ioLight magnification tutorial

What is the magnification of an ioLight microscope and how do I change it?

One of the great things about digital images is that they can easily be enlarged. This applies to microscope images and other digital photographs alike. You will often see digital microscopes advertised online with magnifications of x1600, x2000 or even more. This sounds great because conventional microscopes have to be very carefully set up to deliver x1000, often using advanced techniques such as oil immersion.

However, enlarging a digital image to the size of a building will not help you see any more unless the resolution is high enough. ioLight's 1mm microscopes and inverted cell images have a resolution of 1 micron. This means that the smallest dot you can see is 1 micron. However, to see a feature, you need more than one dot, so 1 micron resolution means you can see features as small as about 5 microns if the contrast is good enough. For example, an ioLight microscope will see a red blood cell (about 8-10 microns) but not features like bacteria or viruses, which are much smaller.

We can enlarge digital images of bacteria and viruses to x2000, but that will not help because the resolution of the optical system cannot detect the subject in the first place. It is possible to build microscopes that will magnify to greater than x1000, but this needs large advanced techniques such as electron microscopy.

OK, so what is the magnification of an ioLight microscope?

That depends on the size of your screen.

ioLight's 1mm microscopes and inverted cell imagers capture a fixed area of the subject that is 1mm wide by 0.75mm high. This is useful because our images are always 1mm wide, so you have a built-in 1mm scale bar.

If you view this on a screen that is 200mm wide (like a standard tablet), then the magnification will be x200. Viewing an ioLight image on a 50" TV gives you a much larger picture. A 50" TV is 1,100 mm wide so the image will be x1,100. However, the detail you see on the big screen is not much more than you see on the tablet screen. You will still need a large optical microscope with a higher resolution to see viruses and bacteria.

When users ask what the magnification is, they usually want to know how much detail they will see. We think our 1mm microscopes show about the same level of detail as a x200 or x400 optical microscope, depending on the contrast in the image and the illumination.

Can we increase the magnification?

We get asked this question all the time. Yes, we could design a more powerful microscope. That would need a bigger lens system and a heavy stage to hold the sample completely still. It would be difficult to focus such a microscope by hand, so we would need a focus knob and probably two more knobs to control the X and Y position of the sample on the stage. This is beginning to sound like a conventional compound microscope, and there are a lot of very nice compound microscopes on the market already.

Can we reduce the magnification?

Users sometimes want a lower-power microscope so that they can see a wider field of view. ioLight developed the 2mm microscope for these applications. It shows a fixed area of the subject that is 2mm wide by 1.5mm high. This product is great for counting parasite eggs, yeast cells or cyanobacteria across a larger area. It is also great for 3D subjects such as insects because the 2mm microscope also has double the depth of field.

So, what are ioLight microscopes good for?

ioLight microscopes are robust, small and easy to use. They are already connected to the internet, so it is simple to share images. Here are some typical applications:

Field use for rapid diagnosis

Diagnosing Harmful Algal Blooms on the beach takes a few minutes. Anyone can capture an image of the algae and email it to a lab or run it through the BloomOptix AI diagnosis app. This saves days and cuts the cost of testing. If the water is safe, you can open public axis immediately; if not, you can warn people and pets not to go into the water.

Veterinarians use our microscopes in the field to diagnose gastro-intestinal parasites in livestock. This means they can advise farmers on when to worm their animals and when to stop so that the parasites don't get resistant to the medicines.

Low-cost labs and personalised medicine

Modern medicine is developing cures that are increasingly personalised to a specific patient. They take cells from a patient and modify them to fight a specific disease. They then grow large quantities of modified cells to introduce to the patient. These cells are grown inside an incubator in controlled conditions and need a compact ioLight microscope to monitor them inside the incubator while they grow.

Many other life sciences labs grow cells to investigate the prevention and treatment of disease, wound healing and vaccines. All of these developments can be monitored by an ioLight compact microscope inside an incubator with the door shut to keep contaminants out.

More questions?

Email: **info@nyscopes.com**
www.microscopeinternational.com

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