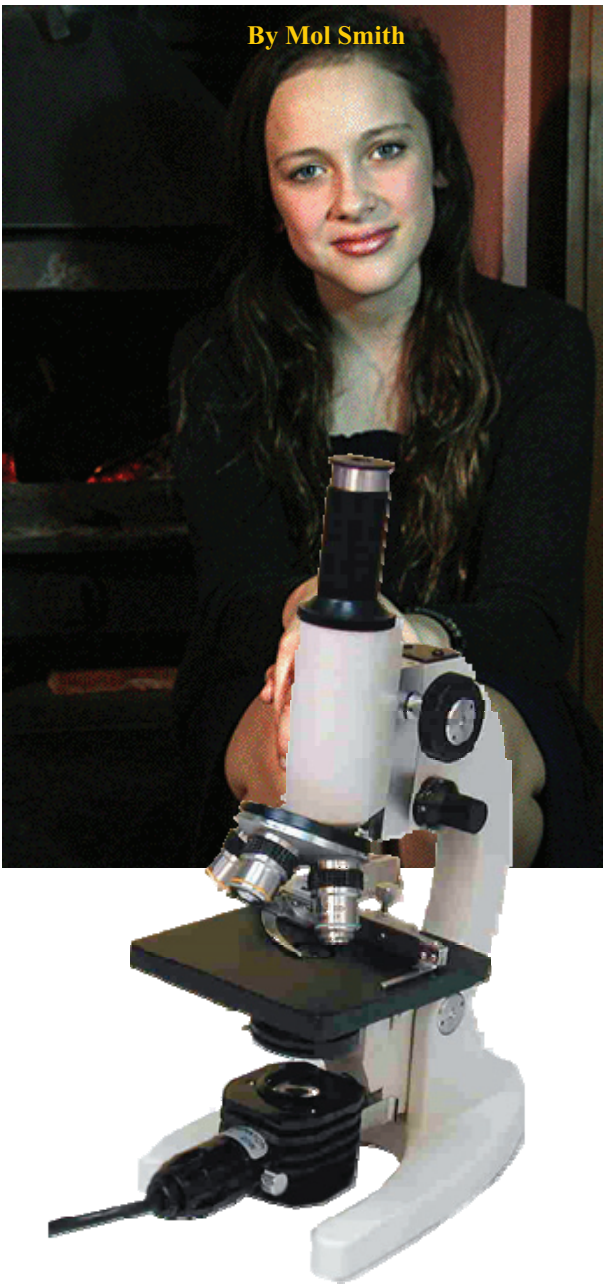
How To Create Interesting Microscopy Movies



Introduction

A video or movie is not simply about recording something you see. I have watched young documentary film makers record nature just by simply point a camera accurately at a few trees or leaves and think that because the focus is sharp, it's good.

It's not. It's boring.

I have seen the same with 'dry' films taken at a microscopy. You can see it all over Youtube: pond life whizzing around, little mites wonderfully filmed etc. etc. etc.

Boring!

The thing is you might be very proud to get to the first stage and actually manage to record anything from a camera on a microscope. You have come a long way to achieve this, but you are now catching up with what a lot of other people are able to do. How do you move ahead?

You have to want to tell a story and engage your audience with you. This is a very powerful thing to do. You educate, you teach, you entertain, and you connect with other people in the world.

Wow! That is better... a whole lot better than not sharing and just doing something on you're own.

What we do as individual people grows more significant when we engage with others.

This article comes from my work with Pippa—a very real young woman—and combining her wonderful optimism with our joint skills at the microscope. I love making films but I believe you need to think about what you do and have an aim, and know tha aim in all that you do.

So, have a look here at an extract from my book and consider how to make better moves of Macro or Micro subjects.
http://www.imcroscopy-uk.org.uk

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Making Microscopy Movies

I remember a time when there were no videos on the internet, now it is full of them, and most of them are poorly made. The worst being the many microscopy related videos on youtube. People, thinking they are now film-makers, stick a camera on a microscope, set it running and record the least inspiring and least informed tripe possible. Yes. There are exceptions. But they are few.

If one wanted to make a documentary film say, about people going to work in the morning in a city, sticking a video camera pointed at a railway or underground station entrance and turning it on for 30 minutes does not a classic make. What it does do however is transfer utter boredom to the viewer and probably an immediate rejection of anything to do with that topic.

