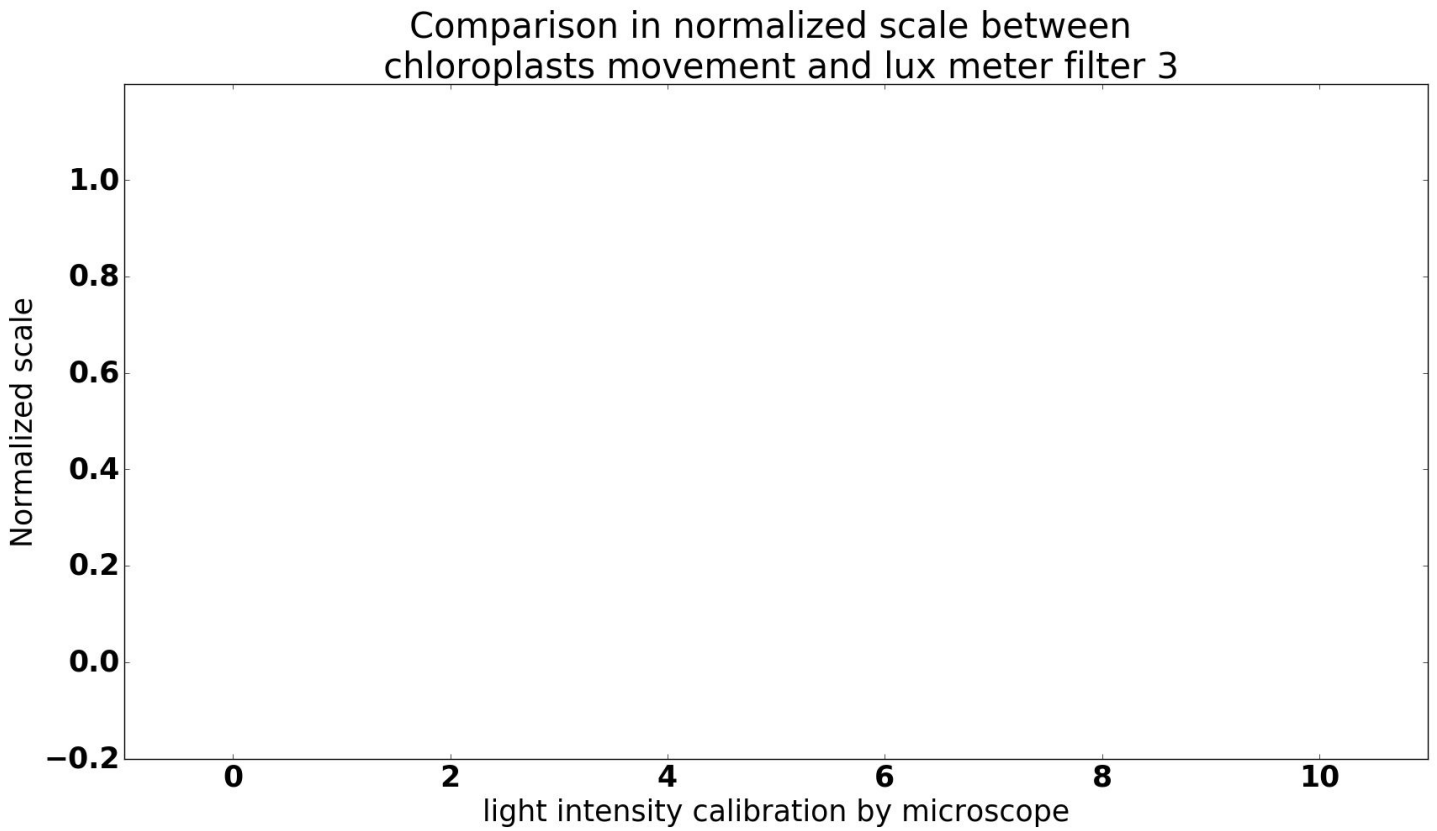
One + control

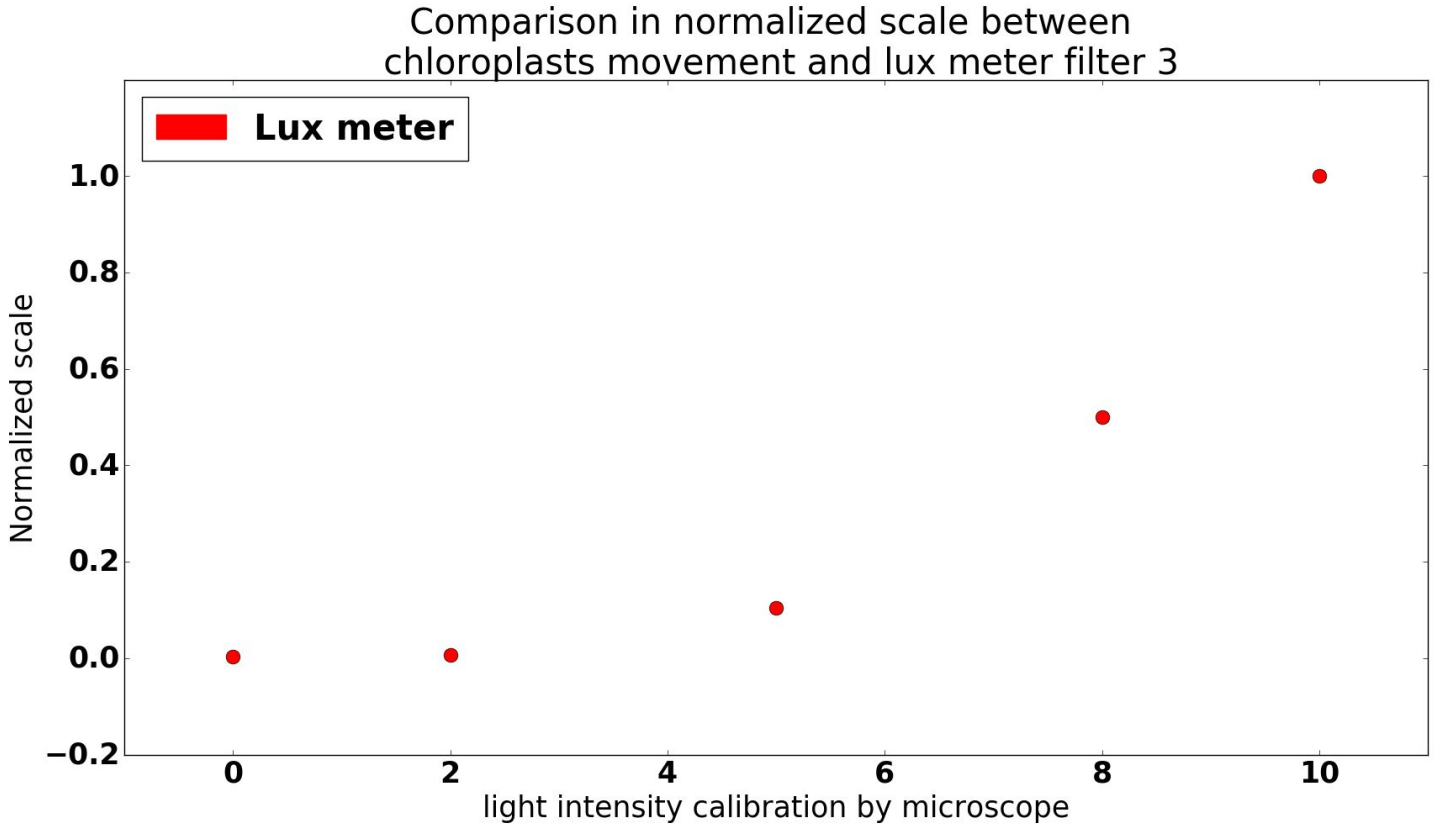


Egeria densa x63 gif normal light



