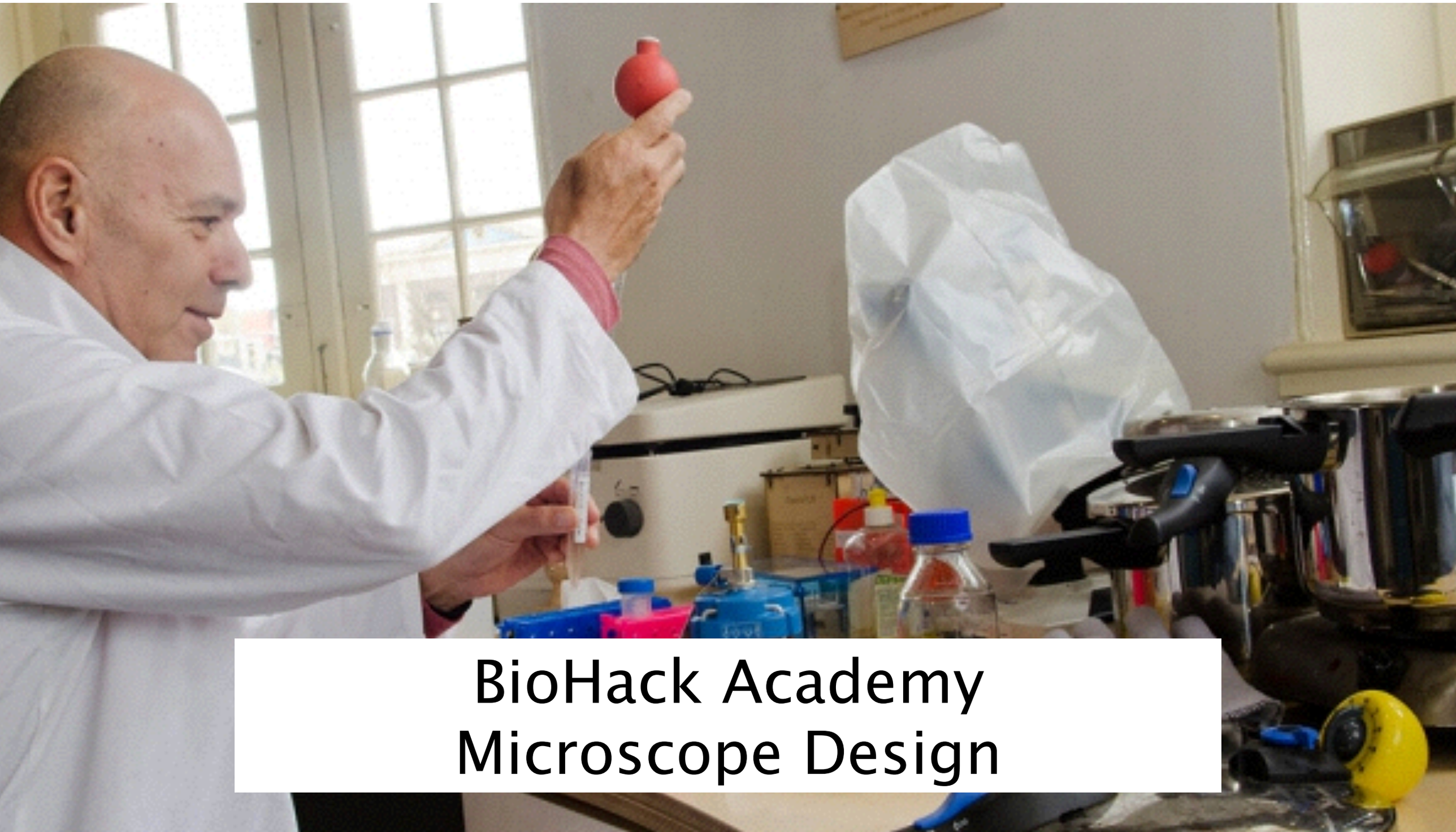
waag society

institute for art, science and technology



BioHack Academy
Microscope Design