I make full length feature films, short narrative movies and the odd microscopy documentary. Making a 'proper' film requires many skills and a desire to tell a story well. There is no reason to think the same skills required to make a narrative or documentary film about things in the normal world do not apply to the drama under the microscope, because it does. And just like a normal film say, about travel, requires a good camera operator, a film with content recorded at an optical microscope needs a good amateur microscopist.

David Attenborough is renowned and respected for his Nature films. Go watch one and see how the structure educates and informs at the same time. He uses drama too, often depicting the competitive nature of living forms to survive, hunt, avoid predation, and reproduce in a world where all resources have to be fought for and won. Any amateur microscopist today making a good movie for either the web or broadcast TV—and now we all can as HD cameras are cheap—will stand out from the crowd and make a name for themselves relatively quickly.

How to make a great microscopy or macro movie—introduction

The first thing is to decide what topic or subject you think you might make a film about. You don't need to think of a story yet, just the subject. Let's assume you decide to make a film about Desmids, or Rotifers, will it be a generally aimed documentary—one which just introduces rotifers, say—but not go into a lot of detail. Or, do you wish to make a film about a specific type or types of rotifers?

A topic which might appeal to a maximum audience would be the microscopic world of pond-life, but that alone would be a vast subject to cover in a single film, even if the film were an hour in length.

The next problem you have is in realising that whatever subject

you wish to cover, you are going to have to get specimens to film, and you are not going to know in advance how they are going to behave when you film them. Rotifers eat, get eaten, give birth, interact with other life forms (in basic ways). You won't know in advance what you are going to be lucky enough to record!

What other resources might you use to 'liven-up' your film? There is sound, music, sound effects, and dialogue—all important and fairly obvious. You can use on-screen labels, split screen content, 3D model animations, a human being talking to the camera... all elements which will help make your film stand out from the rest.

I've been making a series of films to introduce young people (and new adults) to the wonders of amateur microscopy. *You can watch them free online at:*

http://www.pippasprogress.net

Learning by example

The best way to show you how to make a good microscopy-related video is by working through one of mine. This may help you realise the issues involved and the best ways of solving them. My video series employs the young lady Pippa to help create interest, and my videos introduce ideas and thoughts (apparently hers) not directly related to microscopy study per se. Your videos may be more about what's under the microscope, but the same considerations I had should be what you should also bear in mind. I will discuss the hardware side—cameras, sound recording, editing as I go.

Right then, maybe it would be best to get online and watch this episode of Pippa's Progress: **PIPPA'S PROGRESS EPISODE 3.** You will be able to select it from the web address above. It lasts fifteen minutes or so.

Before you start making your video—planning

The first thing to learn is this: all the video clips she shows you under the microscope, I already filmed before Pippa arrived to make the film. What I did is went out and took specimens from streams and ponds, and after looking at what I had brought back, filmed some of them. It was not summer or warm when I did this so it wasn't the best time to collect freshwater specimens. In fact, what I found I had collected was not the best choice. However, this video was not really intended to go into a lot of detail. I hoped to aim it at instilling enthusiasm in the viewer to have a go at what my star Pippa does.

This is important. You need to try and understand what your objectives are: just entertainment, pure education, a mix, a 'wow'

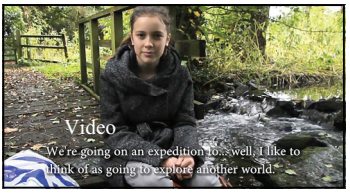
factor, and... is it drama, informative, can it be edited together properly so all of the parts will form a whole to achieve your objectives? In this episode, these were my **starting objectives**.

1) Ensure Pippa is central to the film so that other young people are encouraged to emulate her.
2) Show that freshwater life microscopy can involve pleasant days out in pleasing environments.
3) Show you don't need top notch equipment and if things go wrong, you can improvise.
4) Make sure it's not just a jolly day out. Show tthat she planned well and brought things with her, and she's adhering to basic scientific recording principles.
5) Ensure safety is maintained because people (parents) are over-sensitive to that despite the real minimal risks involved.

It's important for you to see how I establish these in the first *one and a half* minutes:

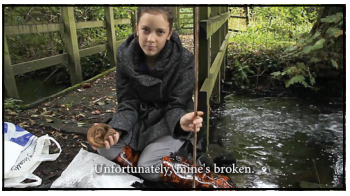
Objective 1:

Stills of Pippa first, with appropriate music to set the mood.