Egeria densa x63 fluorescence colored combined


Comparison in normalized scale between
chloroplasts movement and lux meter filter 3
Normalized scale
1.0
0.8
0.6
0.4
0.2
0.0
−0.2
0
2
4
6
8
10
light intensity calibration by microscope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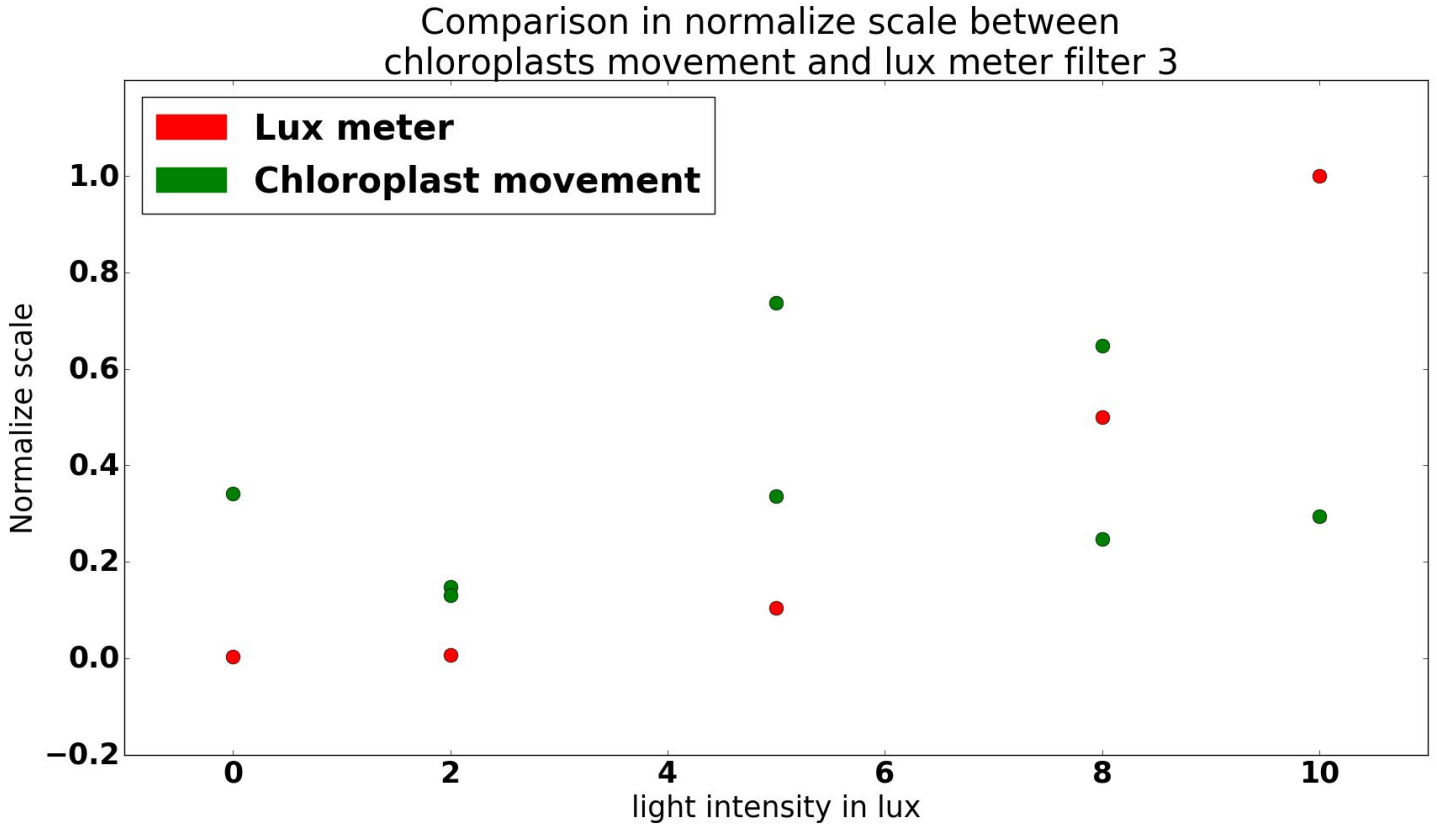