Why we need a microscope

- Morphological identification
- Check purity of a culture

Industry Standard

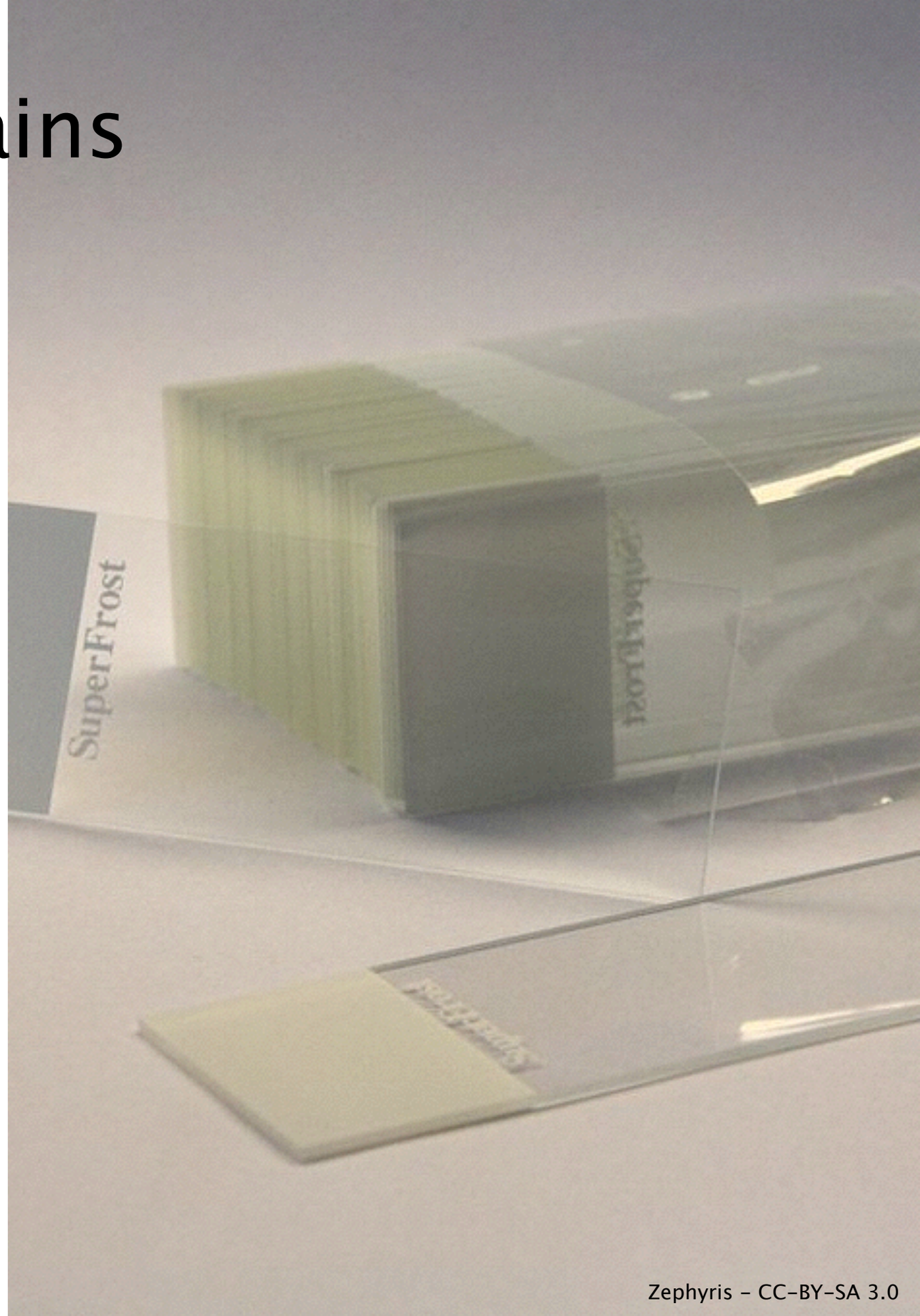