Objective 2:

Cut to a video clip of her in that nice place—by a stream.



Objective 3:

Show she doesn't own a proper net but she is going to improvise and have a go anyway.

Objective 4:

Pippa must show what she brought with her and why. She does things properly and logically.

Objective 5:
Gloves and clean water were also brought along to avoid any risk (slight) of infection.

The next thing to understand is that only after knowing what I had filmed under the microscope, could I start to derive a rough structure to use for a script. This is an odd thing to do for a film maker because normally, if making a feature length thriller and scripting it yourself, you would write the script first and then start filming. With microscopy filming, it is not so easy. One has to know what core material (video taken at the microscope) you were able to obtain first. It would be no good putting in a section on rotifers giving birth if I had no video of that to show it.

Writing the script

A script is a both a guide for you and anyone helping you to create your film. By writing one, you can order your thoughts, plan out what you need and when, and see what you need to do for each bit of filming. Sometimes, when you actually shoot your movie, things don't always go to plan. You can adapt any changes you make back into your script in pencil so that later, when editing the film together from all the clips, you have a reminder of the change made on the day. I've lost the script I wrote for Pippa's Progress Episode 3, but I still have the script for episode 2. A sample from it appears on the next page.

The action is divided from the dialogue. Anyone speaking has their dialogue clearly separated and cantered below the speaker's name. This helps the actor/speaker identify anything they need to learn to say and helps the film maker ensure nothing is omitted during the filming. I use a scripting editor but you can write your script using a simple text editor. Just remember to format it similar to mine so it's clear for everyone to follow.

Sample of script for Pippa's Progress Episode 2:

She points at the stage.

PIPPA (CONT'D)
Anything you want to look at goes on the stage.

She picks up a slide and places it under the clips.

PIPPA (CONT'D)
You move the stage using this control. (*She does it*). It takes a while to get used to moving it because when you look down the microscope, it appears to move in the opposite direction to what you expect.

She clicks on the under-stage light.

PIPPA (CONT'D)
This light shines up through the specimen you look at. Most of the things you put on this microscope will be transparent. You need to shine the light through it to see anything.

She turns it off. She turns on the top light.

PIPPA (CONT'D)
This light, you use when the thing you look at is not transparent. You will see which one to use when we start looking at stuff later on.

SHE LOOKS UP AT US. She looks concerned...

[Silence]

She smiles.

PIPPA (CONT'D)
Maybe, it'll be more interesting if I show you how to use it by finding something to look at and how to...

Drama

No-one wants to sit down and watch a rotifer 'munching' away for half an hour or listen to 15 seconds of a droning monologue and 29 minutes and 45 seconds of whatever else is going on in your room when filming. Use close-ups (remember to exploit different levels of magnitudes when filming at your microscope), and inter-cut to other material—diagrams, easy-to-understand and interesting analogies—to liven up and enhance viewer interest.

So, a main video clip of a rotifer eating might go something like this when scripted...

Rotifer seen with cilia swirling in the water (low magnification).

SPEAKER (V.O)
Rotifers use their cilia for both locomotion and to draw food into them.

[CLOSE UP]: Cilia movement.

SPEAKER (V.O)
The spinning cilia create strong micro currents in the water.

CLOSE UP]: algae being caught up in the current with some missing the mouth and some being swept in.

[PULL BACK—LOWER MAGNIFICATION]: Whole rotifer. Foot anchored to plant of surface of glass slide.

SPEAKER (V.O)
The rotifer has a foot which it can use to anchor itself when feeding.

[CLOSE UP]: The rotifer foot.

SPEAKER (V.O)
The foot can be one of several designs.

[SPLIT SCREEN]—Small stills to right of main video showing different types of feet.

SPEAKER (V.O)
The foot may be one with toes to grasp

plants to so the animal can anchor
itself, or it may be a type which
adheres to surfaces through a substance
secreted from a cement gland.

[CUT TO]: Rotifer jaws. Close up of algae being mashed by pounding jaws.

SOUND EFFECT: water rushing. Dull thumping noise.

SPEAKER (V.O)
The jaws of the rotifer consist of two
powerful hard pieces of material
which pound together...

[CLOSE UP]: Algae caught momentarily in the closing jaws, mashed. The jaws open, the flattened algae is swept further inside and ingested.

SPEAKER (V.O)
...mashing any unlucky algae
before final ingestion.