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Lux meter
Chloroplast movement
Normalize scale
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0.2
0.0
−0.2
0
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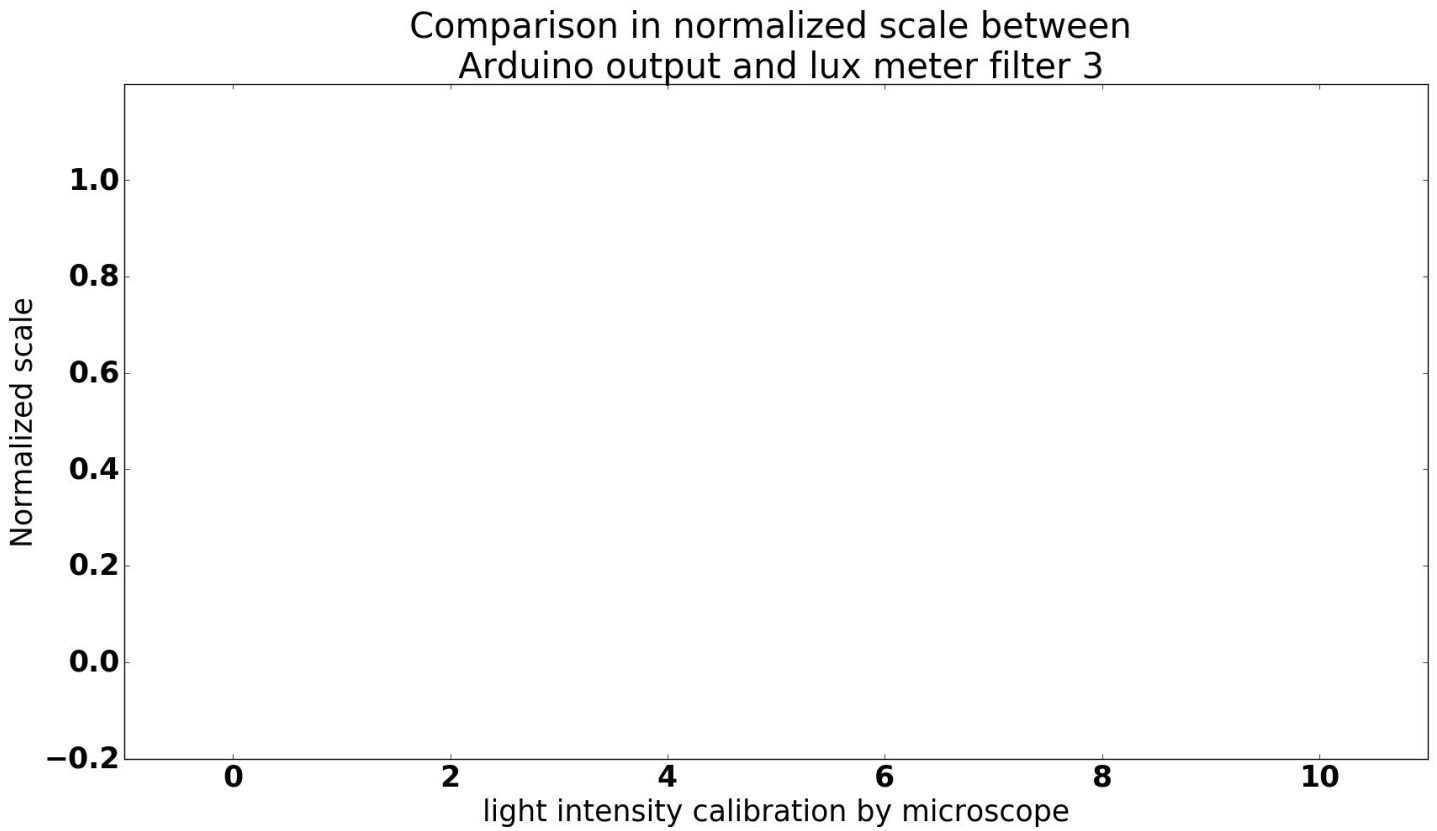
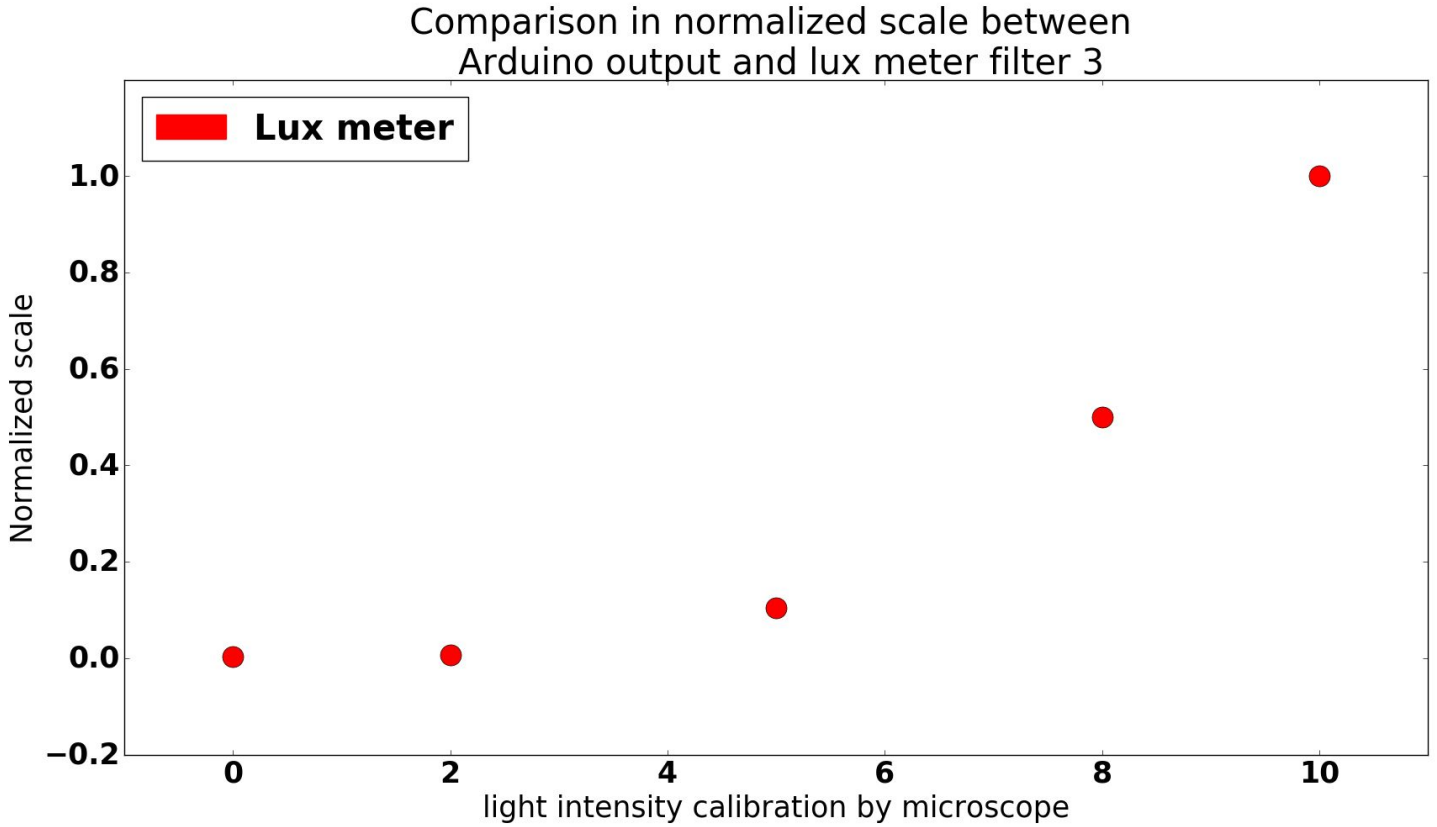
8
10
light intensity in lux

