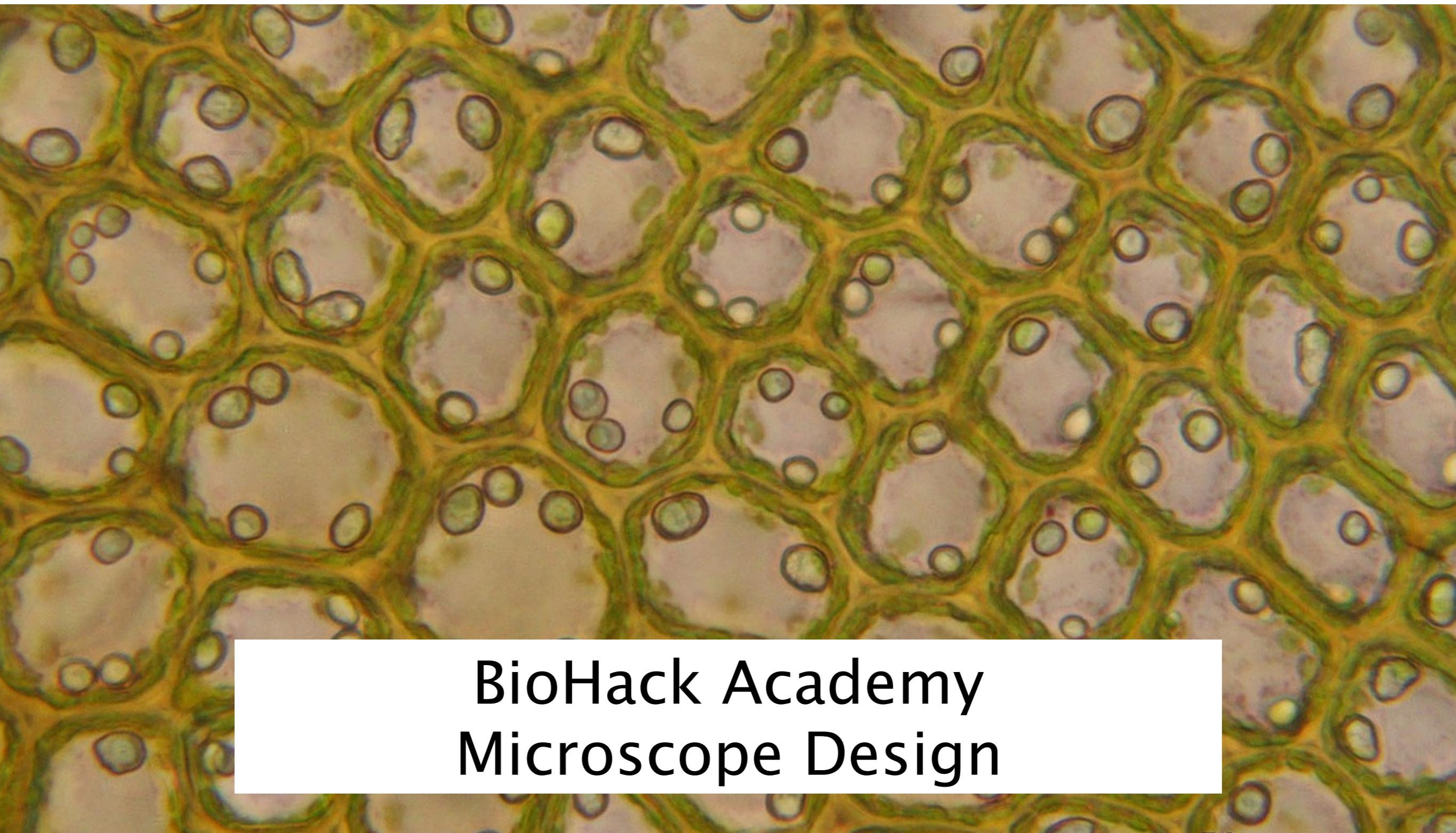




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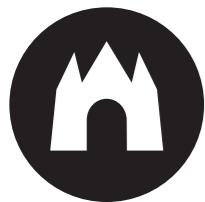
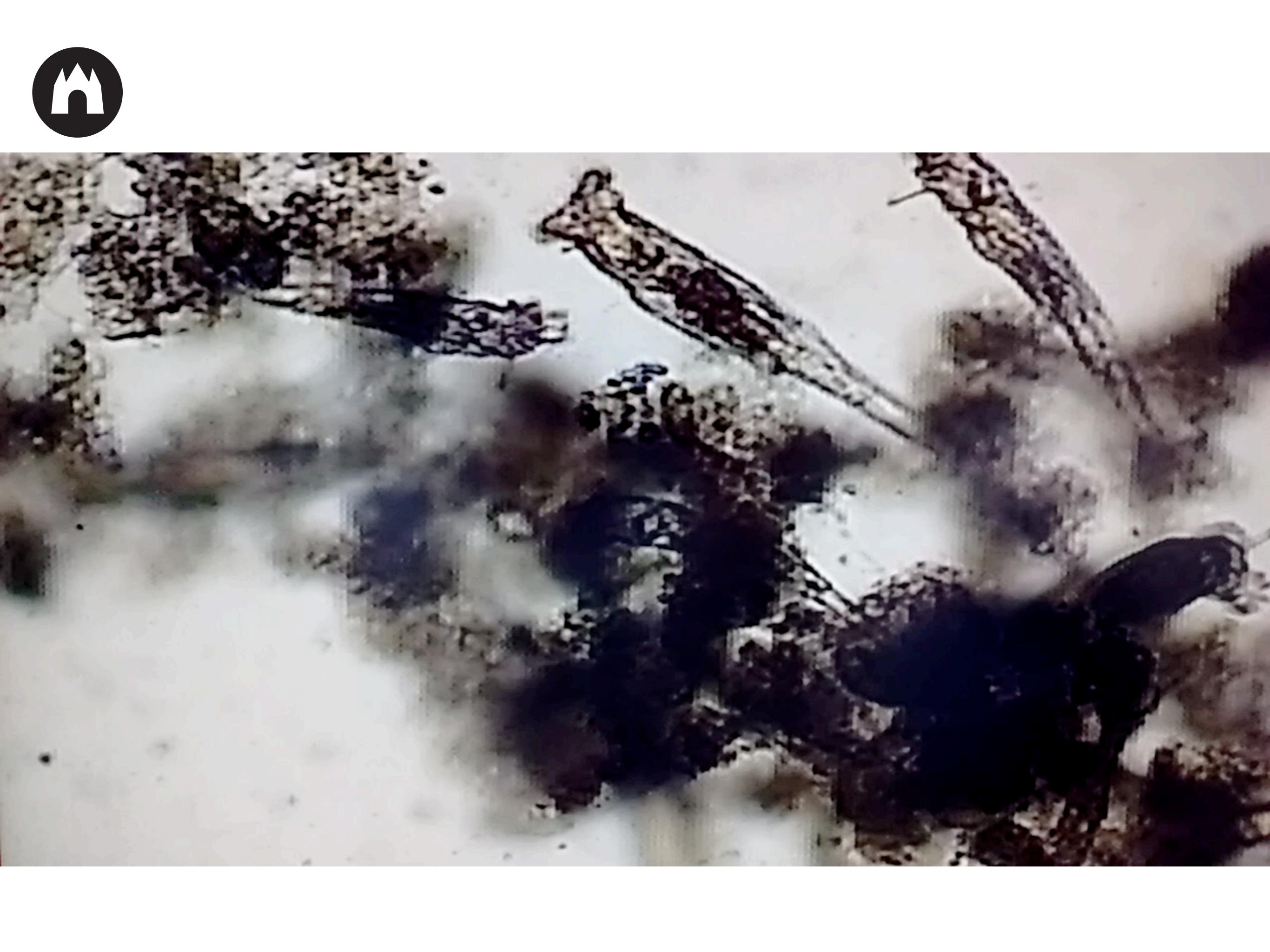