You can see from this how I would use cuts between close-ups and whole view shots, paced and matched with the information provided by the speaker's dialogue, to maintain a sense of action and continuity. We are used to quickly changing viewpoints when watching videos and films, with each new generation of people seemingly able to master an ever faster change of pace. Quite simply: people get bored very quickly if the film remains static.

Abbreviations used in the script are standard:

(V.O.) = Voice Over.

Recording equipment—visual recording

At the microscope itself, you can use the same equipment—camera, attachment adaptors—as in *Chapter 8. Contemporary Digital Photomicrography s*o long as any camera used can record video as well as stills. If you intend to show your film on the Internet, you should try to use a camera which can record at 24 or 25 fps (frames per second) at a definition of 1280 x 720 pixels. This will provide good resolution and

good streaming capability. If your camera can record at 1920 x 1080 pixels, better still, and you should record at this higher resolution. With this format, your film can be broadcast on television, or included in a BlueRay disc or HD DVD. You can down-scale it to 1280 x 720 for web streaming.

Alas, if your camera cannot produce these sizes then you have to go with what you have. We are all limited by our budgets with regard to equipment and resources. Lower sized videos can be scaled up using relevant software or editing packages but they will suffer from a varying degree of empty resolution and pixilation.

Macro-photographers will use similar cameras with installed macro lenses or adaptors but they have a different set of issues to resolve. It's not until you try videoing a bee taking pollen from a garden flower that you discover a slight breeze is your worst enemy. Flowers sway in the moving air—your bee along with it. Only a slight movement to and fro can take everything out of focus and back in again... to and fro!

You have to be creative and imaginative. For example, you can shoot film further away of bees flying over many flowers, and then cut to one close up in full macro. The one you cut to of course will have been positioned somewhere (picked and set up) by you earlier. You might have tied it to a garden cane to keep it from swaying, and just ensure you don't catch the cane on film so the illusion that the flower is part of the rest is maintained.

Recording equipment—sound recording

If you are going to record sound from the external environment, bees buzzing, birds singing, or streams rushing by, you need a good microphone or a separate sound recorder. Using camera microphones for recording audio for videos of macro and microscope work is not really a workable option. All the fussing around the camera focusing it means it will be recorded, and end up as unwanted off-putting noise.

You can plug external microphones into some of the digital cameras. I found the best solution though is to use an independent recording device. The one I have can be put on a tripod or a pole which is required to record someone walking around talking. The only issue then is you have to synchronise the sound recording from that device with the video footage later on to achieve a final video. This is normally done clip by clip rather than a whole film in one go. This is only necessary for recording someone speaking when they are on camera or for anything else on view where a sound is expected—a babbling stream for example—although you can sometimes just edit in a sound effect for this later. The recorder I use is a **Zoom H2N**, which

records digital tracks onto a flash memory card. There are various recorders in the Zoom family and many alternatives made by other companies.

The price often reflects quality, with the more expensive recorders really designed for recording good quality music. Cheap brands are likely to introduce hiss and unwanted noise into your recording so beware of buying cheap alternatives.

Synchronising sound to video—the best way

First: the old-fashioned way

Where you need to video someone speaking and record them on a separate recording device, the old fashioned way is to use a clapper board. *If you do not record sound on your camera and only record via the independent recording device, you will need to use this method.*

You arrange your shot. You start the video recorder running. You start the sound recorder running A helper walks up to where your camera is focused—normally on the person about to speak—and he/she reads out the shot number and then snaps the board together with a sharp distinctive clip.

Hopefully, when you get to the stage of editing your film, you can then manually align the blip on the sound track (the snap of the board) with the moment in your video

where the two halves of the board come together.

In a good video editing software suite, you see a visual representation of the sound wave. The sudden blip is very obvious to see enabling you to slide the sound track along the time line until it lines up with the video frame of the board halves coming together. This is true providing you are using non-linear video editing software like Adobe Premiere.

What you write on the board is said aloud and was captured on both video and sound when you shot the clip, so you can sift through all the video clips and match them up with the sound clips from the recorder. This is a bit of a frustrating process if you have a lot of clips to sync.

The modern way

Providing you record sound on your camera, onto the video, as part of the video clip, and no matter the poor quality and fumbling noises, you can automatically sync your video to the good quality sound you also recorded on the independent sound recorder. It's done magically by a software program called **DualEyes.** The software lets you select a bunch of sound only files and a bunch of video (with sound) stored on your computer and then it—the software—marries up and replaces the sound on the video clip with the correct audio only sound recorded by the independent recorder. Sometimes it fails and then you may have to do that one manually.