Moisey - CC-BY-SA 3.0

Paul Hartzog - CC-BY-SA 2.0

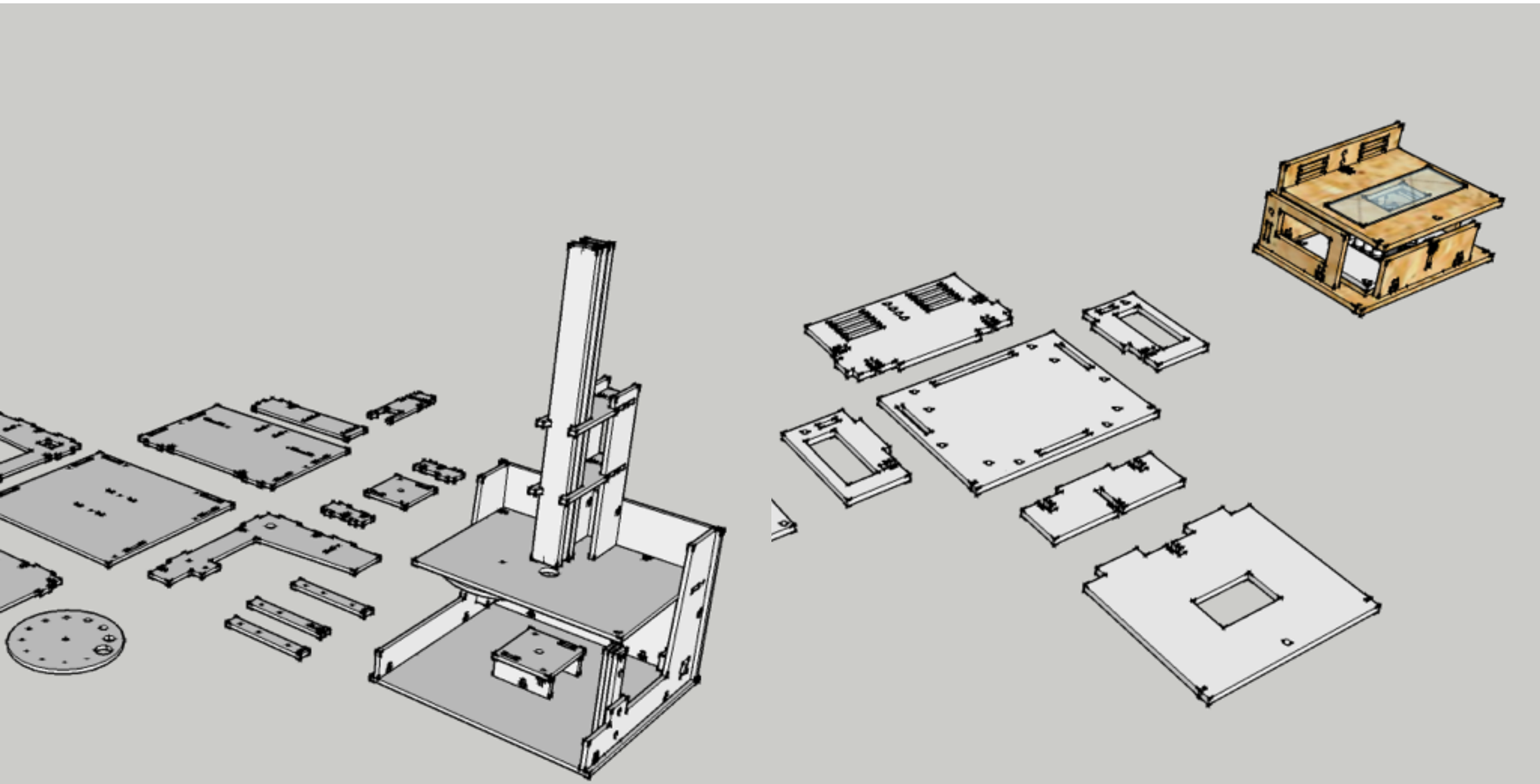
Pixabay Public Domain