Results – Analysing




Comparison in normalized scale between
Arduino output and lux meter filter 3
Lux meter
Normalized scale
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0.6
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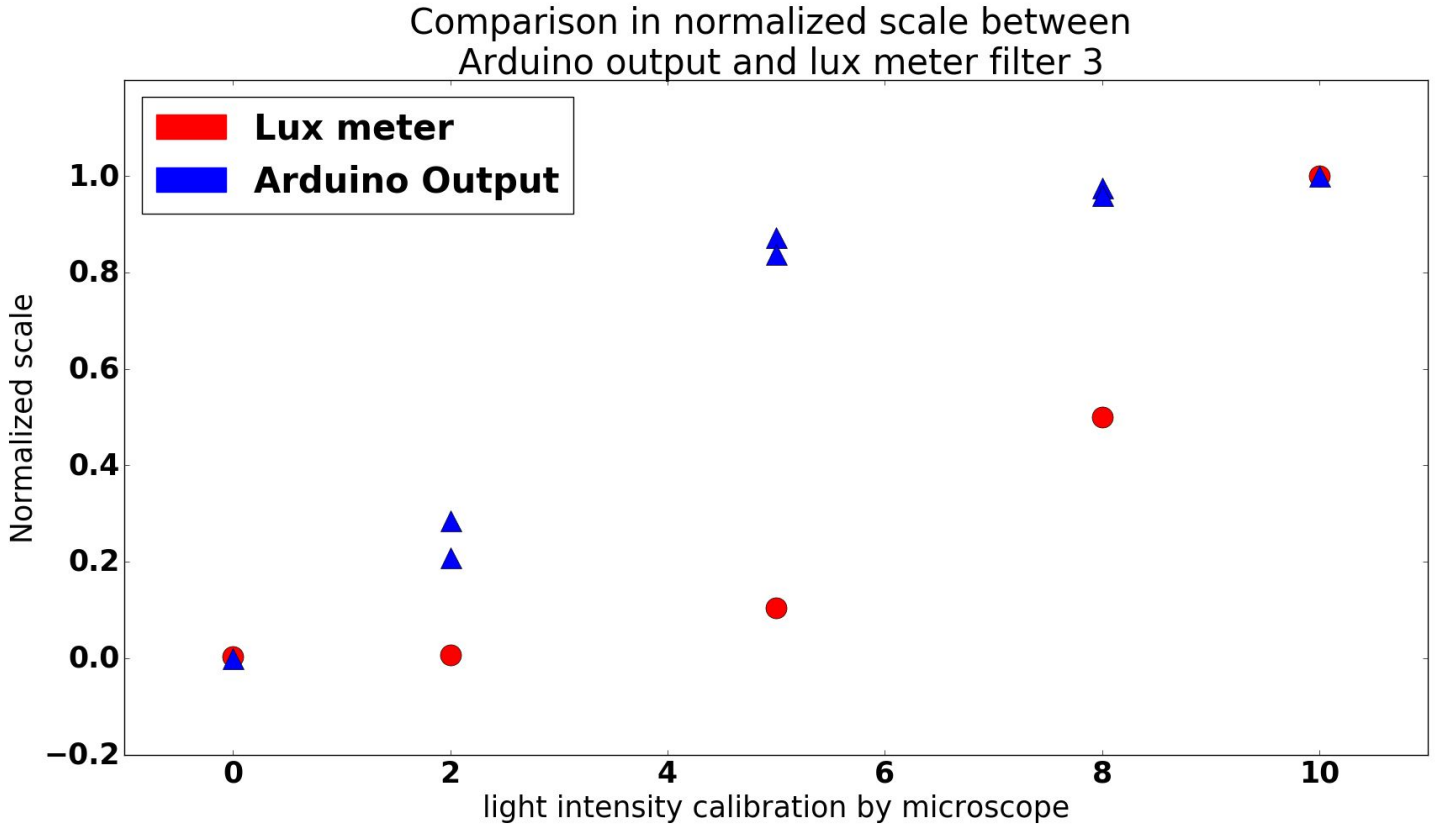
light intensity calibration by microscope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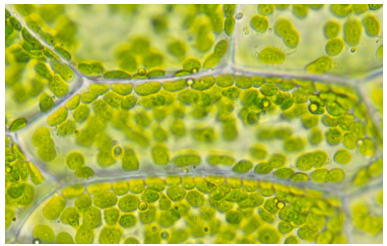
Egeria densa Chloroplasts