DualEyes was originally made and sold by Singular Software, but at the time of writing is now sold by Red Giant. It may also become assimilated into similar software called **PluralEyes**. Obtain it from the Red Giant web site here:

http://www.redgiant.com/products/

Recording equipment lights

You will only need lights when not videoing down the microscope. It is completely unnecessary to buy dedicated movie lights. Simple tungsten lights on stands are sold with 300 watt up to double 500 watt heads in most D.I.Y Hardware stores. These are relatively cheap. They do throw out a lot of heat though and may be less suitable for lighting live macro subjects like insects. You can often use aluminium foil to reflect natural sunlight onto subjects in the garden on a sunny day. LED lighting is improving all the time with costs falling and light output rising. They're cool and are becoming good alternatives to hot tungsten lights. Colour acetates can be clipped in front of tungsten lights to convert the yellowish light to daylight frequency light (blue).

Video editing

Video editing software comes in cheap and expensive bundles. Few are really free. You can only edit your film effectively if you use a non-linear editor which allows you to assemble all your clips in any order you like and shuffle them around until you're happy with the result. I cannot provide you with a whole tutorial on video editing as it would take a book longer than this one to do just that.

I can tell you the standard tips though. Follow these steps.

1. Synchronise all your video clips with the audio ones using DualEyes or PluralEyes first. (You can't do this if you are manually synchronising).
2. Run through the clips. Do you need them all. Get rid of any clips with errors in them. They will only take up disc space on your computer.
3. Open your Video editing software and import all the clips. (If your film is longer than 20 minutes, it may be best to break it up into sections and work in sections first. You can stitch the sections together later).
4. Do a rough assemble on the software timeline.
5. Check out how that flows in principle.
6. Rearrange if you're not happy. When you are, begin more detailed editing.

Sound effects and music

If you are going to use music in your final film, you have to be aware of copyright issues. You can't simply rip music off your CDs or your MP3 downloads and copy them or parts from them into your video editor. Well, not unless you pay a music licence fee. To do so is illegal and you can be heavily fined if you do that and use them on the Internet or on a television broadcast.

Many web sites exist which will licence you 'Royalty-free' music. Costs vary and might make that option too expensive for you. Similar sites exist where you can licence sound effects too, and the same issue with copyright and fees apply. You may not be musically gifted to create your own music tracks but it is much easier to make your own sound effects, like doors closing, crashing waves etc. Just go and record them with your audio recorder separately.

You add the music and sound effects normally once you have the existing video and sound in your film edited and when you are satisfied with that.

Before I finish this chapter, which hopefully serves as an introductory guide to any amateur microscopist who wants to make

great videos at the microscope, I would like to help you (inspire you?) consider how to become a very wealthy film maker or script writer. It's simple. Write a script or make a movie based on the creatures in the microscopic world. What dinosaur study did for Jurassic Park—rotifers, desmids, stentors and the like can do for your block buster movie. Modern 3D modelling and CGI graphics have evolved enough to have rotifers the size of nuclear submarines come thundering at you on a 3D cinema screen.

Maybe shrink your heroes down into a miniature submarine in a plot which requires that and let them loose on a mission in a garden pond or stream. Toys, comics, games will all ensue from a successful film of that time and it's an untapped area.

When you make your millions, give me a mention on your TV interviews and a plug for my book and I'll be eternally grateful.

List of resources for video editors

Video Editors

Adobe Premiere (expensive but great):
http://www.adobe.com/uk/products/premiere.html

Sony Vegas Pro (less expensive and a rising star)
http://www.sonycreativesoftware.com/vegassoftware

Final Cut Pro (for Apple Mac and on a par with Adobe Premiere)
https://www.apple.com/uk/final-cut-pro/

Windows Movie Maker (***Free.*** I've used it. It's ok.)
http://windows.microsoft.com/en-gb/windows-vista/getting-started-with-windows-movie-maker

Lightworks (***Free*** and it seems to have enough functionality to make it a good choice if you can't afford a heavyweight editor).
http://www.lwks.com/

Published in Micscape Magazine Jan. 2015
An extract from the book for new microscopists:
Microscopy As A Hobby. A 21st Century Quick Start Guide
Available on Amazon.