

# Time-lapse imaging: equipment, set-up, operation & data analysis

a short introduction by  
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Some years ago, you would need to change the film in the photo camera after 36 images. Video tapes could store a few hours of footage at max. Digital photography and fall in prices for data storage is revolutionizing the way how we can use imaging techniques for biological research. Just like high-speed cameras (which take thousands of images per second) time-lapse imaging also opens a totally new view on “what is happening”.

Here I will give a short overview on the equipment, set-up and data analysis options when you are planning on integrating time-lapse imaging into your teaching or scientific work. The combination of practical work (sediment and organism collection in the field, aquaria set-up), technical work (operating the time-lapse imaging system) and computational work (image and video editing) teaches a wide range of skills and can be lots of fun.

## Camera equipment

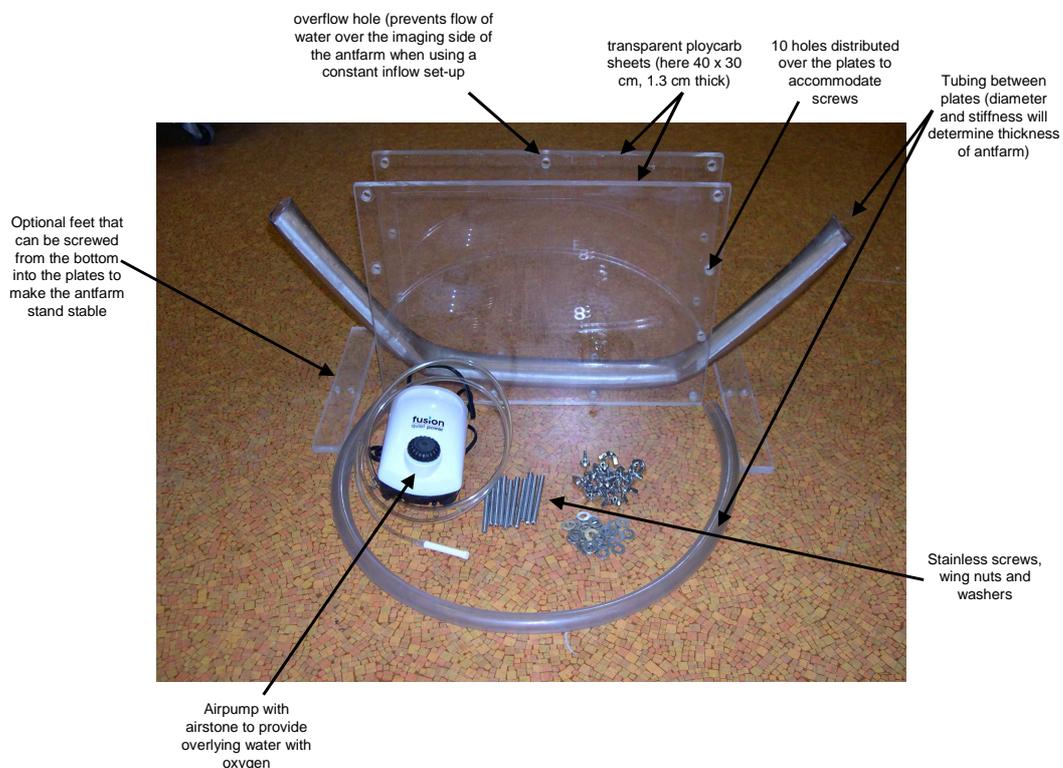
Ongoing rapid change in digital photography and filming will also change the way and ease of time-lapse imaging. Many compact digital cameras have an integrated time-lapse function in their video mode (e.g. Canon Powershot SD 1000 series). However, quality/resolution is often poor (since the camera operates in the video mode) and interval options are often very limited (one image every 1 or 2 seconds for the Canon). Better resolution (1920 x 1080 pixel) have HD camcorders and many models offer full control over a wide range of time-lapse intervals (e.g. JVC HD camcorders). Nowadays there are even very nice time-lapse apps for smartphones.

For best quality we use external triggers (Digi Snap 2000 series, Harbortronics) that make any SLR camera to function as time-lapse camera at any desired interval.

Tripods or adjustable arms (e.g. Manfrotto) are very helpful for camera positioning.

## Aquaria

For many animals the top-down view onto the sediment surface is already very informative (e.g. burrowing bivalves). In this case a bucket will do it. However, when you are interested in what is happening within the sediment, aquaria with transparent walls are necessary. To increase the chance that an animal will be active close to the wall you can either put many individuals into one aquarium. Alternatively you can reduce the amount of sediment that is available for the organisms by narrowing the aquarium, i.e. ant-farm aquaria.



## **Operation**

The choice of image intervals strongly depends on the species and behavior that you are interested in. We typically take images every 15 to 30s over many days. Since cameras will typically shoot as long as there is space on the data card, rather take images at higher frequency – you can use every  $n^{\text{th}}$  image in the analysis anyway.

The best way to keep animals happy is to provide them continuously with new oxygenated overlying water, or by recirculating a large water volume within a closed system, so that the overlying water is replaced every 10 min or so. However this may not always be possible. Then an airpump with airstone should be used to keep the overlying water oxygenated. Since some solutes tend to accumulate in the overlying water, water should then be exchanged manually at least once per day. At the end of an incubation ant-farm aquaria can be carefully opened and burrow structures can be explored.

## **Data analysis**

*Adobe Premiere* is probably the most advanced video editing software for semi-professionals. However it offers far more options than you will typically need. There are many much alternative programs that are available for free and that will mostly do what you want.

*Irfan view* is a very nice image viewer that allows you to scroll quickly through your images. The batch conversion feature also allows you to crop, rename, and/or resize thousands of images in a batch conversion.

*Monkey Jam* allows you to import up to approx. 1200 images and produce an avi movie from your images at desired frame rate.

*Virtual Dub* is a free very nice video editing software. Just drag and drop a video file into the window and you can scroll through the video frame by frame and edit the video.

*Super* is a program that allows you to convert videos to various formats with various codecs.

