



# Homemade microscope



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## What's a microscope?

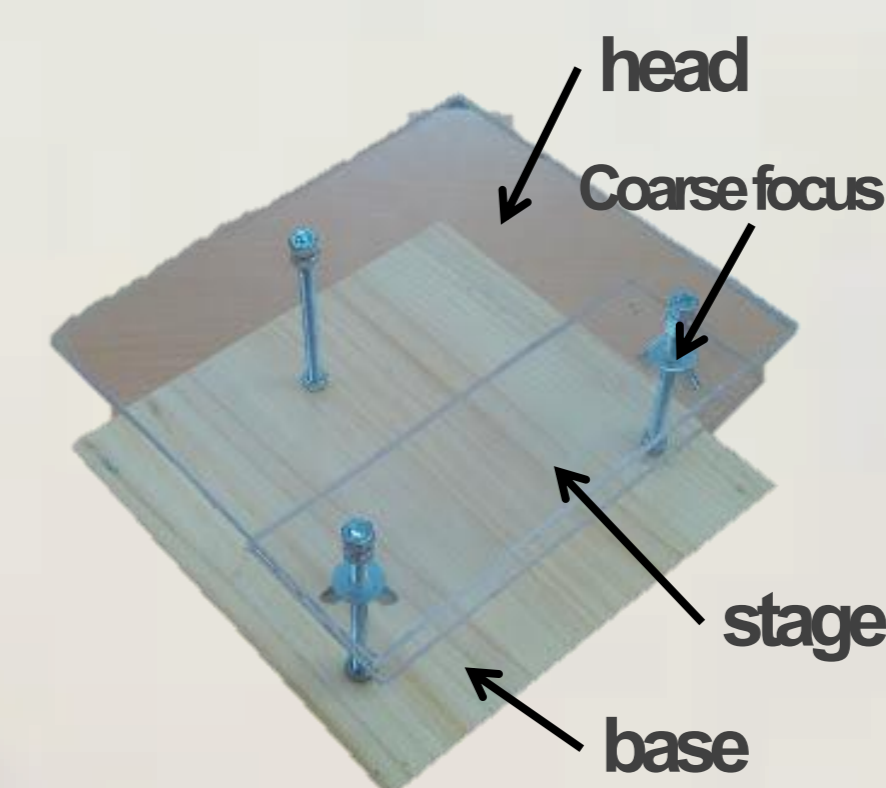
It's an instrument used to see things that are too small for the naked eye.

The difference between a microscope and a magnifying glass is that light comes from different places.

## How can we make our own homemade one?

We need:

- A piece of wood
- Two pieces of plexiglass:  
One the same size as the piece of wood,  
the other approximately one third of the size.
- 3 or 4 screws and a few nuts to fix the plexiglasses.
- 2 wingnuts to be able to move the smaller plexiglass along the screws.
- A lens from a laser or any convergent lens.
- A torch that will be used to light the specimen.



First we begin by removing the lens from the laser. Then we drill the holes in the wood and the plexiglass. Next, we drill a big hole in the wood where the flashlight will go. We need to drill another hole in the large plexiglass for the lens. Afterwards, we start to assemble the microscope; after that, we put the screws in the wood and fix them in place with nuts. We take the smaller plexiglass and put it on the screws, using wingnuts to hold it in place. Make sure it is half way down. We will use nuts on the top of the screws to hold down the large piece of plexiglass. Now we are ready to insert the lens in the hole of the plexiglass. Finally, we put the flashlight in the hole in the wood, fixing it with glue

## Difference between our microscope and a professional one

In a normal microscope there are two tubes called ocular lenses; ours has one ocular lens: the mobile phone.

A normal microscope has 3 kind of lenses and we only have one kind.

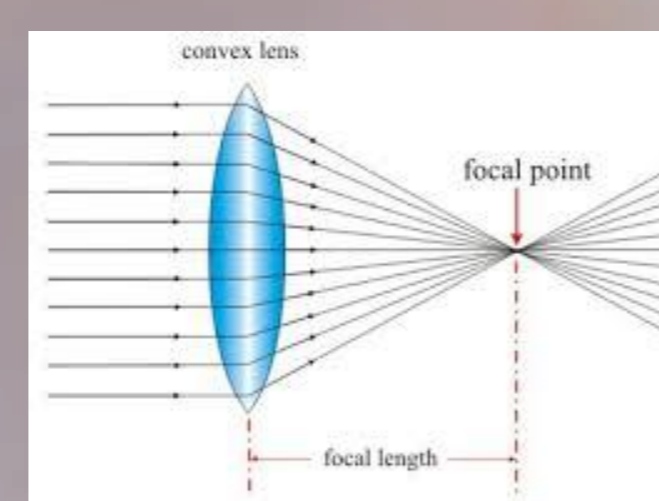
We only have a coarse focus. Our illumination control is the torch.

## How it works: converging lens

All microscopes have 2 converging lenses: the object lens and the ocular lens. In our case the object lens is the mobile phone and the ocular lens is the laser lens.

A converging lens is focal curved on both sides.

This means that light rays coming out of it come together at a point.



We can obtain the magnification of the microscope using this formula:

$$A = \frac{25 \cdot L}{f_1 \cdot f_2}$$

We know that the focal distance of the mobile phone is 3,5 cm and the distance we obtain passing a light through the ocular lens and measuring the distance between the lens and the point we obtain reflecting the light in the wall is 2 cm. We also know that the distance between the object lens and the second lens is 1,5 cm, so:  $A = (25 \cdot 1,5) / (3,5 \cdot 2) = 5$

## Conclusions:

- We can say that this is a cheap way to make a microscope that works well, as you can see in the photographs around.
- We enjoyed working in groups and observing the microscopic world around us!

## References:

- [www.youtube.com/watch?v=KpMTkr\\_aiYU](http://www.youtube.com/watch?v=KpMTkr_aiYU)
- [en.wikipedia.org/wiki/Microscope](http://en.wikipedia.org/wiki/Microscope)
- [www.microscope.com/education-center/microscopes-101/compound-microscope-parts/](http://www.microscope.com/education-center/microscopes-101/compound-microscope-parts/)
- Oxford CLIL Natural Science and Biology and Geology – 1º ESO

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