BioHack Academy
Microscope Design



Why we need a microscope

- Morphological identification of organisms
- To check the purity of a culture





Industry Standard



Moisey – CC-BY-SA 3.0



Paul Hartzog – CC-BY-SA 2.0

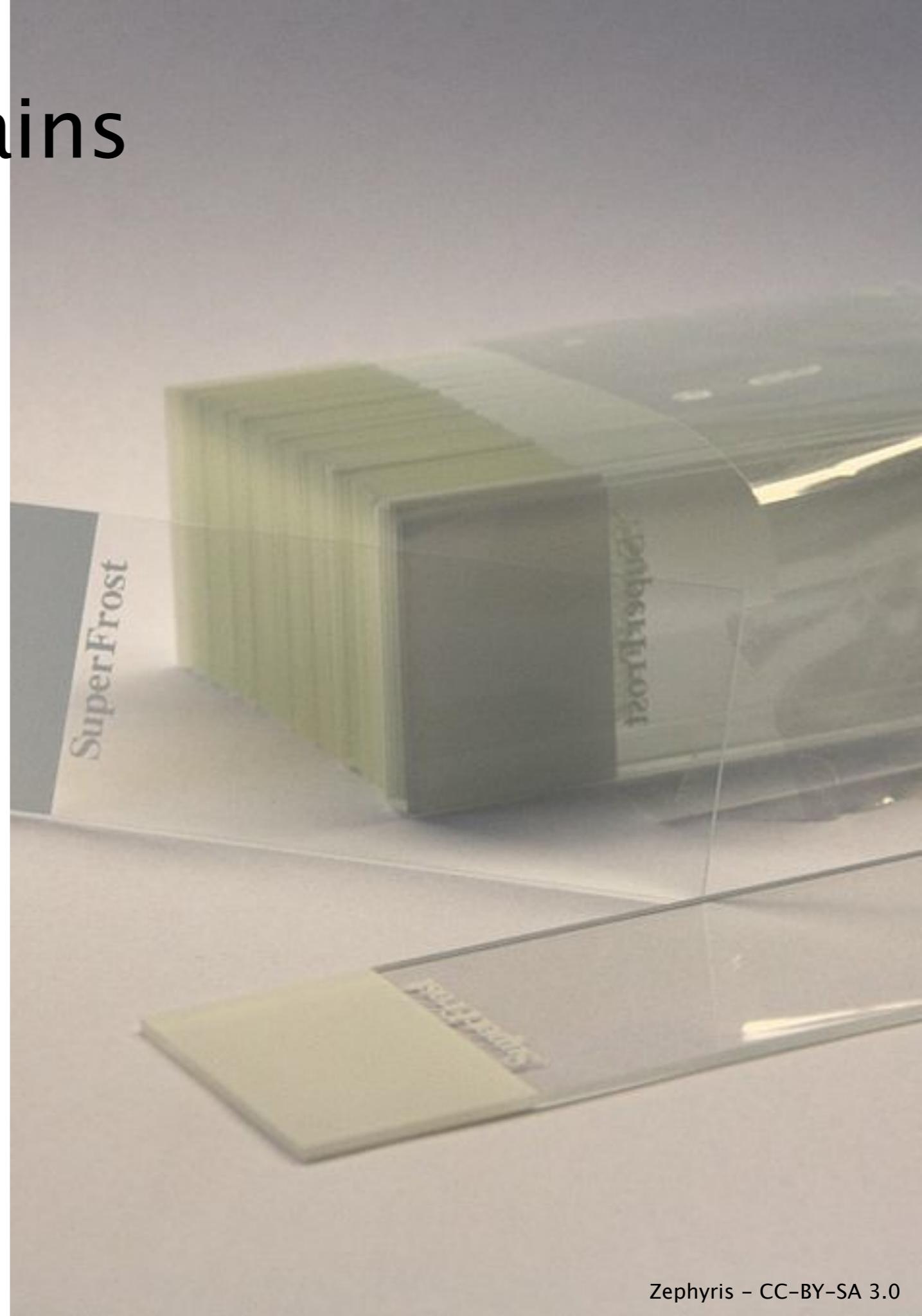


Pixabay Public Domain



Design Constraints

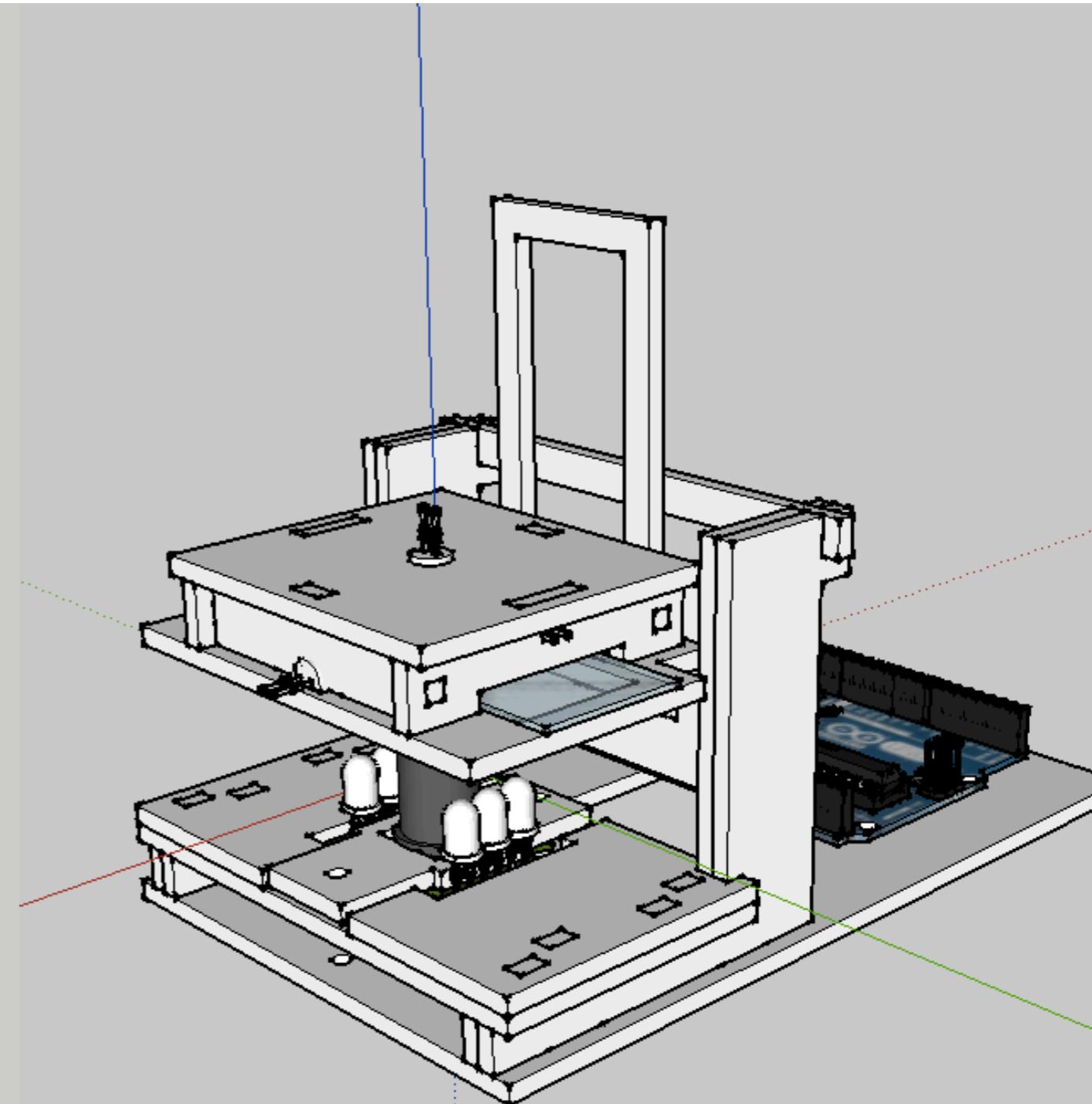
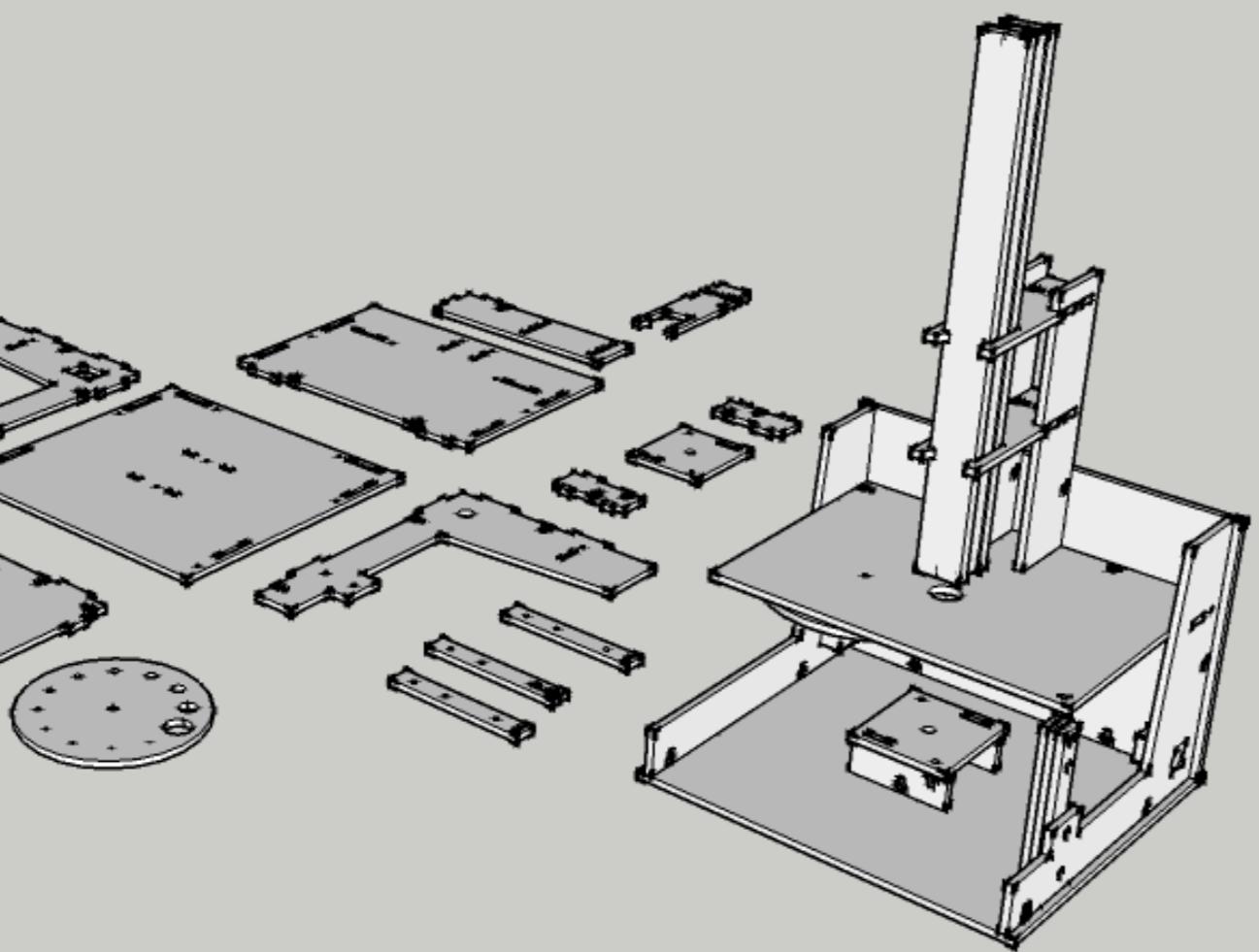
- Microscope slide
 - Make sure these fit in your design





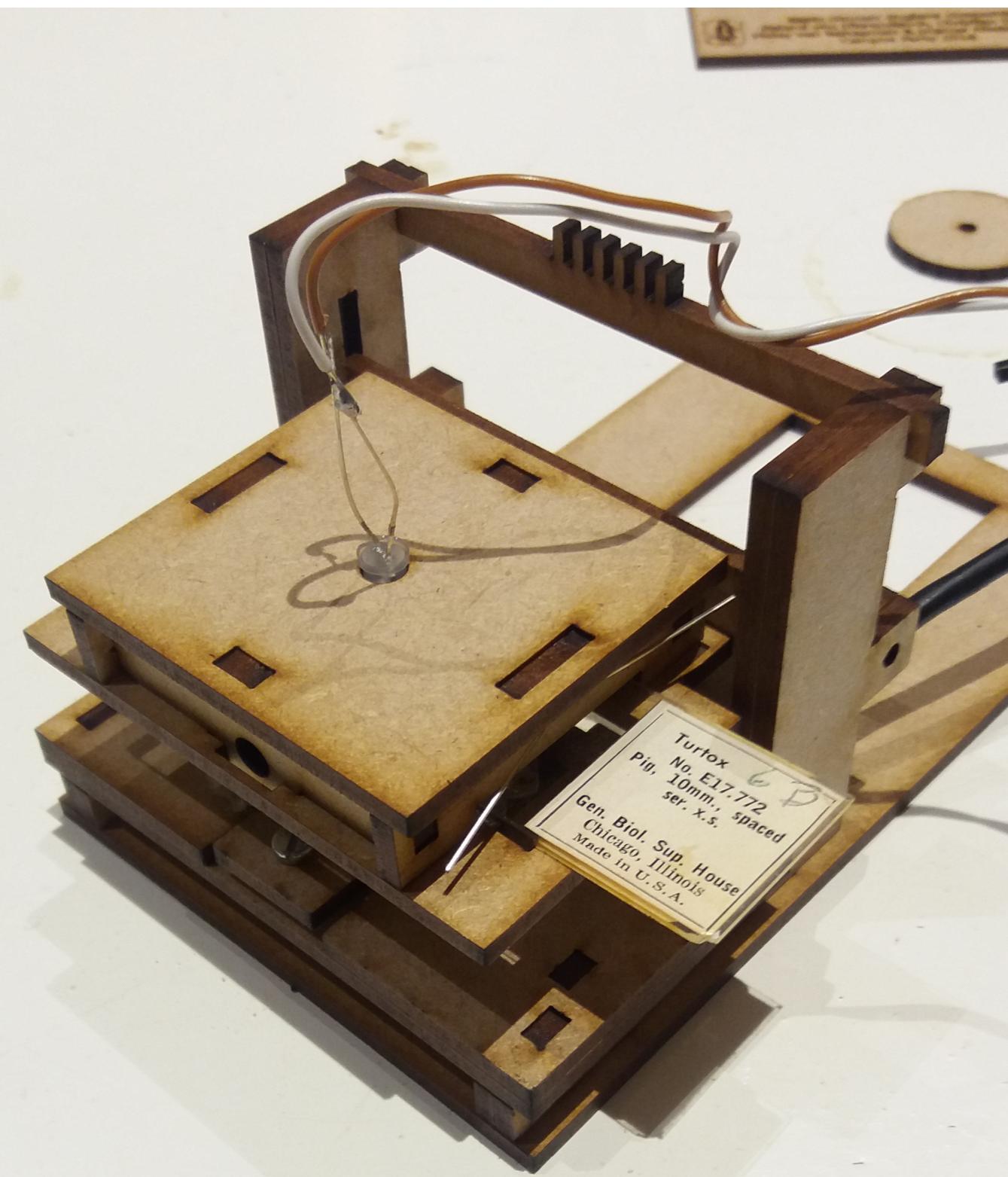
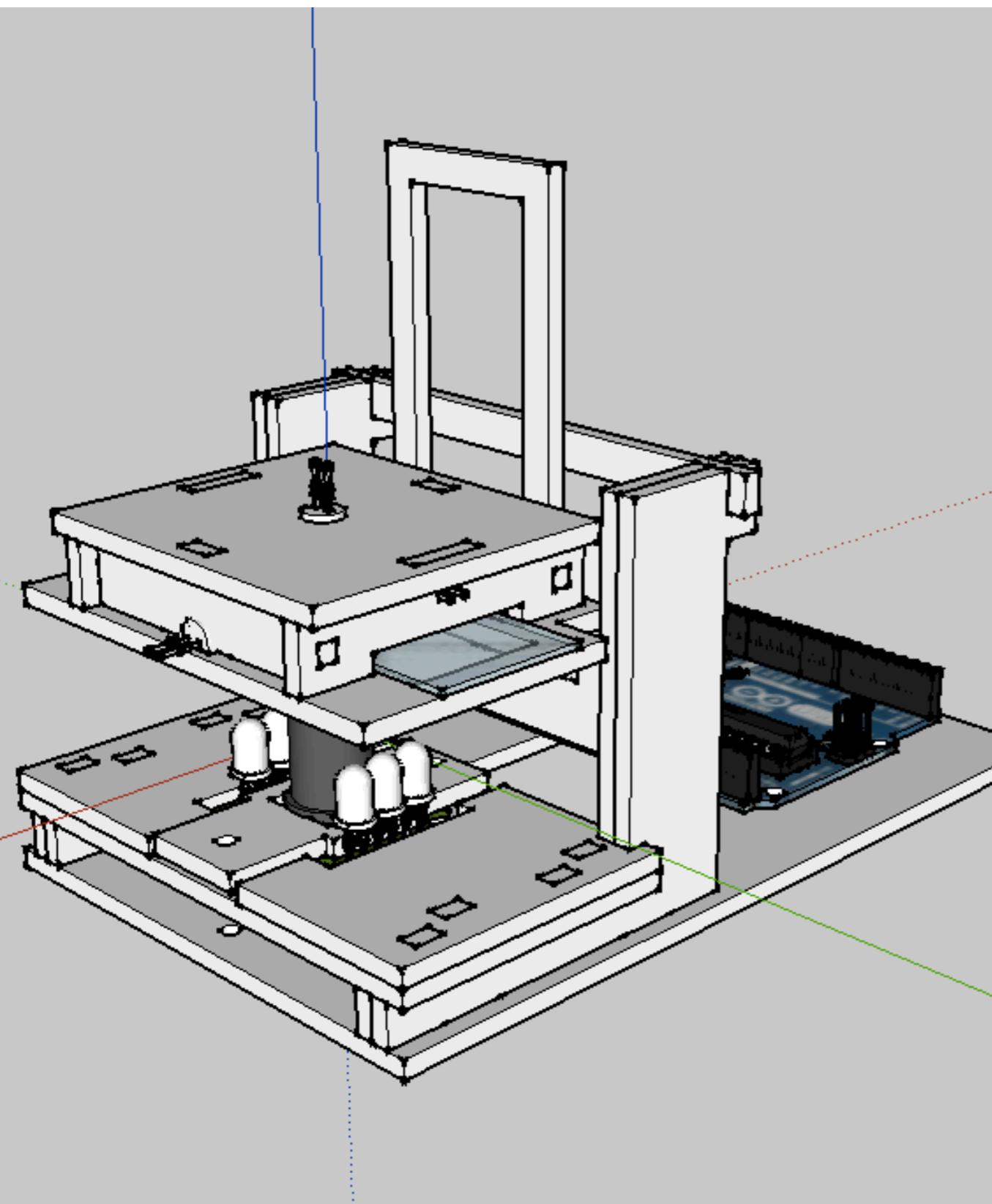
Biohack Academy Designs

You may choose which one to build





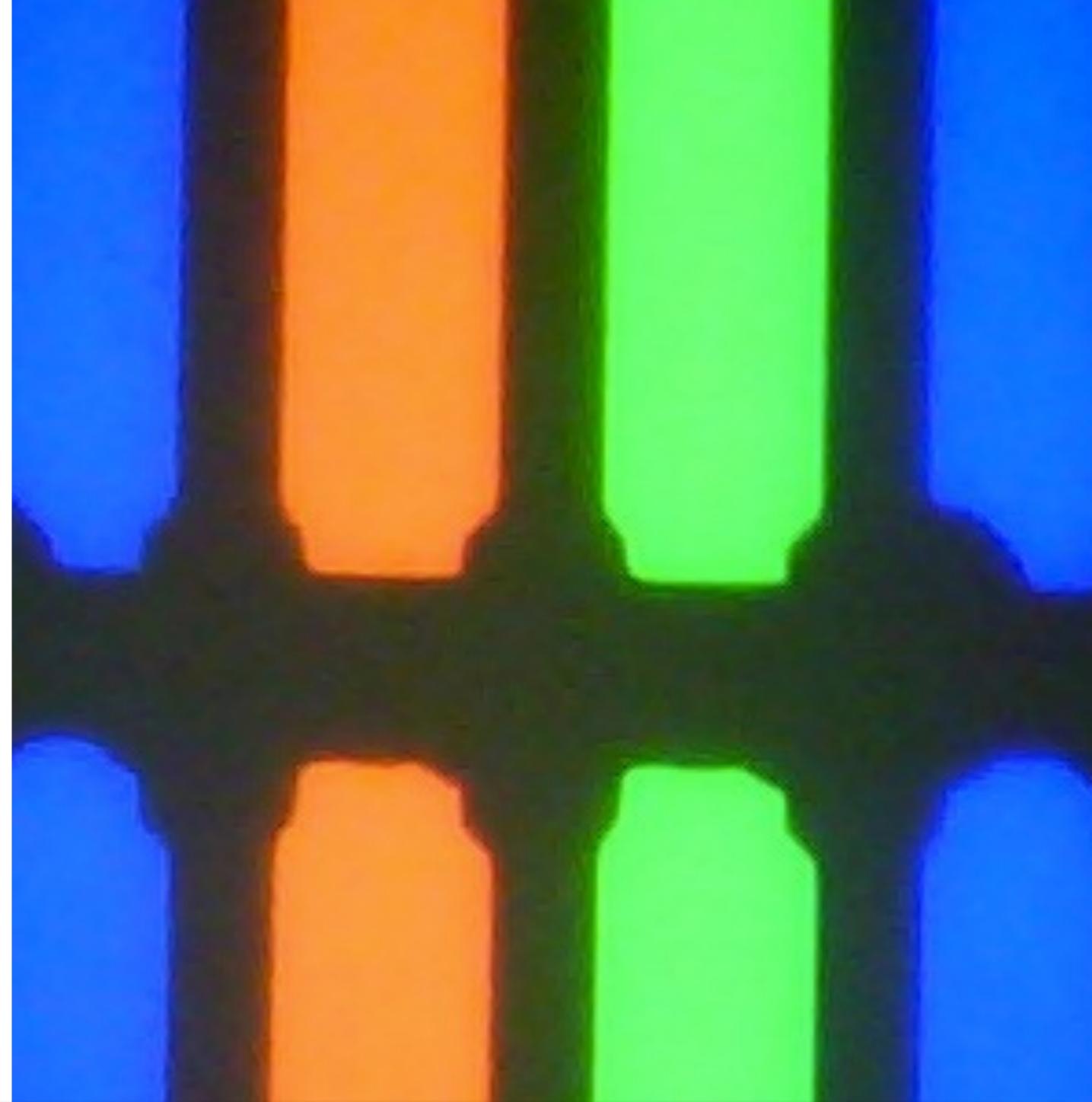
Webcam Microscope





Pixel Based Magnification test

- Take a picture of your screen up close
- Count the number of pixels in the frame
- Calculate the magnification



$$Magnification M = \frac{Number\ of\ Screen\ Pixels \times Size\ Screen\ Pixels}{Size\ of\ Webcam\ picture}$$



Spirulina by webcam microscope



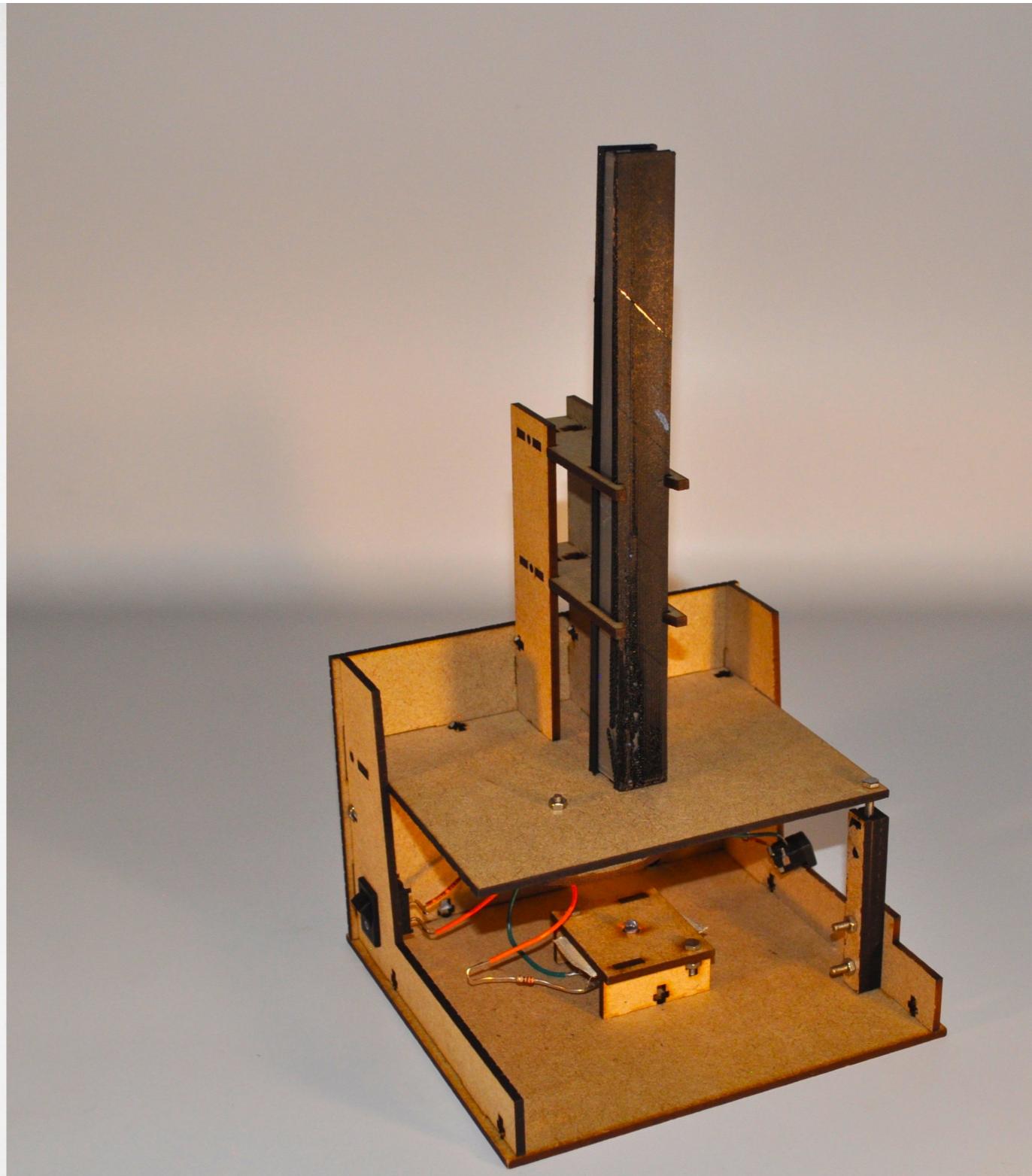


Euglena by webcam microscope



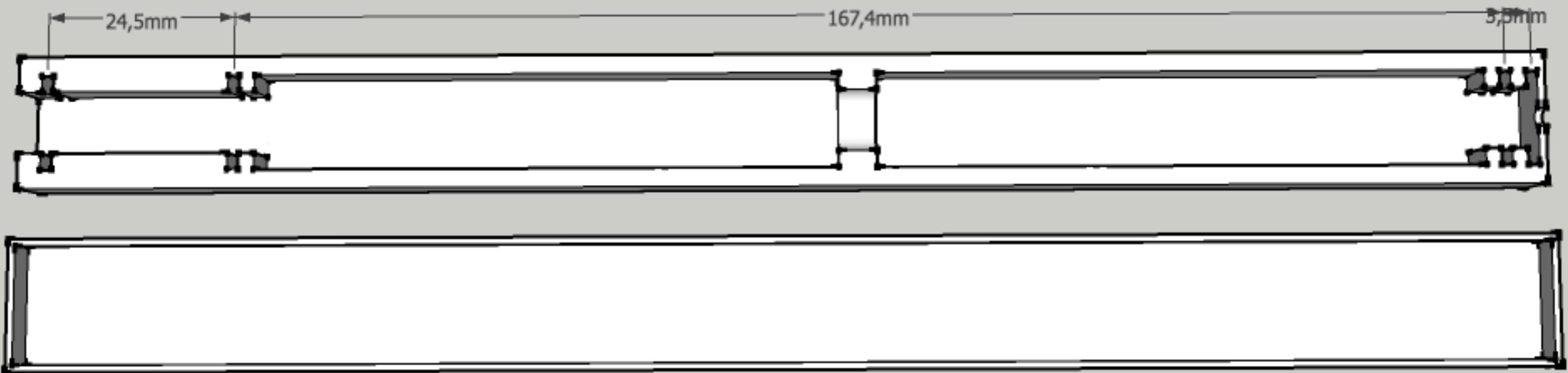


Compound microscope



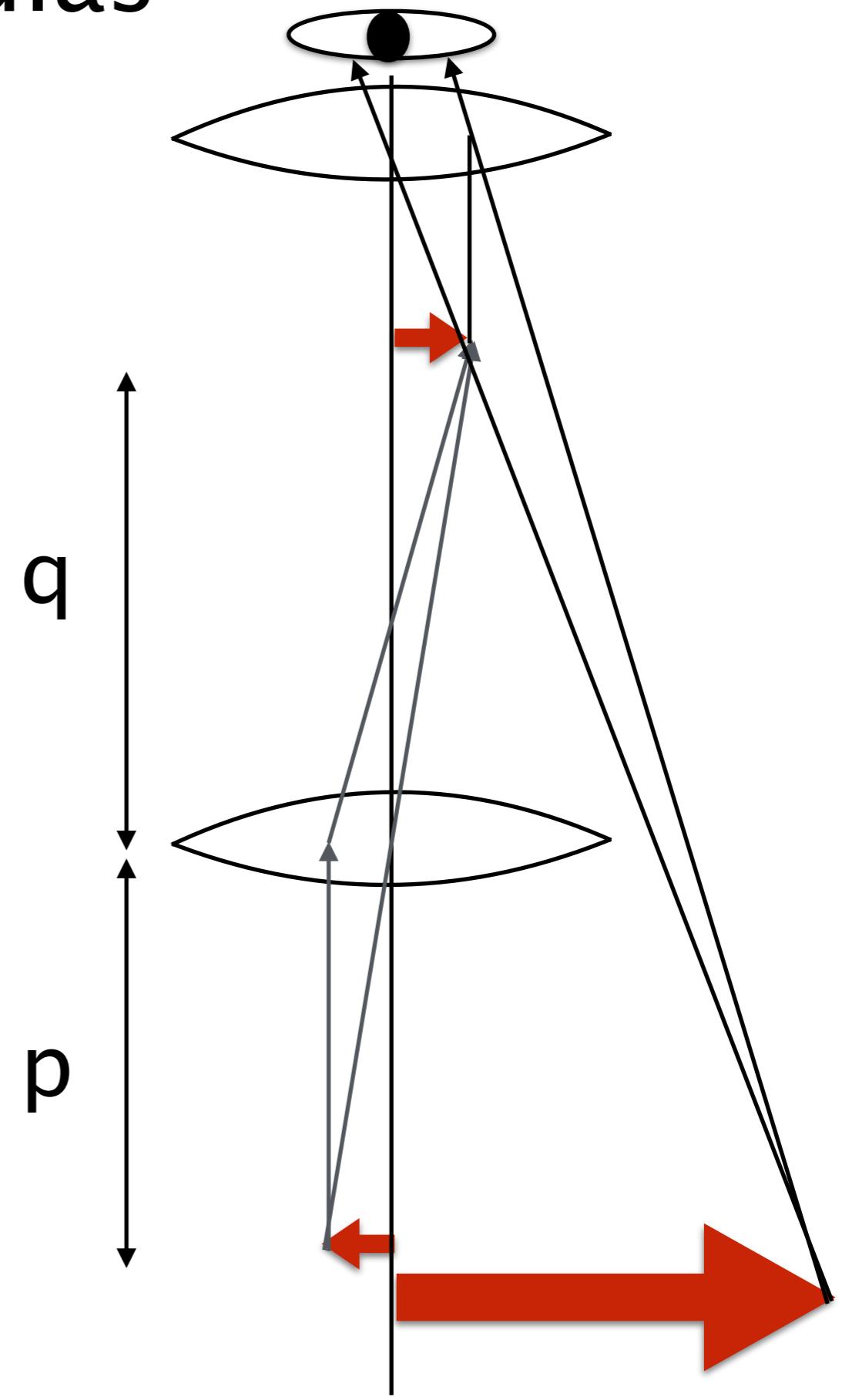
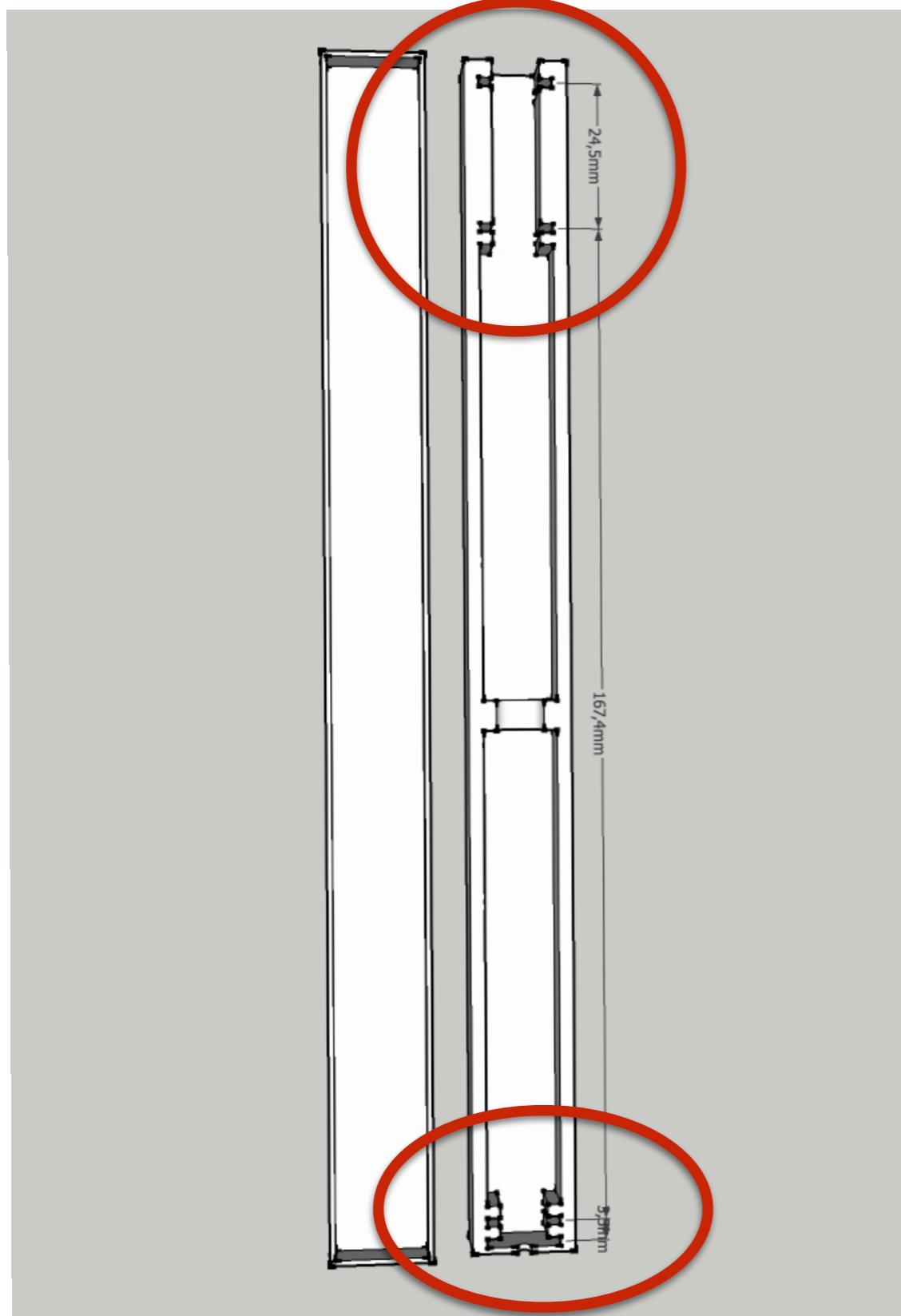


Dimensions





Microscope formulas





Magnification Objective

- Focal length of objective
 - $F_a = F_b = 35 \text{ mm}$
 - distance = 3.2 mm
 - $F_{ab} = 18.3 \text{ mm}$
- Objective-specimen distance
 - $q = 167.4 \text{ mm}$ (given)
 - $p = 20.6$ (calculated)
- Magnification power objective
 - $M_{ob} = 167.4 / 20.6$
 - $M_{ob} = 8.1$

$$f_{ab} = \frac{f_a \times f_b}{f_a + f_b - d}$$

$$\frac{1}{f} = \frac{1}{p} + \frac{1}{q}$$

$$M_{ob} = \frac{p}{q}$$



Magnification Eyepiece

- Focal length eyepiece
 - $F_a = F_b = 35 \text{ mm}$
 - distance = 24.5 mm
 - $F_{ab} = 26.92 \text{ mm}$
- $M_{ep} = 250 / 26.92$
- $M_{ep} = 9.3$

$$f_{ab} = \frac{f_a \times f_b}{f_a + f_b - d}$$

$$M_{ep} = \frac{250}{f_{ab}}$$



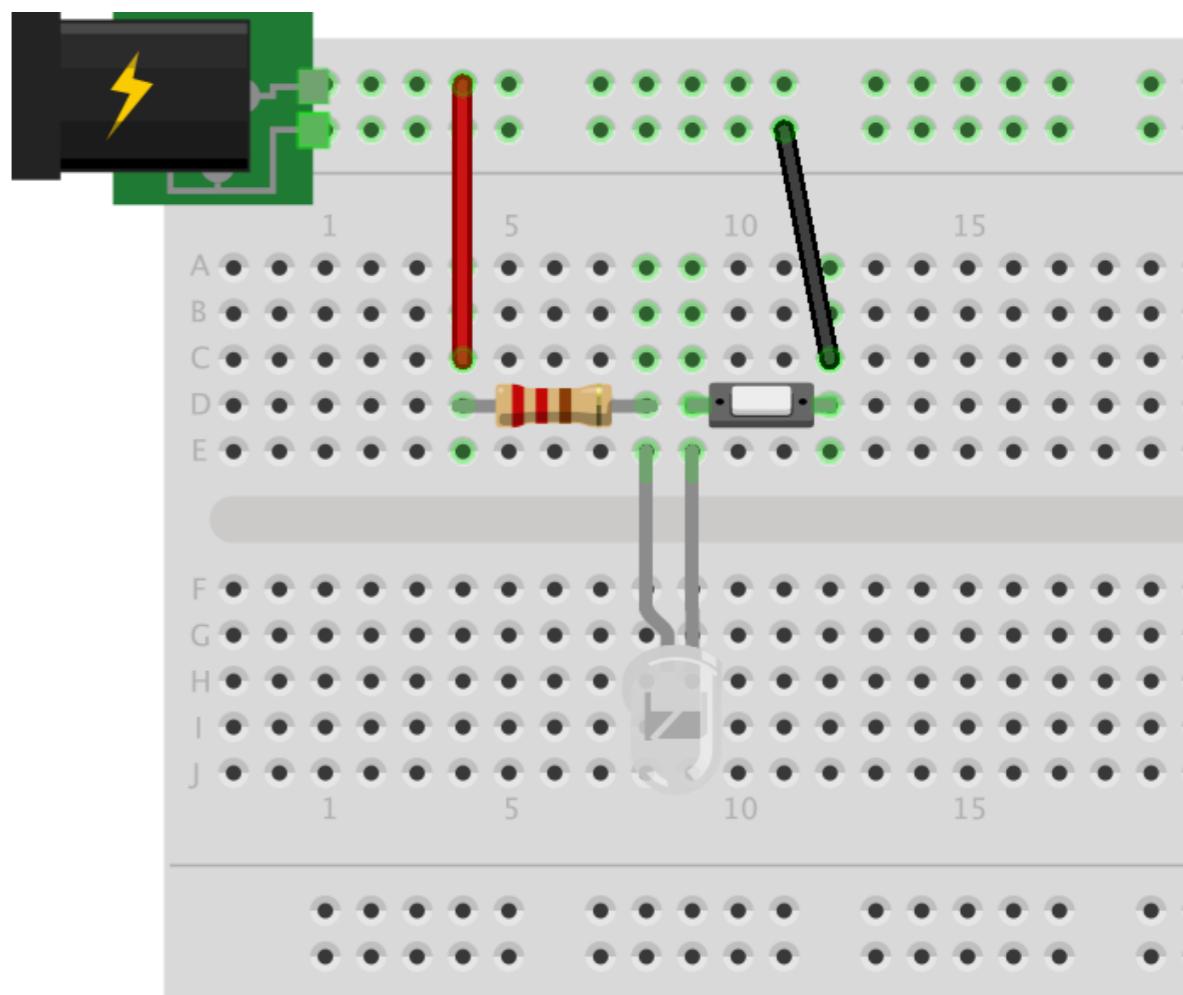
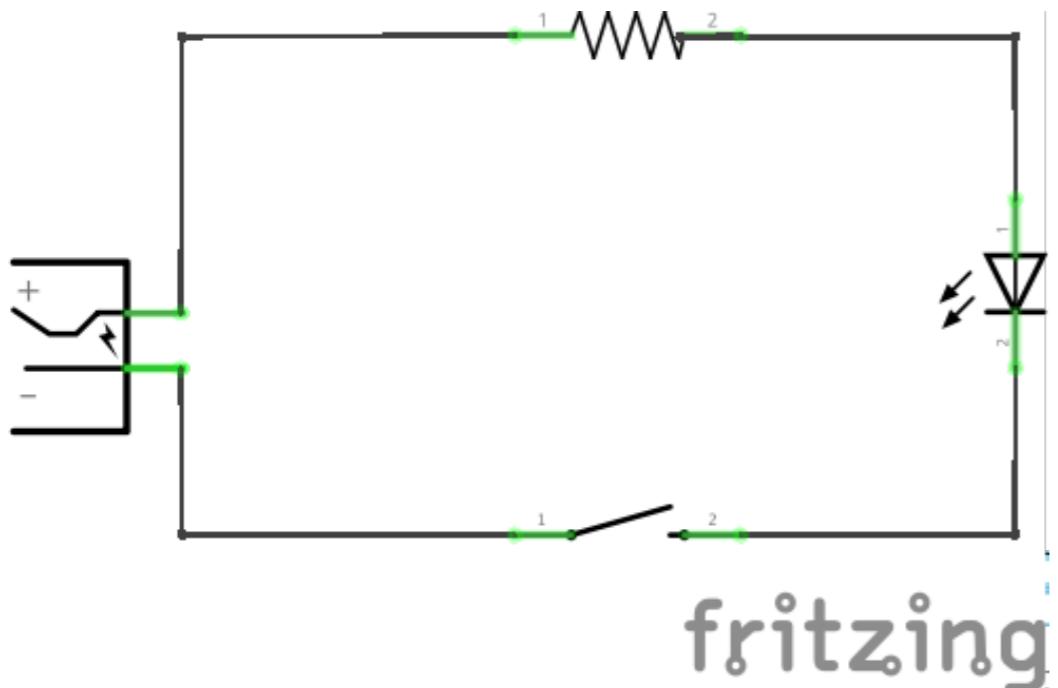
Magnification Microscope

- $M_{mic} = 8.1 \times 9.3$
- $M_{mic} = 75.5$

$$M_{mic} = M_{ob} \times M_e$$



Wiring





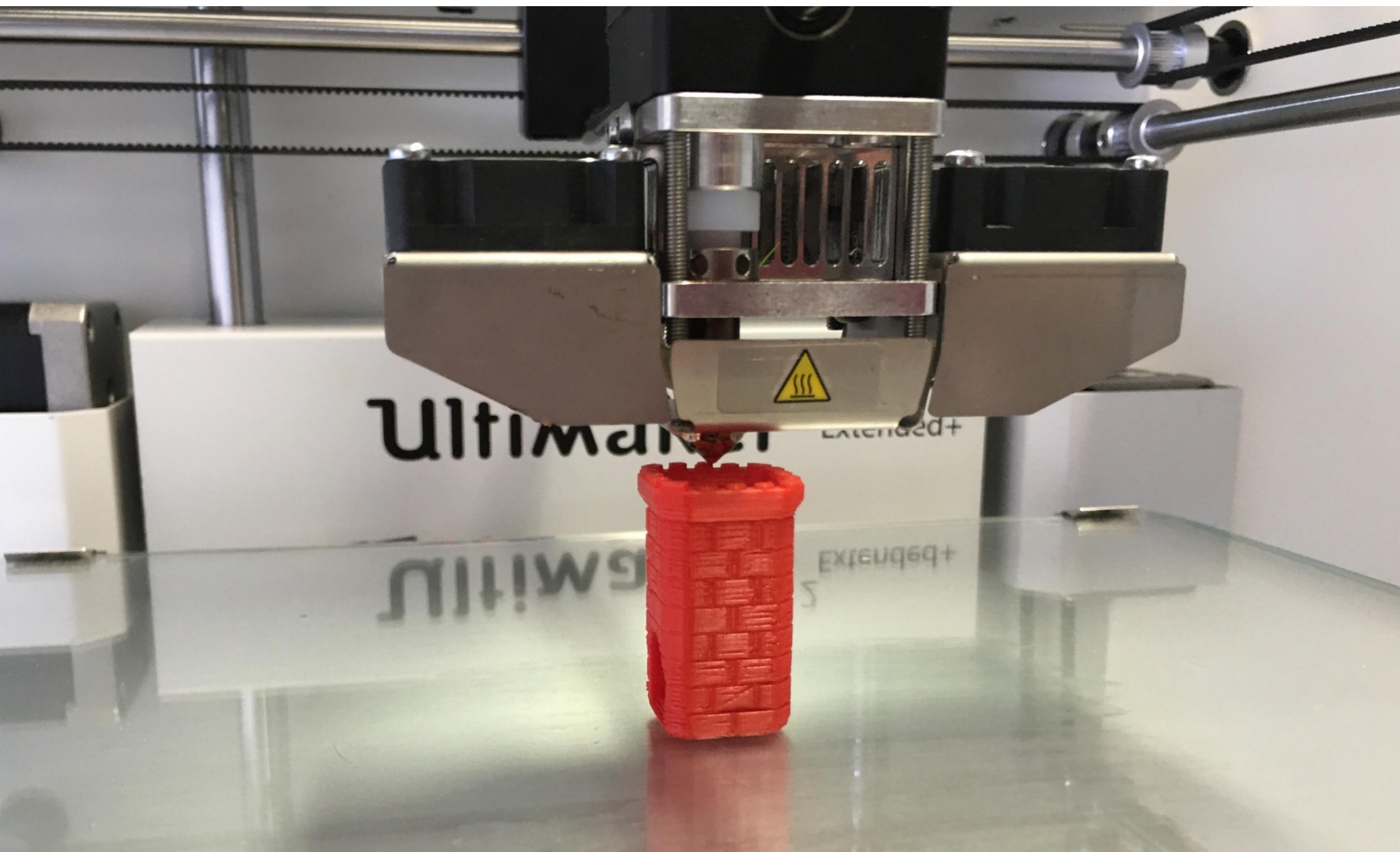
Hackteria Microscope Stage



<http://www.thingiverse.com/thing:1086414>



3D printing





Bioprinting





Syringe extruder



<http://www.thingiverse.com/thing:21302>



Bio-logic workshop



Maurizio Montalti in collaboration with Sonja Baeumel, Co-de-iT, WASP & Waag Society



Laser microscope

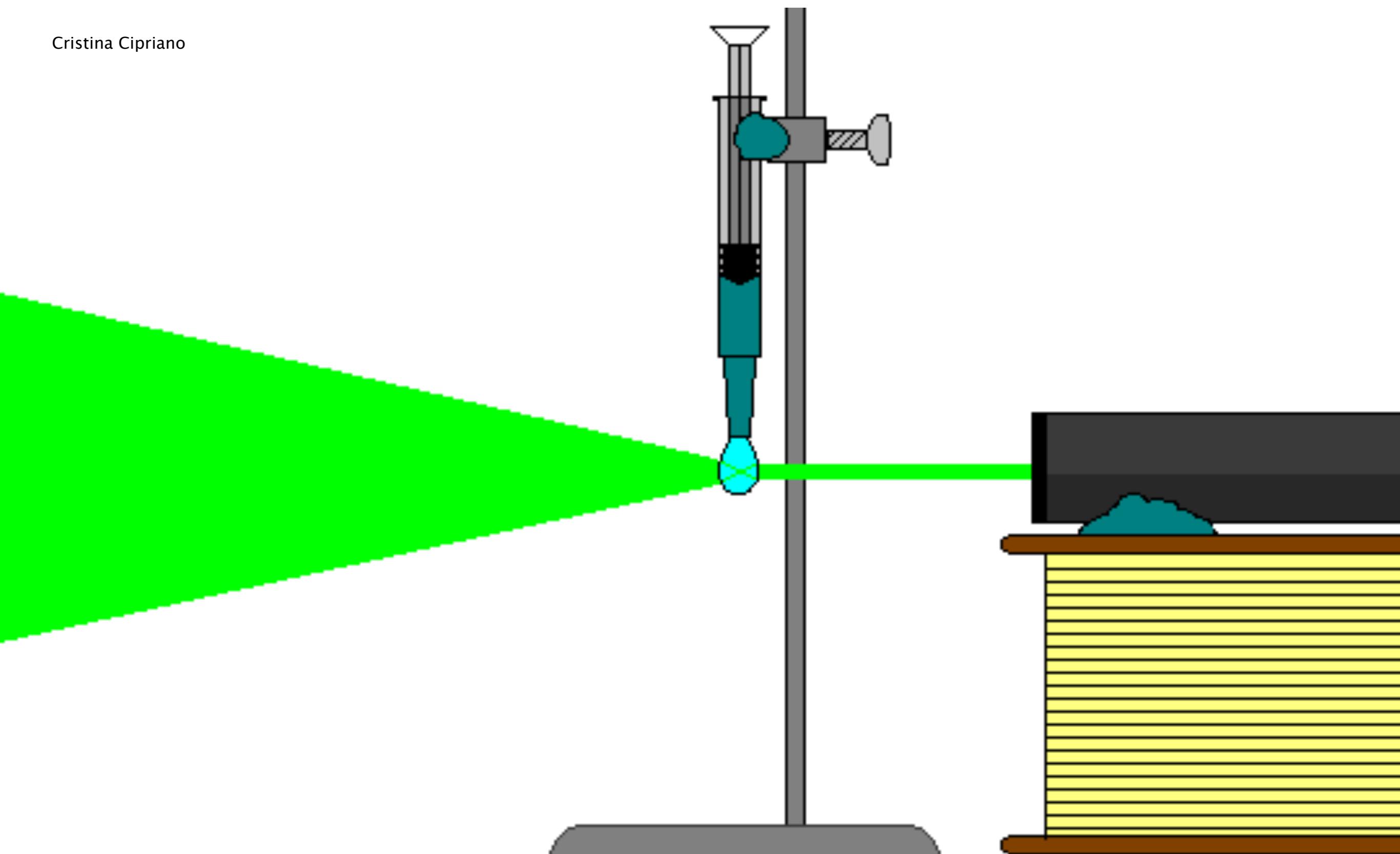
Cristina Cipriano

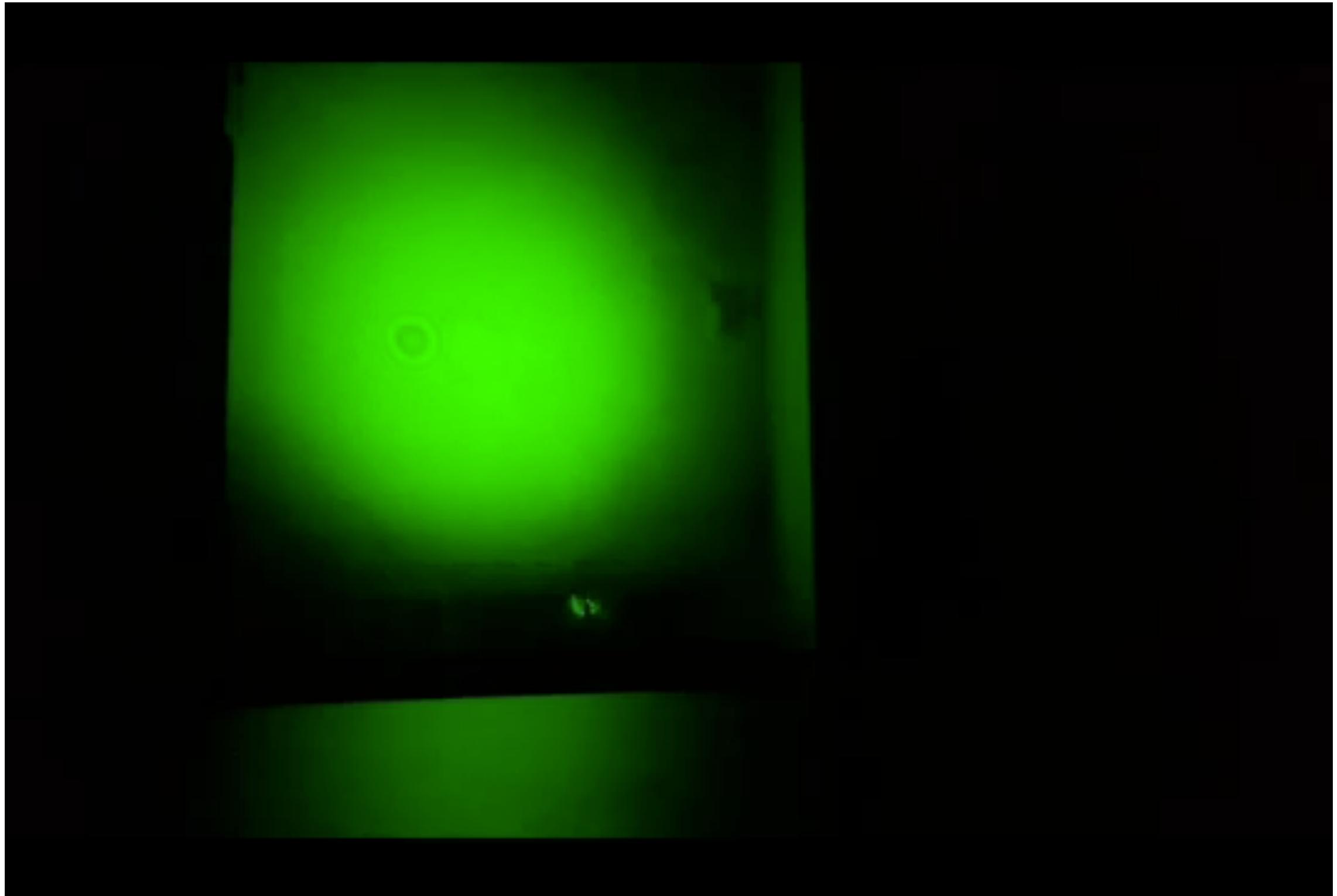


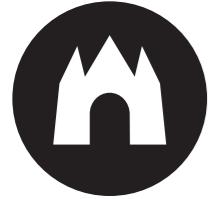
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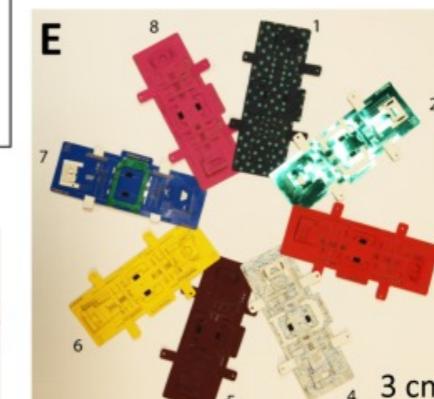
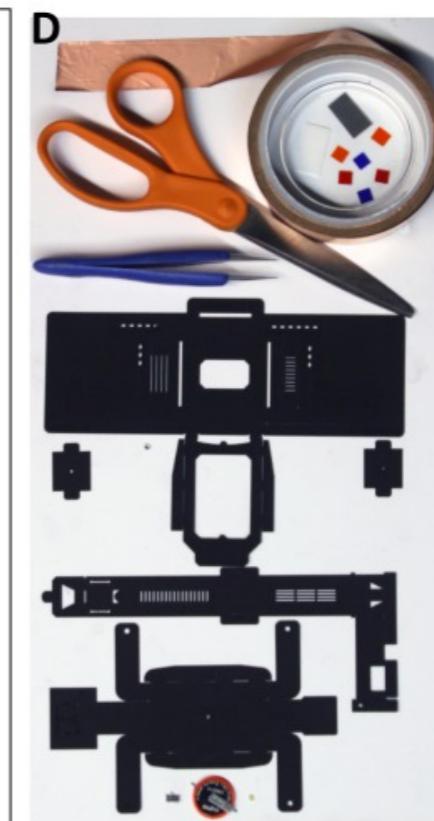
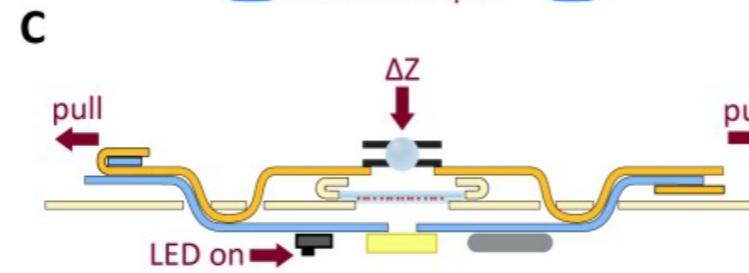
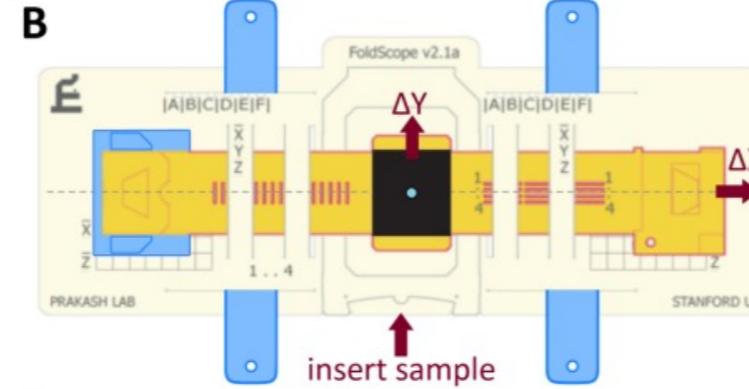
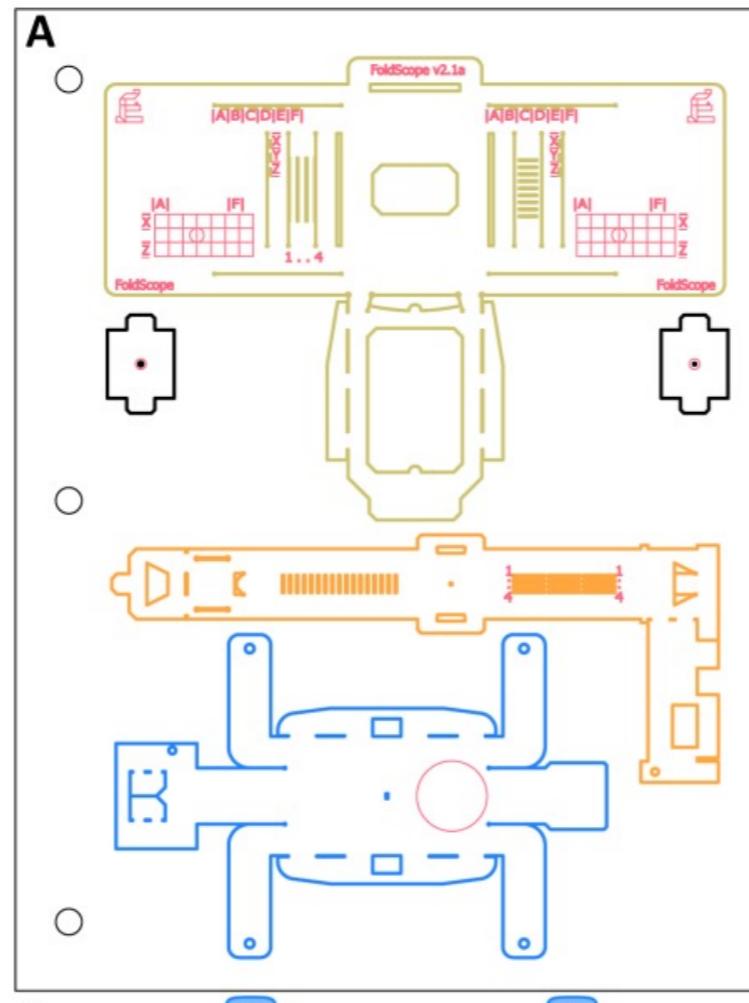
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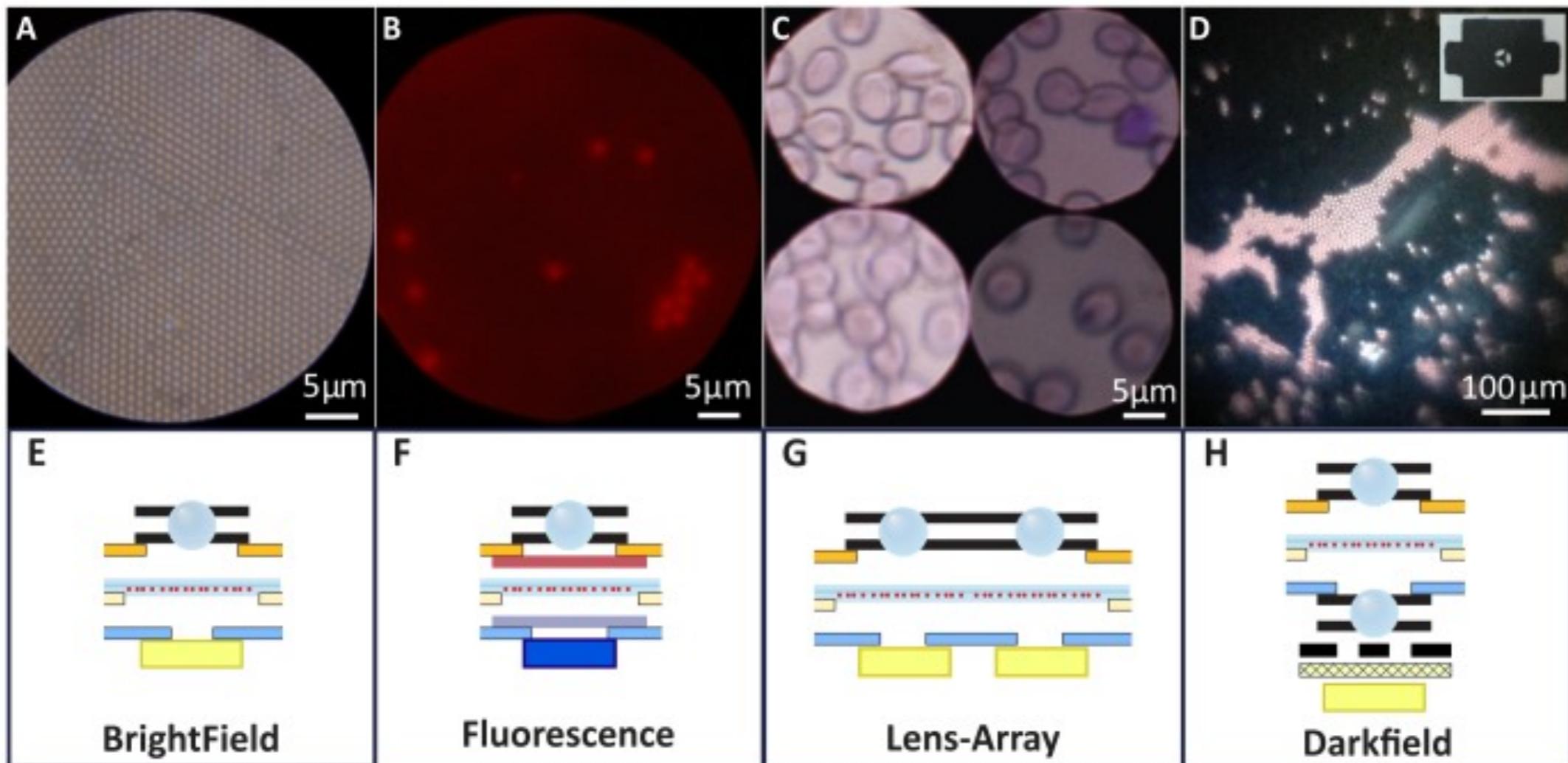






Foldscope







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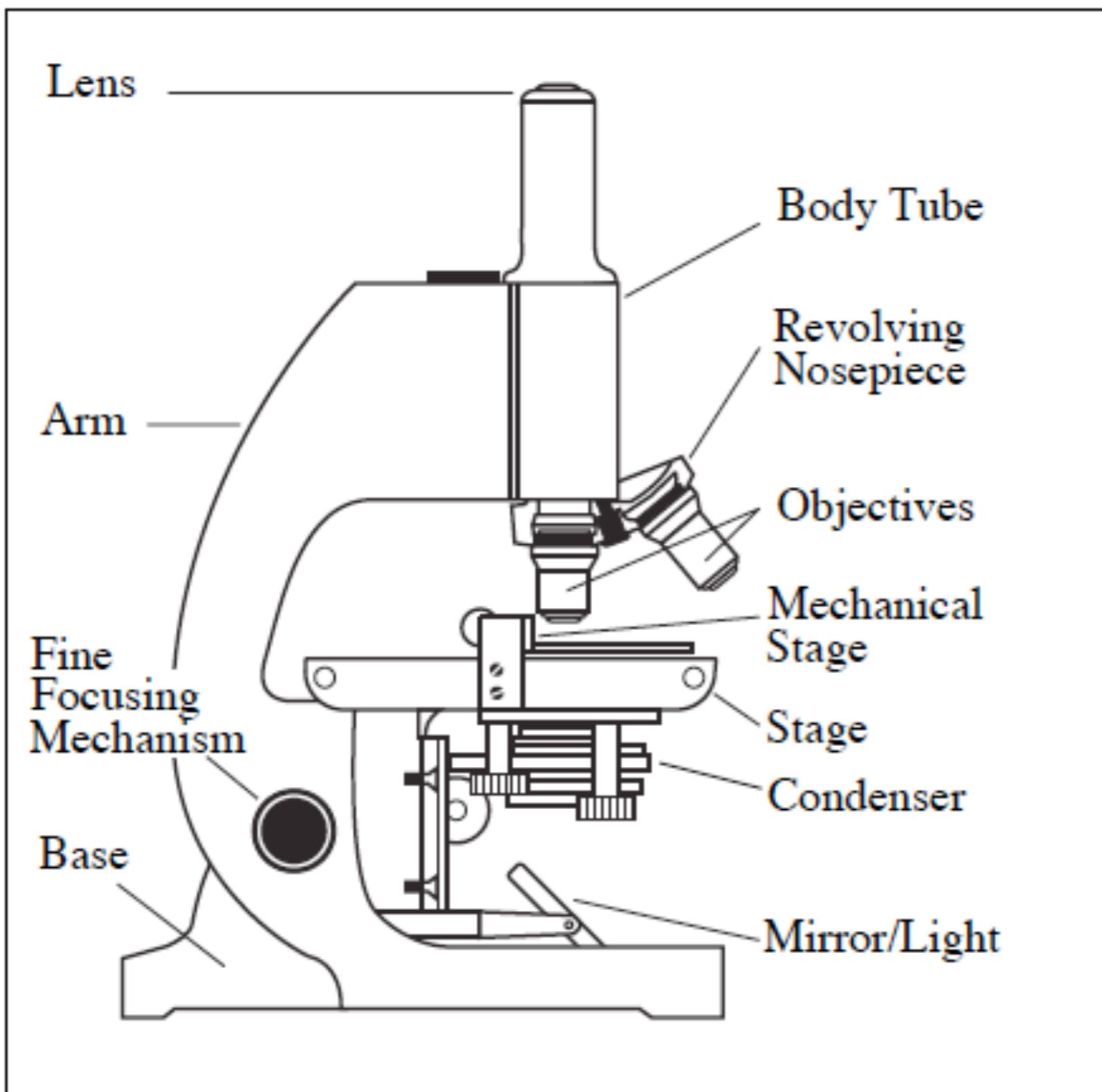
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Practicals



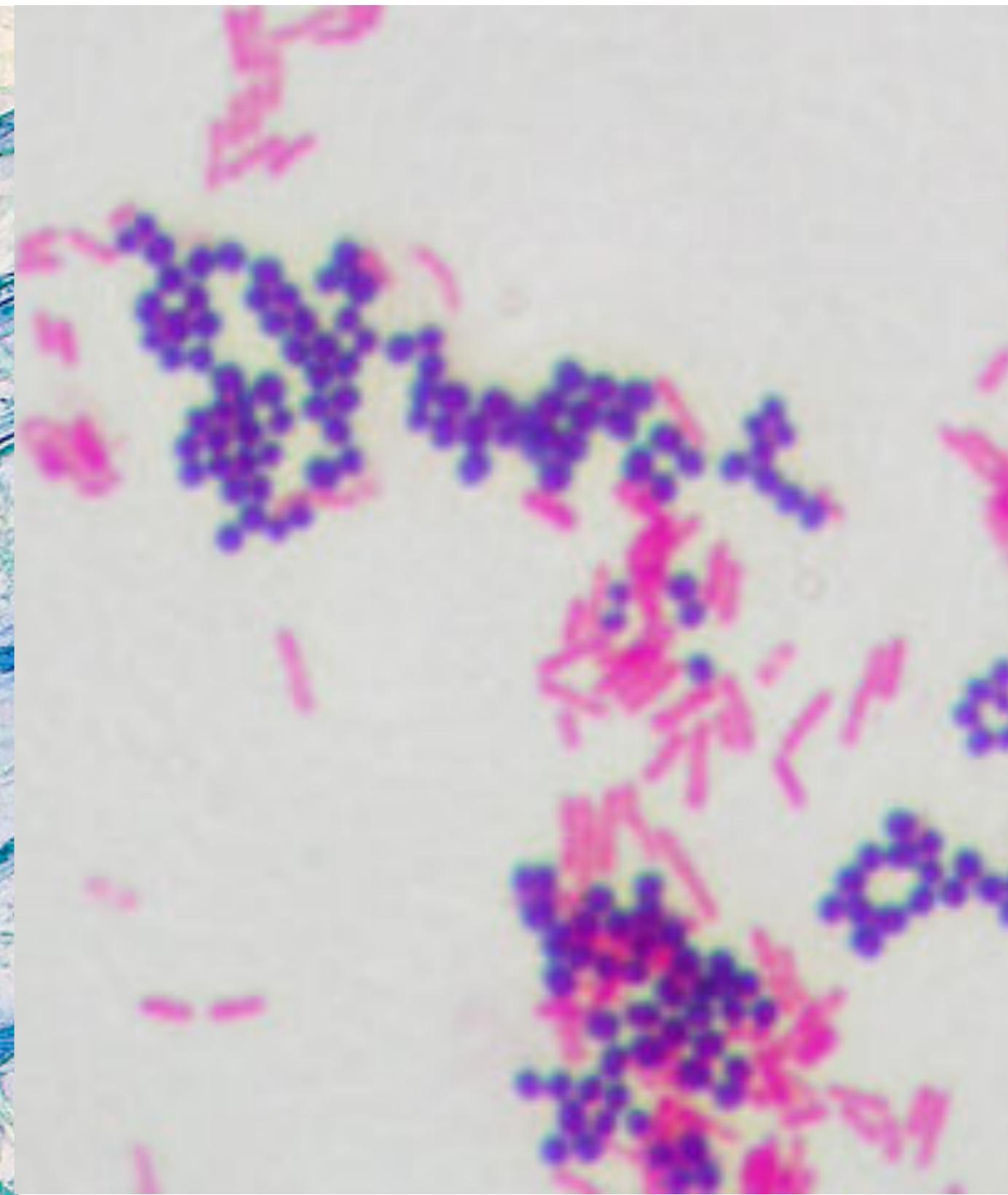
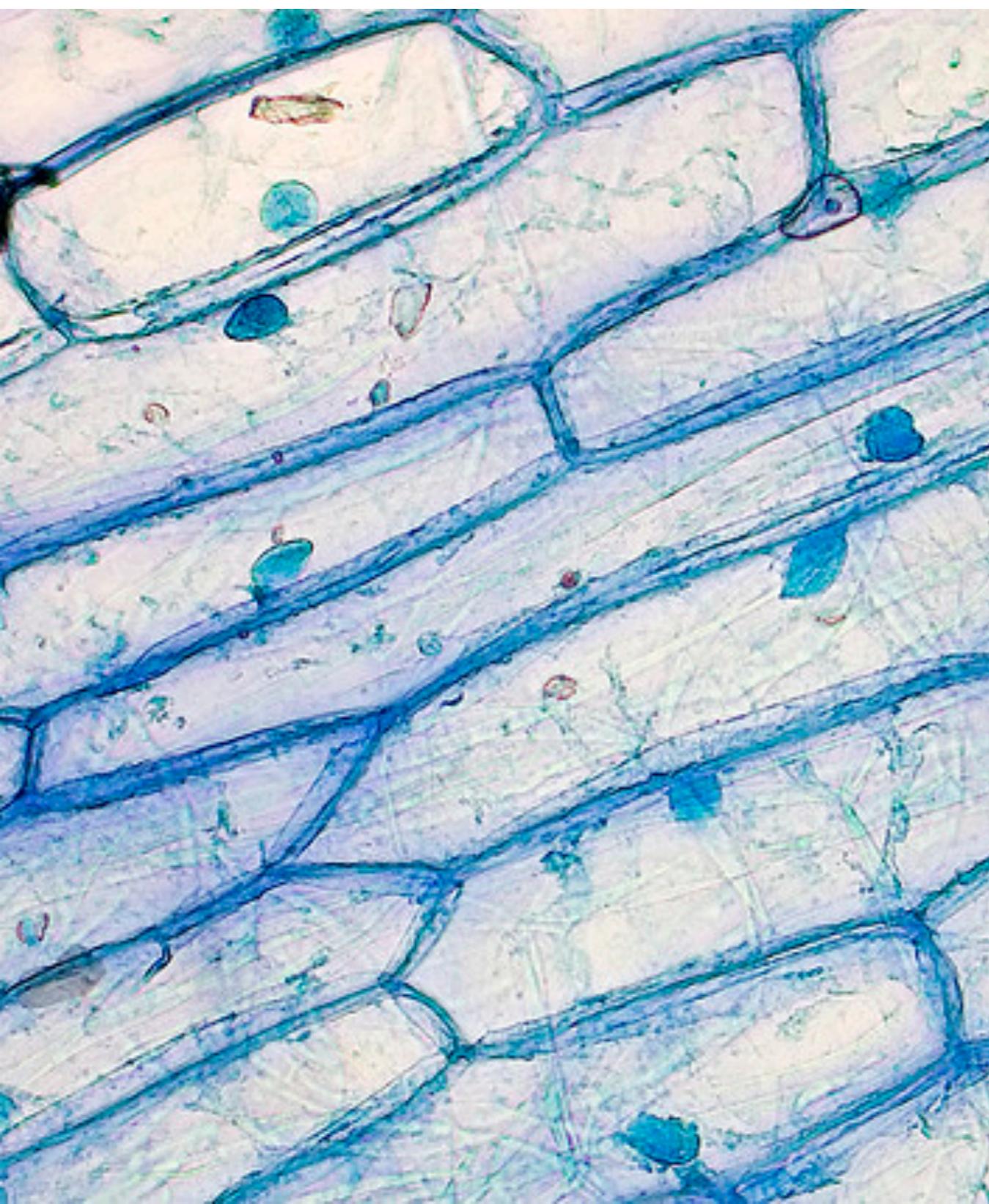
Anatomy of a microscope

You will learn how to operate a microscope





Gram & Loefler staining





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