Design Constrains

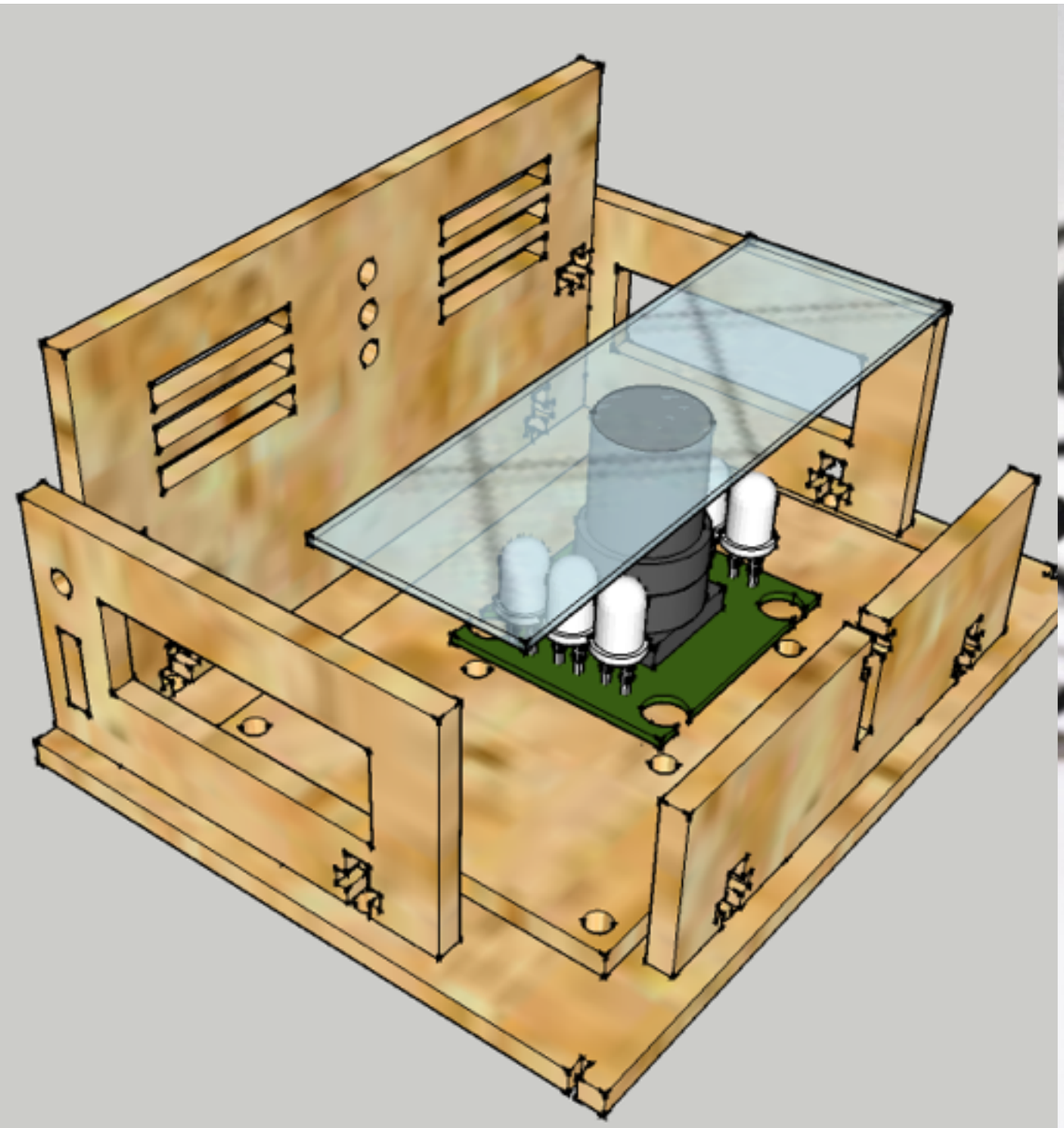
- Microscope slide

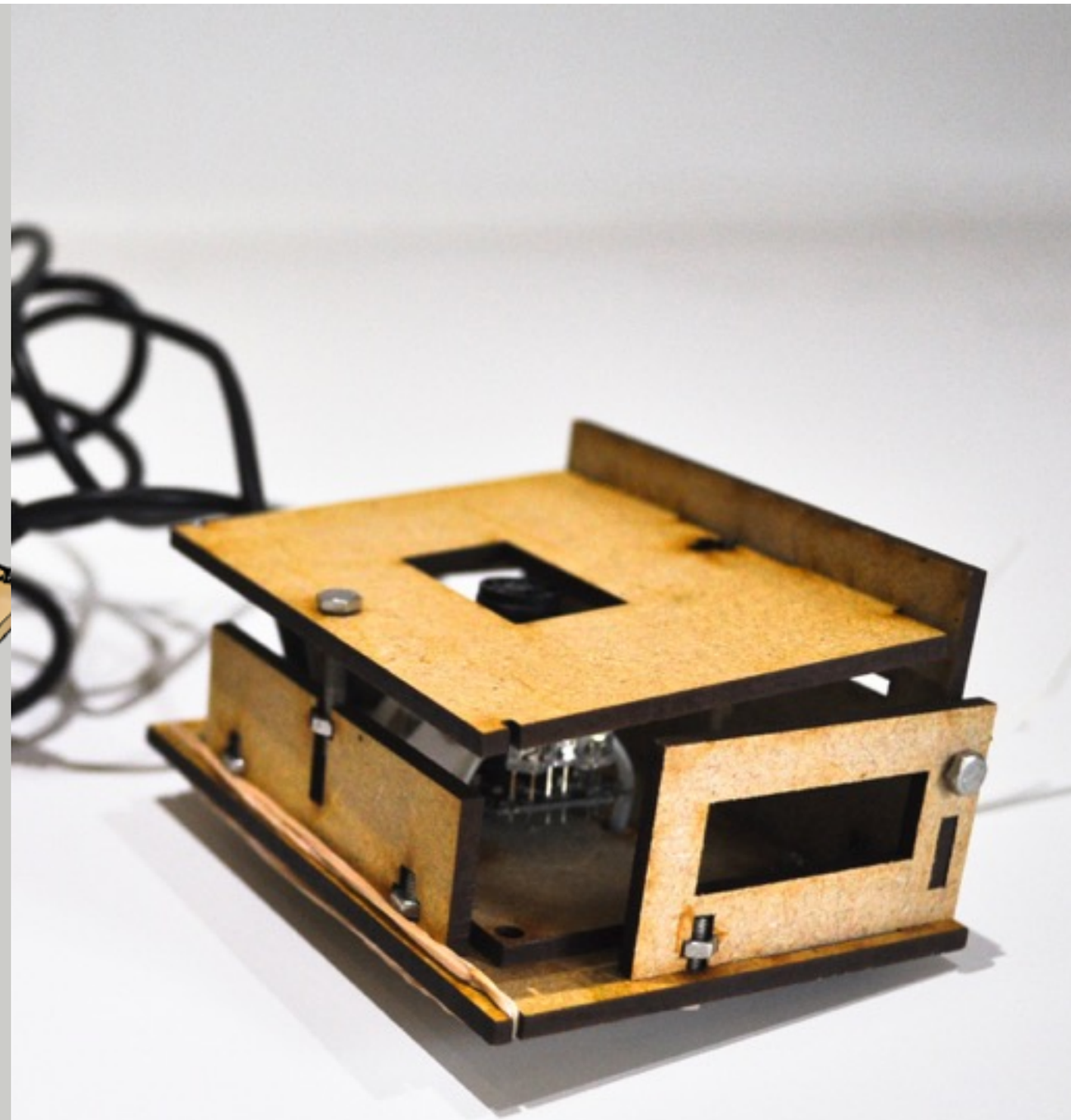


Biohack Academy Designs



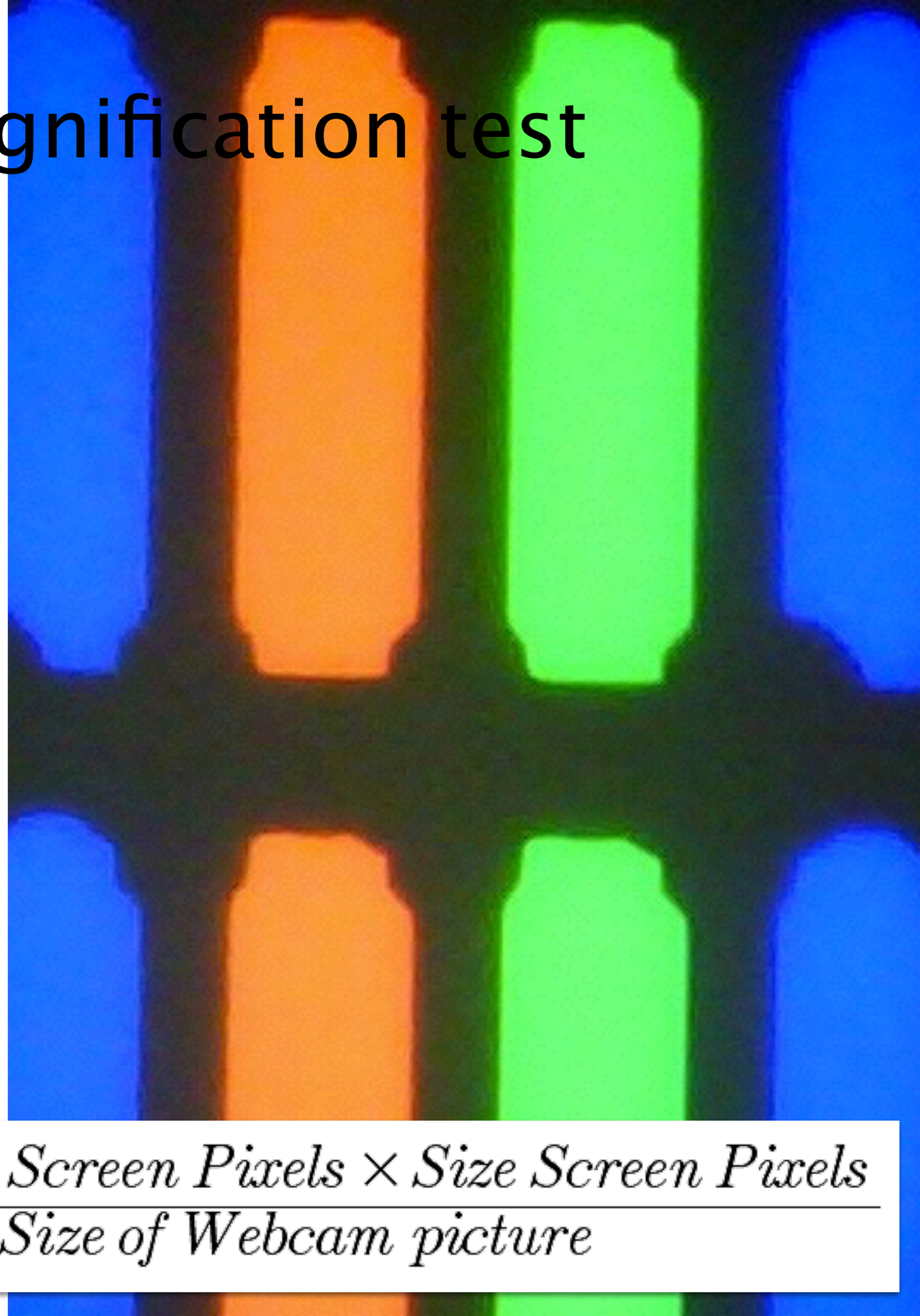
Webcam Microscope





Pixel Based Magnification test

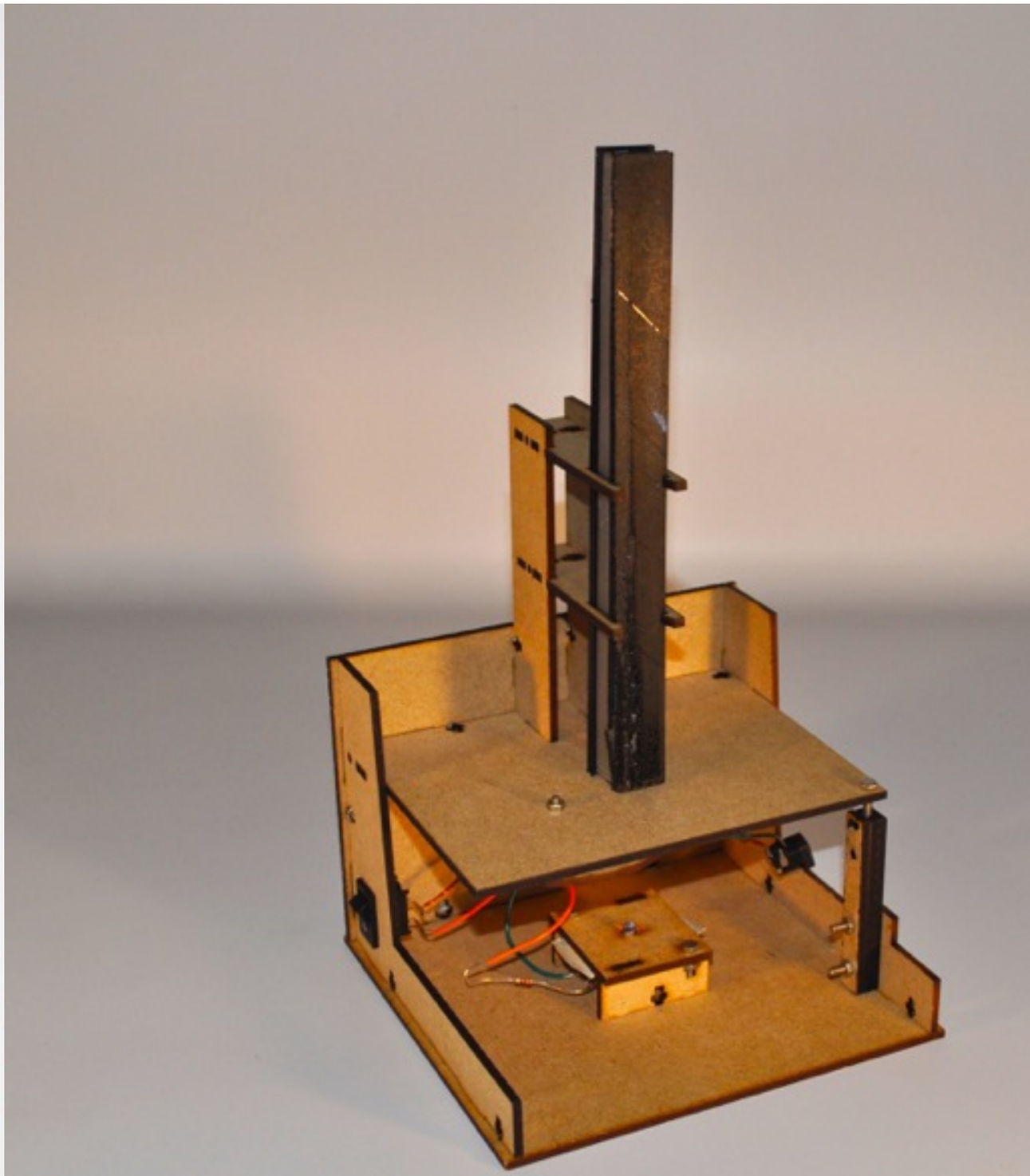
- Take a picture of your screen up close
- Count the number of pixels in the frame
- Calculate the magnification



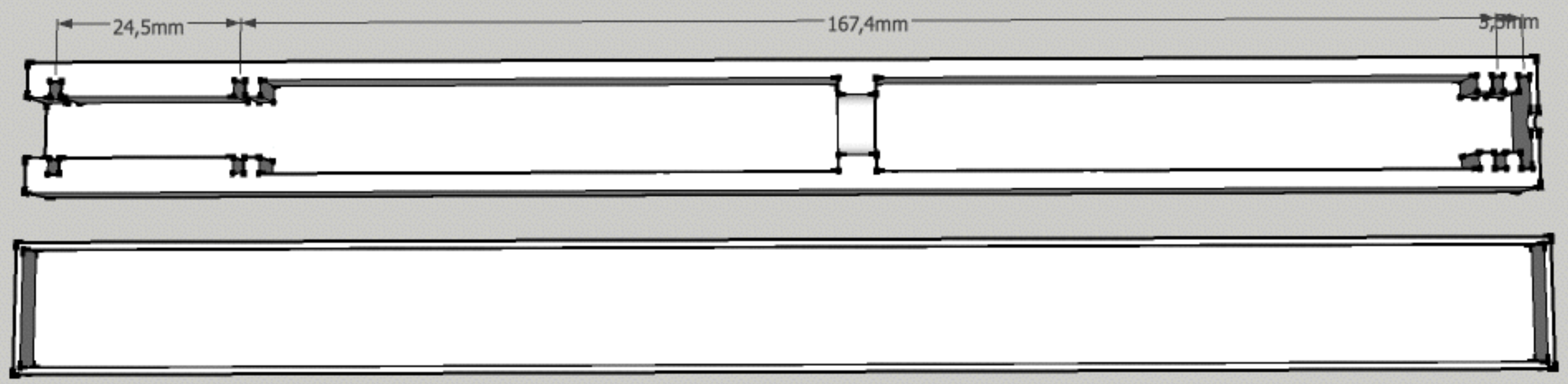
$$Magnification\ M = \frac{Number\ of\ Screen\ Pixels \times Size\ Screen\ Pixels}{Size\ of\ Webcam\ picture}$$

Spirulina by webcam microscope

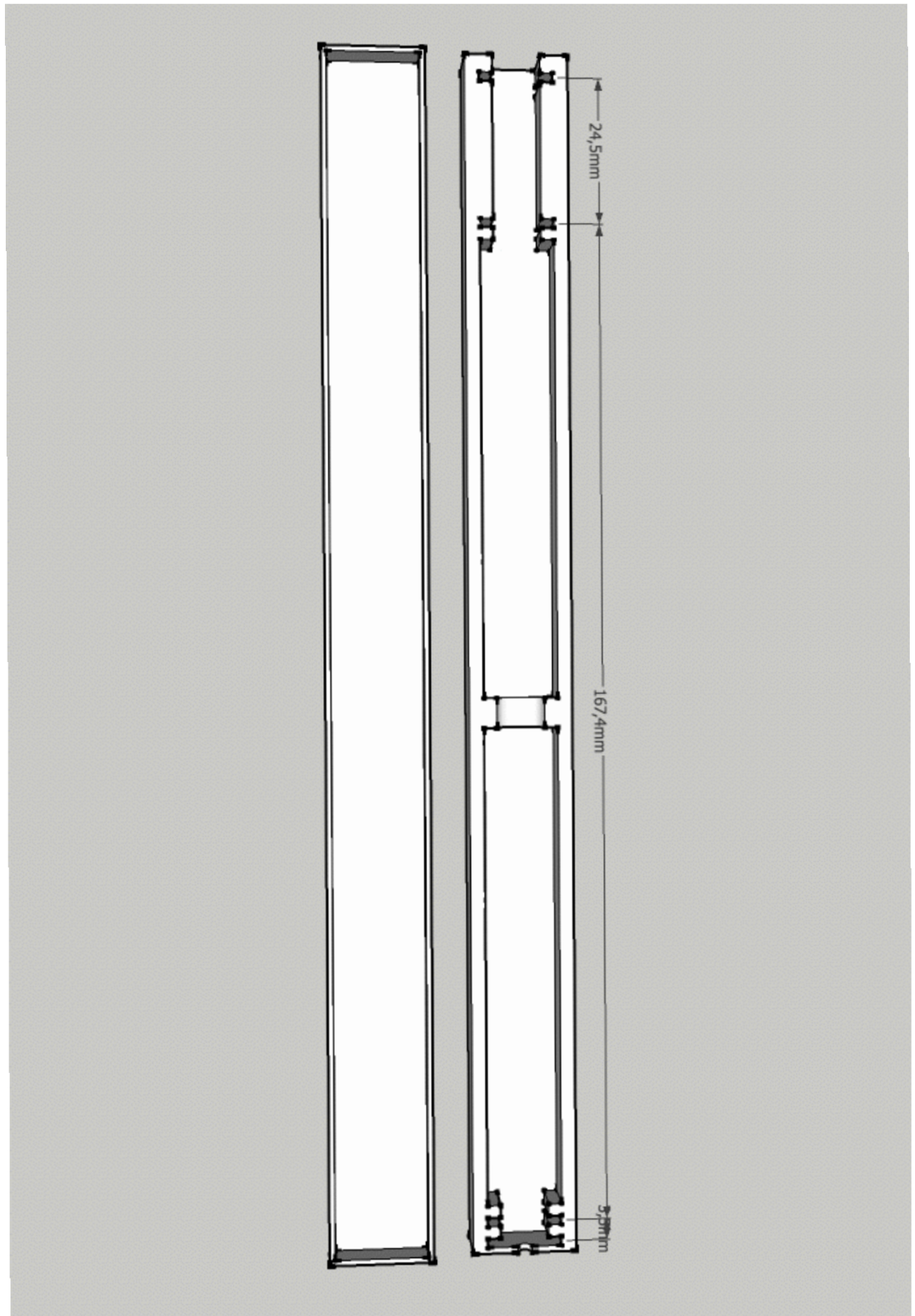
Compound microscope

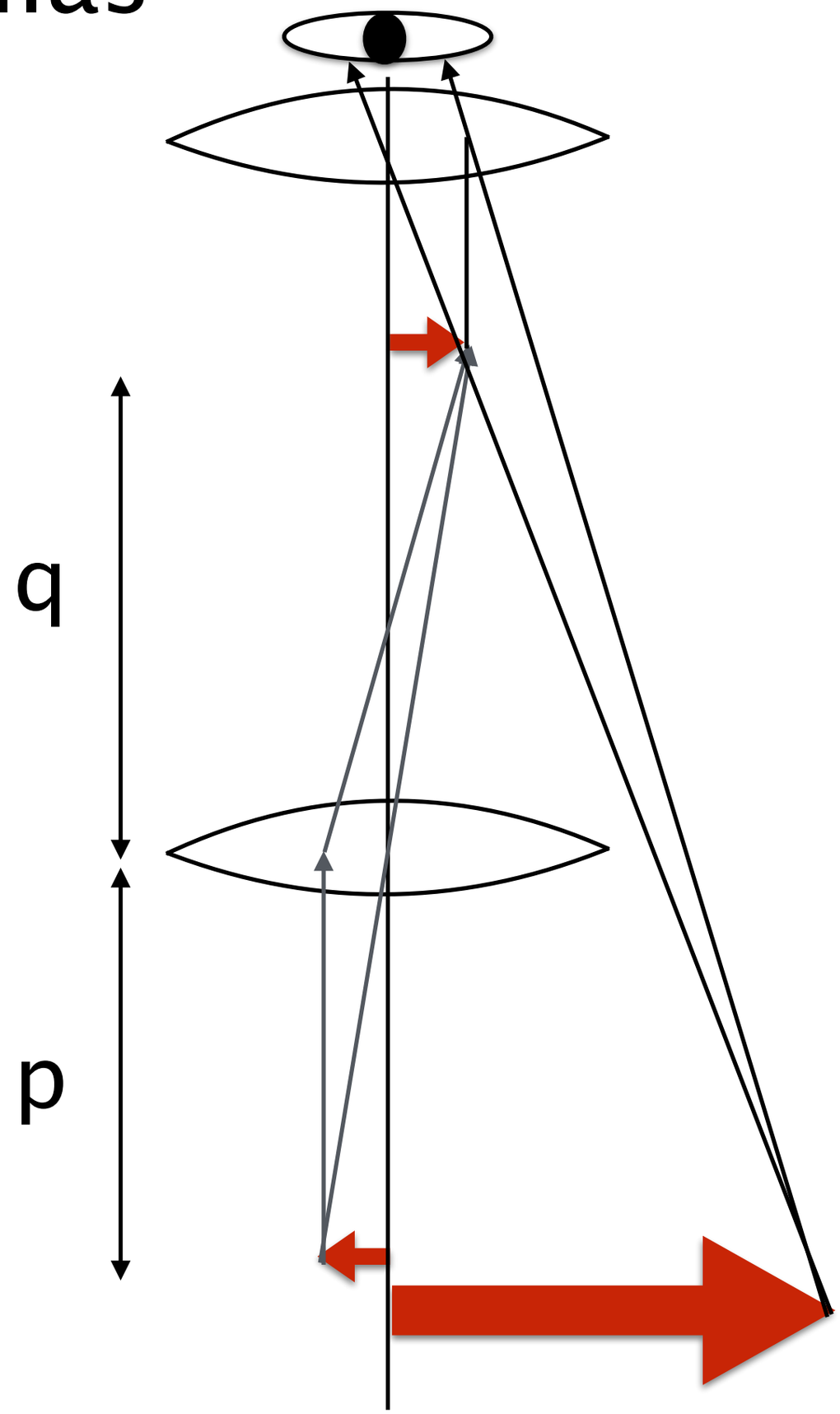


Dimensions



Microscope formulas





Magnification Objective

- Focal length of objective
  - fa = fb = 35 mm
  - d = 3.2 mm
  - fab = 18.3 mm

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

- Objective-specimen distance
  - q = 167.4 mm
  - p = 20.6

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

- Magnification power objective
  - Mob = 167.4 / 20.6
  - Mob = 8.1

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

Magnification Eyepiece

- Focal length eyepiece
  - fa = fb = 35 mm
  - d = 24.5 mm
  - fep = 26,92 mm

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

- Mep = 250 / 26.92
- Mep = 9.3

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

Magnification Microscope

- Mmic = 8.1 x 9.3
- Mmic = 75.5

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

Wiring