Source :Carolina biological supply company

VS

Arduino LDR sensor

Wikimedia

Very high response time ?

Not precise

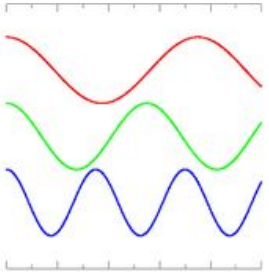
Not sensitive at low intensity ?

Saturate at high intensity

To do next

- Explore cytoplasmic streaming

- Test higher intensities, and specific wavelengths



- Increase exposition time

Bibliography

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- Kasahara, Masahiro, Takatoshi Kagawa, Kazusato Oikawa, Noriyuki Suetsugu, Mitsue Miyao, and Masamitsu Wada. “Chloroplast Avoidance Movement Reduces Photodamage in Plants.” *Nature* 420, no. 6917 (December 19, 2002): 829–32. doi:10.1038/nature01213.

- “Chloroplast Avoidance Movement Reduces Photodamage in Plants : Article : Nature.” Accessed January 20, 2017. http://www.nature.com/nature/journal/v420/n6917/full/nature01213.html.

- “Phototropin-Related NPL1 Controls Chloroplast Relocation Induced by Blue Light : Article : Nature.” Accessed January 20, 2017. http://www.nature.com/nature/journal/v410/n6831/full/410952a0.html.

- “Phototropin-Related NPL1 Controls Chloroplast Relocation Induced by Blue Light : Article : Nature.” Accessed January 20, 2017. http://www.nature.com/nature/journal/v410/n6831/full/410952a0.html.

- « Induction of Cytoplasmic Streaming and Movement of Chloroplast Induced by L-Histidine and its Derivatives in Leaves of Egeria densa ». *Plant and Cell Physiology* 32, n° 2 (1 mars 1991): 253‑60. doi:10.1093/oxfordjournals.pcp.a078071.

Thanks !

FONDATION BETTENCOURT SCHUELLER

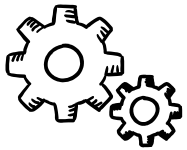
UNIVERSITÉ PARIS DESCARTES
INSTITUT UNIVERSITAIRE DE TECHNOLOGIE

Goal of the project

The presentation needs to have the following elements:

- the goal of the project
- the explanation of the characteristics of sensors that were examined
- the experimental setup - electronic and biological
- results from the electronic and biological sensor (presented as graphs plotted with Python)
- conclusion on the similarities and differences between electronic and biological sensor

Chloroplasts vs LDR Arduino



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Experimental set-up

Biological and electronic

SlidesCarnival icons are editable shapes.

This means that you can:

- Resize them without losing quality.
- Change fill color and opacity.
- Change line color, width and style.

Isn't that nice? :)

Examples: