



FILMMAKING FOR RESEARCHERS

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Jon Wood

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FIRST THINGS FIRST: CUT!

Filmmaking is more accessible than it ever was. The availability of decent equipment is not the issue it used to be. Even feature films like *Tangerine*, *Host* and some of Danny Boyle's *28 Years Later* were essentially captured on an iPhone. Referring to the latter film, one commentator opined, "It doesn't matter how the movie is shot, whether it's a phone camera, a professional camera, or a cinema camera. What matters are the ideas and creativity."

The ubiquitous *TikTok* and *YouTube* have made it look deceptively easy to create fast content, but much of this media usually lacks BOTH key elements of "ideas and creativity". There are only so many times you can watch somebody pose, jump into the air, and land only to have their outfit change. Surely you want your efforts to have a lasting impact and stand out from the ocean of such unoriginal, mediocre and disposable content.

Rather than simply picking up the camera, hitting record and hoping for the best, you will fare better if you approach your project with more planning. To do this requires a lot of extra work, which may seem unnecessary, but will really help. And no matter what you decide to record, you may be surprised to find that you will follow the same process that has been done successfully for over a century. Your filmmaking 'workflow' will be divided into three stages: *pre-production*, *principal photography*, and *post-production*.

Pre-Production The story is the most important aspect of your film. Beautiful images and stunning music cannot rescue a poor story. There are volumes of texts written about storytelling and everyone has their favourite. Examples here have been partly drawn from the excellent '*Pixar in a Box*' resource found at www.khanacademy.org. There are also elements drawn from *The Science of Storytelling* by Will Storr.



Greg Foot's course

You will also gain ground on pinning down your story via Greg Foot's excellent 'Talking Science' short course on YouTube. Even if you are not a scientist, there are many top tips around considering your audience, hooking them in, explaining clearly and storytelling. Plus, you will get quicker with practice, and you are going to learn filmmaking.

All the time you spend in pre-production, the 'research, writing and planning' phase, will be paid back so much when you are in the later stages. Take your time and don't rush this vital preparation.

Principal Photography

Top Tip

Don't be the auteur! There are aspects of these stages that you will enjoy, and others that will stress you. Try them all before finding what you are good at. Put together a good team that means you have the best people doing the jobs they excel at.

These are the nuts and bolt of capturing all the components making up your film. You have planned the theme, story, scenes, and emotions you want your audience to experience and now it is time to commit them to digital memory. This section covers all the basic aspects of accurately capturing the sound and vision that tell your story.

You may switch your cameras to manual to provide the best production value possible. This brings extra challenges, but this guide should ease you through some of the most obvious steps. Some of these steps will vastly help your production value. Others may be merely fine-tuning. These will be highlighted as you read ahead.

However, for the most part, you'll be using the camera you have to hand, and that is likely to be your mobile phone. You are likely quite familiar with that, but can take your movie making skills further with these additional aspects: What does composition bring to a scene? How can lighting enhance the telling of your story? What methods can you use to record the sound you want? Not rushing this stage will make your job a lot easier in the final stage of making a film.

Like all the elements in this process, even your best efforts will result in issues that leave you feeling 'less than happy' with your finished product. While this guide can prepare you, there are some things only practice will teach you. Remember, there are no shortcuts.

There are many resources you can supplement this with. I'd recommend following *Wolfcrow* on YouTube for great how-to guides on cinematography and filmmaking. This and more sources are available in the appendix.

Post-Production "It's in the can" is only the start of this section. You've captured all your components and now you need to stitch them together. You will discover new ways of telling your story that make the most of its emotional impact.

This last stage is a quick lesson in using *iMovie* on a Mac, managing green screen techniques, tweaking clips, and adding those small touches you want for your film. Don't worry if you don't have iMovie; free alternatives for PC users will be recommended.



Science Storylab tutorials

This section is unexpectedly shorter than the others. If you are looking for more, then you can get 'How-To' guides from the *Science StoryLab* channel on YouTube, but you should also consider learning from films you enjoy and examining why they are edited together in the way that they are; everything from the order of them, to the shot length can yield interesting insight into the intended emotion of a scene.

Let's tackle the first of these sections, perhaps the one requiring the most work: Pre-production.

2

STAGE 1: PRE-PRODUCTION

Five aspects make up the pre-production stage and any of them will likely take you out of your comfort zone. Fortunately, you can take them a step at a time and logically progress through them. They are:

1. Crafting your characters
2. Building your story structure
3. Preparing your screenplay
4. Visualising your storyboards
5. Preparing for the practicalities of production

Crafting Characters Consider your favourite fictional story. Any real character would be fully developed, drawing on their inner personality and the external environment. What are their beliefs? What do they enjoy? Why? What do they dislike or fear? Why? How are these reflected in the way they dress and style themselves? When you are trying to figure out your character, put them in a broken elevator and extrapolate how they would behave. Give your character human traits. Nobody is perfect and neither are your characters; they will be flawed. Under what scenario would that flaw be tested to the point that they overcome it?

Myth
Bust!

While we talk of storytelling, never forget that with film, we are talking more of 'storyshowing'. To depict a character on film, find a way to show that personality rather than having someone tell us about them.

How does that exercise flesh out the description of your character? When faced with a challenge, what desire of the character will drive them through it. Do they lack the trait that will lead them to fail at the task you have set them? This is a wonderful start of breaking your story down into the ultimate question: 'what if...'

A character's desires and subsequent actions will drive the story. How are their *wants* at odds with their *needs*? These may differ greatly, causing a *conflict*. Conflict is an example of an obstacle that needs to be overcome by the character. These

obstacles may be external barriers such as a long journey, but can also be raised by our personality, such as fear, or generosity. The choices your character make as they succeed and fail at overcoming these obstacles will portray their character arc.

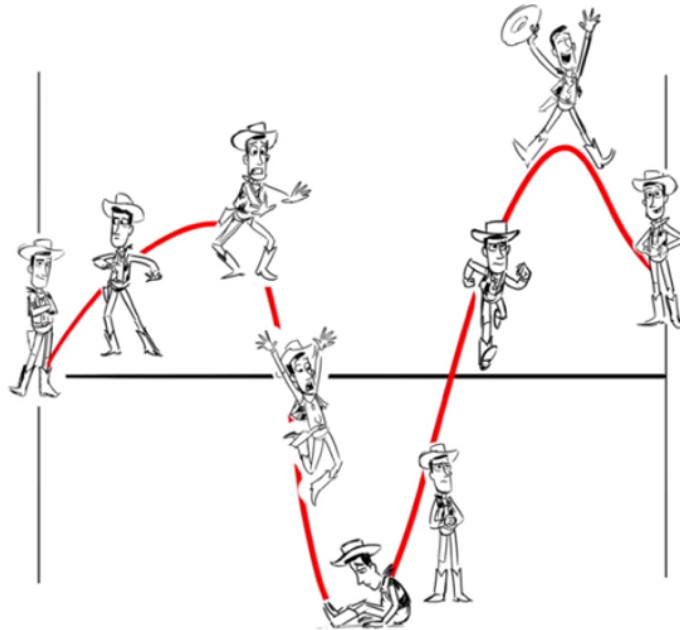


Fig. 1: The character arc through wins and losses.

They need to work to reach their goal. If they achieve their goal too easily, they won't value it. The stakes of making their choices present the reason of why we care about your characters and their story. What is at risk if the character fails? For instance, will they be infected with a debilitating illness if they don't take adequate measures? What happens when the countdown timer reaches zero? Stakes add drama. *External stakes* are what is physically going on in the world, e.g., life or death. *Internal stakes* are psychological or emotional, e.g., broken heart. *Philosophical stakes* are what will impact on the world, its values and beliefs, e.g., good versus evil. Balance the scope and scale of these in your story to add the right depth.

Of course, this is seemingly easy if we are creating a fictional character. What has all of this got to do with telling the story of your research or of a topic you want to share with a public audience? First question: What do you want to achieve via this? Let's re-examine what you've just read in a new context.

People as a character Are you one of the characters? If we are telling YOUR story, think about all the elements, events and environments that contributed to where you are now. Reflect on your background, school life, home life, early plans, culture, work environment, etc. Don't just focus on the positive things but be honest with yourself; what did you hate at school that you may still not have reconciled yourself with? What are your aspirations? How do you see your future?

What about your audience as the character? What is their journey through the subject that you have chosen. Getting to know your audience as characters is important. Who are they? What do they want or expect? What do they seek and why do they do so? You may have to generalise to create the 'average' audience member, but then craft that into a character that your audience can care about, resonating with some shared experience. That means making specific choices about portraying your audience on screen. If you craft a film with emotion, your character and audience will become changed as they journey through it. This tends to happen as you progress through the second act. More on this later.

Content as a character Is your topic also a 'character'? What struggles did it face coming to fruition? Were there competing theories that took attention away your topic? Would anyone fund it? Was it a race against the clock to complete it? What cultural environment did this discovery happen in? What sort of history did it have? What went wrong and what was discovered by chance? What about the legacy of people who contributed to the current state of your topic? What were those advocates like, both those supporting your discovery and those who have competing theories? What challenges and conflict lie ahead for this topic? Will its development path stand it in good stead for prevailing against those challenges?

Ultimately, we come back to the same key aspect mentioned in the last section. Why should I care about this topic? What about it resonates with me? You need to make your audience care.

The Character Flaw All this leads us to the 'flaw'. Whether we are talking about a person or a topic, it is worth focussing on the character flaw. This will be a fault in the character: a gap in their understanding about how the world works. Maybe it is an area for personal growth; or that of your topic when portrayed as a character. For instance, Harry Potter, while possessing a heroic desire to save people, is prone to anger and occasional arrogance. The theme of the whole series of J. K. Rowling's body of work deals with how Harry's flaws are challenged and how he overcomes them to become a better character. By finding the character flaw in your main protagonist, you can build an emotional bond between your audience and your characters.

What about your topic? Take the topic of the human use of plastics. Plastic packaging is brilliant, contributing to food security all over the world, and saving millions of tonnes of food from being discarded early. Yet, plastic waste is a problem. We are all reminded of the emotional fallout and pragmatic action taken after scenes of sea-bound plastic waste in Blue Planet II.



Fig. 2: The visual inciting incident that lead to an environmental revolution.

Now go back and re-read the introductory paragraphs to this 'Character' section. Take time and make notes about how you can 'flesh out' your new characters. Give them a background and history so that they breathe life into the story you are filming.

Story Structure What do you want the audience to know and when? When telling a joke, the punchline must come at the end with the build-up in the middle. Every other order would ruin the joke. The emotional impact of your story demands the same attention to structure. It requires more than just a start, middle and end.

1. *Once upon a time...*
2. *Every day...*
3. *Until one day...*
4. *Because of that...*
5. *Because of that...*
6. *Because of that...*
7. *Until finally...*
8. *And ever since then...*

And the moral of the story is...

Begin by coming up with the most important moments in your story; the 'story beats'. Beats are the kind of things you would mention if you described what happened yesterday in thirty seconds. Avoid going into the details, but focus on *cause and effect*, or choices made by the character. An example of how to do this is to use the improv tool of the story spine opposite.

Step back and focus on what connects all the separate events in the story. Simply put, what are you trying to say? This is getting to the theme, often connected to the moral or lesson that the main character reaches at the end of the story. A month after seeing your film, what would people say it was about? Ideally, you should know the theme before you begin a film, but you may discover a different one while working on it. Allowing your theme to grow during the development stage is essential, but you should be clear of what that theme is by the time you've finished writing.

The individual points in the story spine can be grouped into three acts, forming the most common form of story structure.

Act One: This is the hook that makes the audience want to go on the journey with the you, the filmmaker. Mapped onto the story spine it looks like this:

1. We meet our main characters, protagonists, and antagonists, and find when and where the story takes place.
2. Where we learn more about how the world works, and the character's place in it.
3. An event, which leads to a key obstacle, setting the story in motion. Also known as the *inciting incident*.

The inciting incident should happen at the end of the first act and launch you into Act Two. With practice, you will begin to analyse movies, television episodes and even whole series, predicting timings of the inciting event and twist that happen at the end of both the first and second acts. Top tip: Typically, these are at one third and two thirds of the way through the running time.

Act Two: Here begins the journey to achieve the goals of the protagonist. It is more than just a series of events strung together. The protagonist will encounter a series of progressive complications during steps 4 to 6 of our example story spine. The choices and actions of the main characters as they attempt to overcome these escalating obstacles are the substance of the second act. They will challenge your audiences' ideas through the questions your story asks them. It's your chance to surprise them and introduce something into the story for your audience to experience; a trigger that elicits an emotion. Never forget that not all emotions they experience need to be positive ones; disappointment, fear and angry are equally valid.

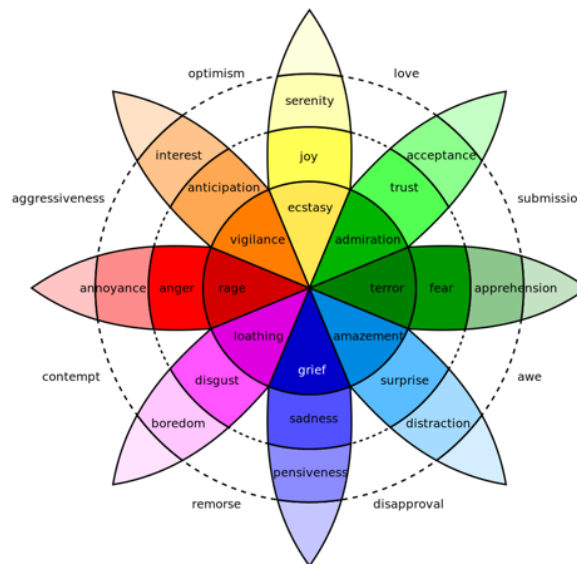


Fig. 3: The wheel of emotions, positive and negative; all useable for film.

The more your character and audience triumph, or are beaten up, the more of an opportunity for growth they have and to learn what is most important: the theme of the film. As a result, Act Two may contain the lowest point of the film for our character.

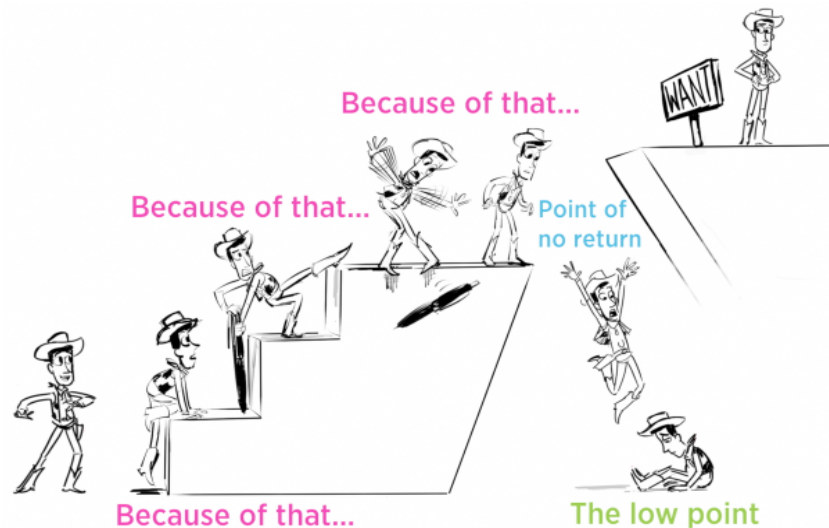


Fig. 4: The story spine: an exercise in cause and effect.

This low point should happen at the end of Act Two, so that in Act Three the main character is forced to confront the things that they didn't want to confront as they bungled their way through the second act. The point of no return may occur halfway through Act Two, but the permanent change in your character could occur at the end of Act Two.

Act Three: This is the build-up to the final crisis and inevitable climax, delivering the moral of the story. The character will face the ultimate test of making choices they weren't capable of in Act One. They were driven by their wants in Acts One and Two. Are they now ready to accept their needs? When they do, they attain resolution, the world returns to normal, and your audience are satisfied logically and in an emotional way.

All this story planning will give you a theme, a world, character arcs and the structure and pacing of your film. It's time to research and plan the details of how that story is told.

The Screenplay A screenplay is the script of your film, including any instructions for actors and scene directions. Scripts tend to have very specific guidelines on formatting, font size and even font. Combined, these guidelines ensure that one page of a screenplay usually takes up one minute of film. A ninety-page screenplay plays out in about an hour and half. A typical one looks like this:

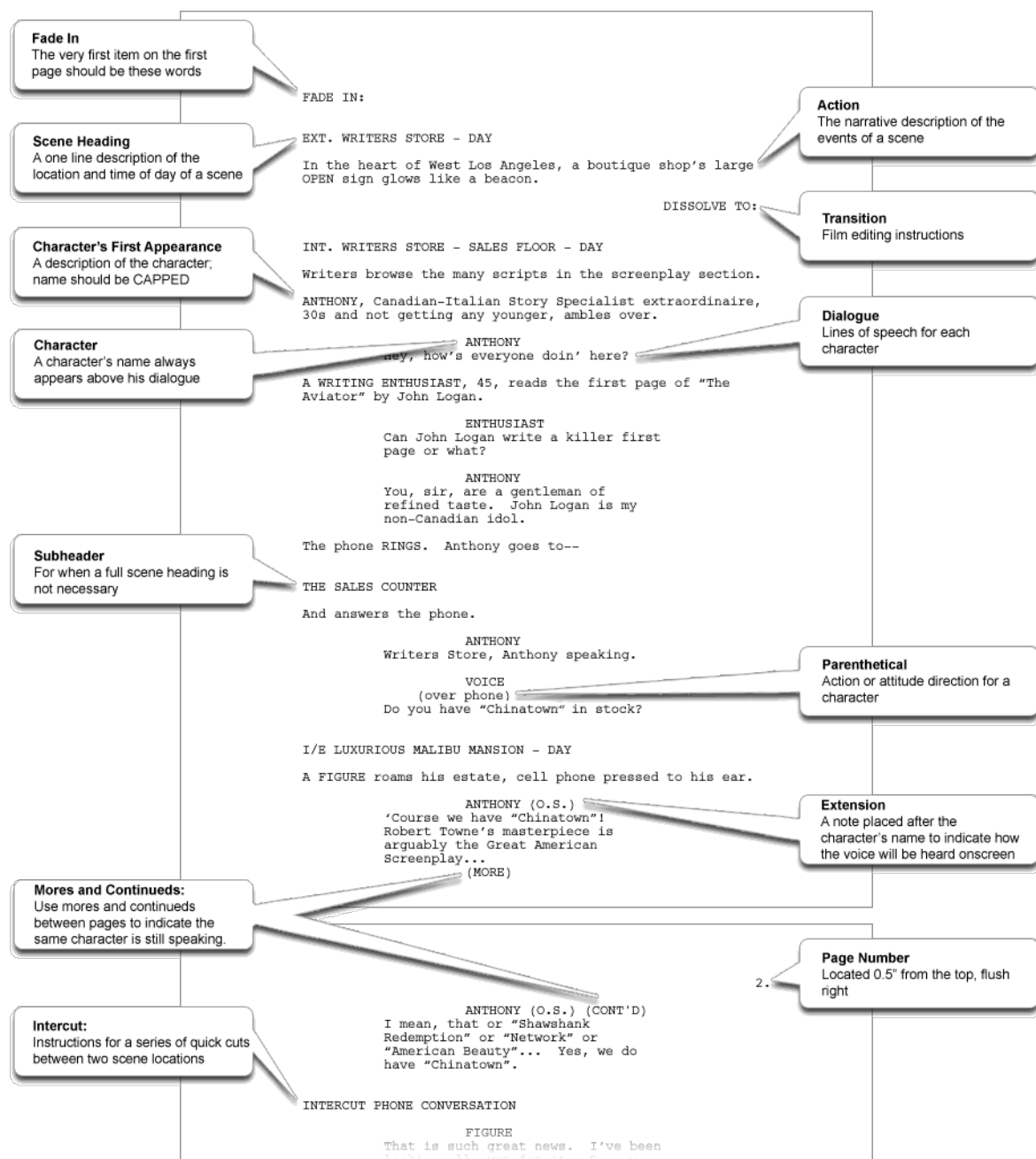


Fig. 5: Example of a properly formatted script. More than you probably need, but a good reminder of all the aspects to think about when planning filming.

**Top
Tip**

The good news is that you can get a software package to do most of the formatting for you. Use Google to find a simple screenwriting software package that works for you. Some are free, and many are premium priced with many analysis features. Microsoft Word has a free screenplay template.

How much detail you want to go into when you write your script is up to you. You can find a wide range of examples online, even for many famous films. Yet, you may not be wanting to craft another classic from cinema, so why go to the trouble of writing a script?

Writing your script should highlight those aspects that you've missed in the earlier stages, allowing you to fix them. It is the cathartic process of refining your understanding of the characters, material, and research you have done. Your story will develop during this process. When you revise your facts, they will become more accurate; important if you are sharing the story of a well-researched topic, or if your audience are either experts or will be relying on your material to teach others. Use this opportunity to be sure your material is perfect before you give it a voice.

Famously, Pascal is often credited with concluding one correspondence, 'If I had more time, I would have written a shorter letter.' Indeed, a concise script containing jargon may land well with an expert or academic audience. However, you are likely making a film because you want to make your topic more accessible. Your audience should bond emotionally with its story, rather than just hear some impersonal facts. Don't aim for an overly polished script. It will sound unnatural when the lines are delivered. At the other extreme, too little attention to lines leads to waffling and repetition. We all have the executive power to switch to another YouTube video, or scan ahead to the popular section, rather than be forced to watch a boring build up. When people sense your lack of preparation, they will not waste their time. The balance lies between the two extremes.

**Top
Tip**

Prepare your script and write like you are talking to a friend in a café, rather than presenting at a conference.

How should your script read? While you may consider your own voice and choice of language, you should write focussing on the ears of your target audience. You are not writing for YOU, but for them! Family film director John Lasseter ('*Toy Story*', '*A Bugs Life*') used a different tone to Quentin Tarantino ('*Reservoir Dogs*', '*Kill Bill*'). The tone of a film should match the expectations of the audience, not jar them. Don't be dark, gritty or juvenile inappropriately. Use these tools for purpose only when they are needed.

Tone especially impacts on your choice of words. Make sure you are understandable to your audience. It is okay to use jargon, but you should ensure that new terms are appropriately explained when you first use them, maybe revisiting those definitions again at some later point as a reminder. If you are trying to convey the scale of something, use an analogy. Compare a new concept with something your audience can relate to. Consider whether a simile ('light as a feather') or a metaphor ('She has a heart of gold') is more appropriate depending on the tone you are conveying. When communicating scientific details factually, accuracy may be the most important thing to be conveyed. In such instances use simile and metaphor cautiously. Is that object really 'as light as a feather'?

And there is another important reason to consider your audience first. You need to pitch the subject for them. If you were throwing a ball for them to catch, you would pitch it in a manner that would allow them to catch it. Remember that you are not being overly simplistic or 'dumbing down'; rather 'explaining clearly'. Your film is not aimed at you, so don't feel that it skips over the more complicated details and makes something appear too basic. Likewise, don't pander to a deficit model and assume they know little of the topic you are unpacking with them.

No matter how much you prepare your script, you will inevitably revisit it when you remind yourself of the golden rule of filmmaking:

Show, don't tell!

Storyboarding Which bring us to the important use of the visual image, which can be used to convey words you don't need to say. A storyboard is a route through your narrative, highlighting the shots you want to capture, and linking the main aspects you want in your story. It's about filling in those little gaps between shots that make up and link your scenes. It isn't necessary for you to be a proficient artist; sometimes even words will do. Your concept can be captured very quickly indeed, ensuring YOU stay in the moment of the images in your head as scene plays out.

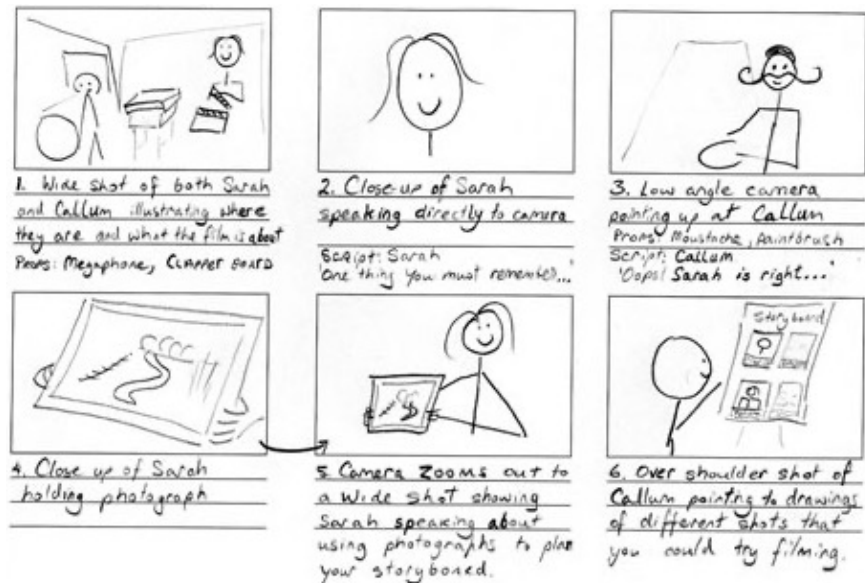


Fig. 6: The storyboard that complements the script. See page 65 for another example.

The pictures in this example start with a wide shot, then introduce Sarah in closeup. This is also time to put to good use all those composition abbreviations, such as XLS and CA, etc. More on these later. Any fine details are omitted from the drawing, but would likely be indicated in the screenplay. For example, while the first frame shows what looks like a barbeque, indicating an external (EXT) shot of a patio-garden, it might be a badly drawn table in a living room, clearly an internal (INT) shot. Similarly with the other descriptive markers in the scene heading of the screenplay, such as DAY or NIGHT. Rather, let the screenplay do the hard work of clarifying those aspects for you, while allowing the storyboard to take care of the actual images you plan to film. Any notes beneath each frame can detail any action in the shot, camera motions as well as key dialogue.

Top Tip

Films are rarely filmed in the order they are shown. Likewise, each scene may not shoot in order. Set up the kit to film all the closeups, then capture the wide shots at the end. Just beware of any continuity of props and the like when you reorder them.

Each scene may have its own storyboard. This may help not only when you come to stitch it all together in post-production, but also while filming. If you know that you will return to a scene later in your film, you should be planning to film both scenes at the same time. Why would you move camera, lights, kit, and crew twice, when you can film all the shots from both scenes in one go?

If you really aren't sure where to start, divide the sheet up into separate panes you can reorder or move around your desktop to get a feeling for how flow changes the emotion?

Pre-production There will be lots of things that go wrong in the stage to come,
Practicalities but the trick is to be prepared and work as a team. On set, you will organise a *runner*; the person that is sent to get the one essential item you need immediately. To help ensure you don't run short on runners, prepare the following:

Gaffer tape: Useful for holding kit together, securing loose cables.

Batteries: Not just spares for the camera, but also a range that fit your mics and digital recorders.

Chargers: For all phone makes, cameras, monitors and possibly lights.

Extension leads: Because you are likely taking over a large space, cables will inevitably never reach the wall.

Umbrellas: Because you live on Earth, and it rains here. Use large umbrellas for the camera and your actors or '*the talent*'.

Bin bags: Not just to leave the set clean, but they make good impromptu weatherproofing!

Whiteboard marker and a cloth: For the slate (see later).

Notepad: You need to record every shot and take, together with any comments made by the director about each take.

A printed copy of your script: Because batteries on your tablet will fail during the day.

Logistics: Plan how you will get to the location. Do you need accommodation too? Where can you park close to the location? Can you even carry all of this kit? How many people do you need?

Permission to film: Sounds obvious, but have you cleared with necessary people that you can film at their location? Will they turn off the piped muzak while you film? Does filming coincide with the busy day in the labs or museum? Do you have signed consent from everyone that will appear in your film? There is an example of a blank form in the appendix. This is important legal stuff! Keep hard copies on set just in case you get challenged and bring spare consent forms too.

Cash: Because you want tea, right? Yes, and so do your crew. Treat them well and they will work better!

Something else: I can't tell you what it is, but you WILL forget it and you will really need it!

Myth
Bust!

***'I don't need a permit
just for one scene.'***

You would be surprised just how many public places you DO need a permit for: public highways, libraries, cemeteries, shopping centres, public squares, and parks, etc. Google for your local authority's filming permit conditions. Remember that these permits exist for a reason. Always ask!

While on that last note, you are going to want patience; lots of it. Be well prepared for the next stage. Filming takes much longer than you imagine but take solace in that fact that the longer you spend getting the preparation right, the quicker your filming will be.

There is such a thing as '*guerrilla filmmaking*', and if you are reading this guide, that is likely what you are planning. This involves filming in real locations, often without filming permits. You may need to be quick to set up, quick to shoot and quick to move on before being questioned. I can't tell you to do it, as it's likely illegal; however, it is fun to practice.

If you do apply for a permit, you will likely be asked to supply evidence of *public liability insurance* (PLI), along with a risk assessment of your activities. If you are working at a university, you should be able to find the former on their intranet. Also be aware that if you plan to use drones to film you may have to apply for permission to film from the *Civil Aviation Authority* (CAA). If you plan to use children in your film you will encounter further complications regarding safeguarding, welfare and a limit dictating the hours they are allowed to work. Check well ahead in advance of filming

Finally, remember that your film can never be rescued from a bad story, no matter how technically brilliant it is. When the director is ready to call action, the pressure turns over to the subject. If you are the subject then you need to relate to your audience, even though you can't see them beyond the people behind the camera. Your job is now to throw away the script and talk to the camera like you are sharing the wonderful things you want your audience to hear.

Never forget, filmmaking is all about telling a story, so tell it well!

2

PRINCIPAL PHOTOGRAPHY:

'Everyone is Kubrick these days'

With a mobile phone in your pocket, we have all got used to being able to capture video whenever we want and yet we get so much of it wrong. We often use the wrong aspect ratio and frame rate even though we have all the basic controls and kit we need to be able to capture quality footage.

However, we're most likely to be using a mobile phone so it's worth covering some basics that are specific problems for phones because of how we've historically used them.

*Think beyond the
phone screen*

Top
Tip

The exception to this rule is if you are going to reach an audience exclusively via their mobile phones on platforms such as TikTok, via Instagram stories or YouTube Shorts. If so, consider whether portrait is the better (or even required) format. You still need to fill the frame rather than being a speck in the distance.

Firstly, ask how people will watch your film? For computers, television screens, *YouTube (excluding 'shorts')*, and big screens, you should hold your camera in landscape not portrait mode! It's okay for news reports to include rubbish footage of events submitted by the public appearing as a vertical strip on the screen; they have no choice but to use what they've been given. It all looks the same; vast amounts of unused space above and below the tiny action in the middle, squashed into 1/9th of the screen. If you must zoom in, the resolution and quality plummet. Think about making the best of the screen to capture the most important elements.

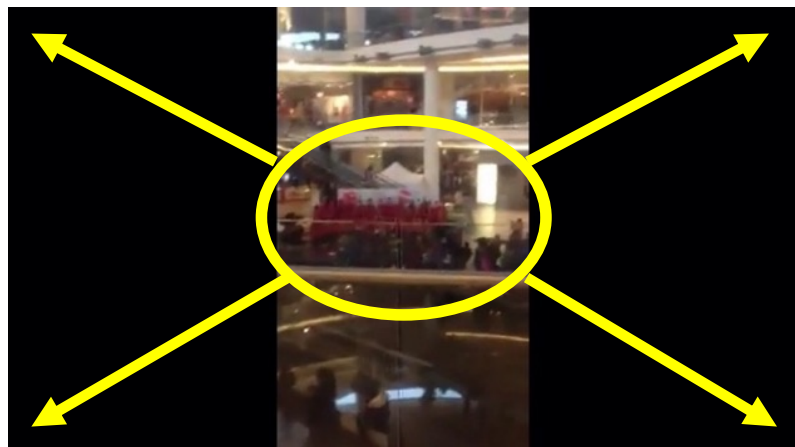


Fig. 6: Why poorly framed portrait video cannot be used in the school classroom.

**Myth
Bust!**

"If we say 'Show, don't tell', then film is all about what you see."

For storytelling, maybe, but audio is essential for most viewer experiences.

Television was born from radio, nursing hangovers from that.

For instance, if you watch an external news broadcast and the image is terrible, they will maintain the link if the audio is integral. If the audio is poor, they will kill the link even if the image is perfect.

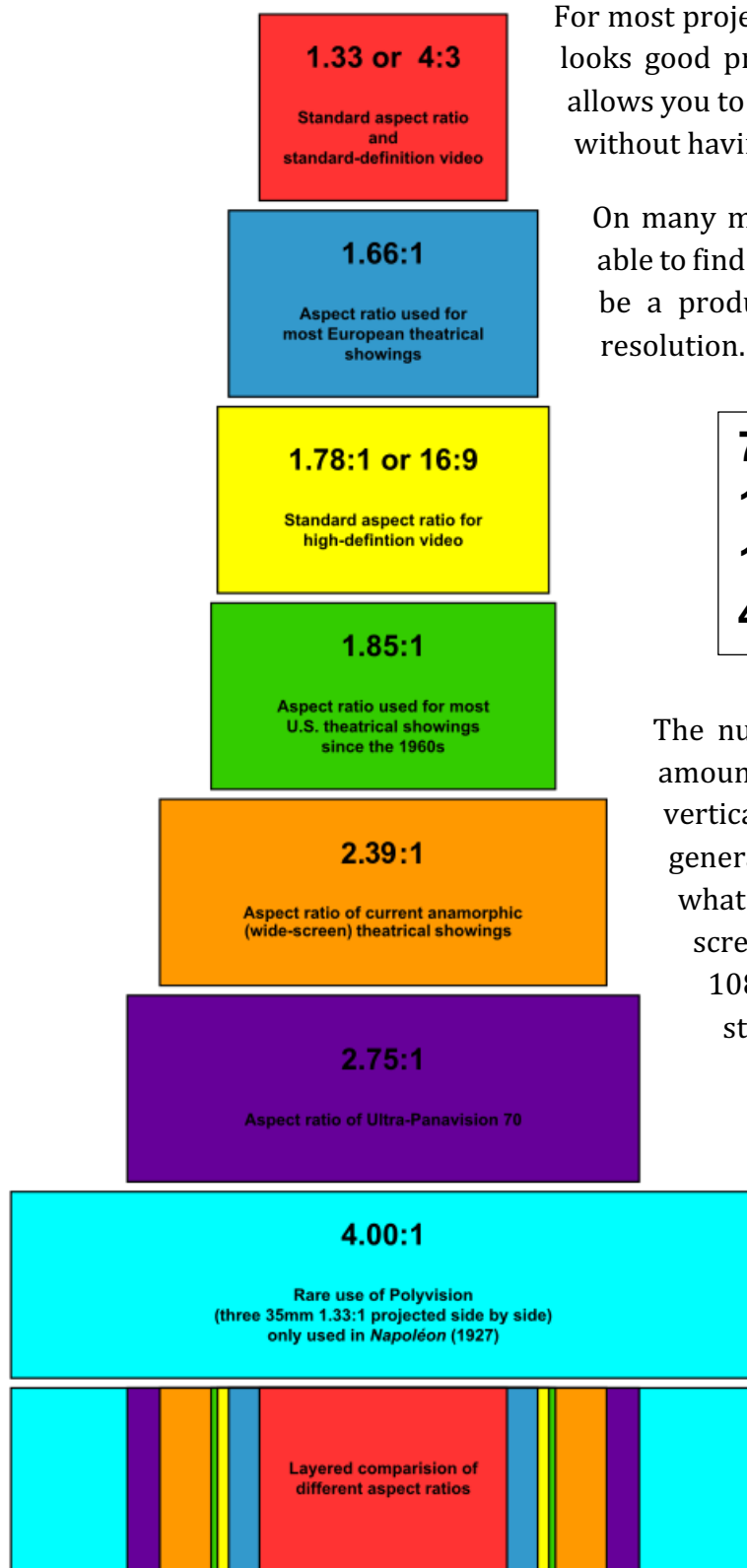
Secondly, the audio from a phone will inevitably sound like it is recorded in the bathroom so you will want to use an external microphone. Choose one that's either plugged direct into the phone or into an external device such as a digital recorder. Either way, get the microphone in the right place to get the best sound. More on this in a while.

Finally, hold the camera still. You may simply be able to rest it on something, so long as it is at the right height for the subject of your scene. We often use a tripod with large cameras, and this is also possible with phones. For small action cameras, a rig that provides a little weight to stabilise them is very useful if you need to bring motion to your shot. Even then, in-built stabilisation will bring some control, and some shaking can be fixed 'in post', but if your footage looks like outtakes from the 'Blair Witch Project', you're going to struggle.

These principles apply to everything you are going to film in most projects, whatever camera you are using. There are also many problems common to phones and all cameras and these largely relate to them being set to 'automatic' or using their default settings. We're going to solve many of these by setting up our cameras before we start filming anything..

Global Settings: To make life easier later on, agree on some of the global settings that you want to use for a project when it is finally published.
Aspect Ratio,
Resolution and FPS These settings will likely apply for every scene you will be filming. Set these first before worrying about those settings you will have to set differently for every scene. How you navigate to these settings will vary depending on what camera you use. Get to know your camera well and never be afraid to get the instruction manual out.

Set the aspect ratio of your camera to record in 16:9. This is the shape of your typical HD television, and your picture will fill the screen. Most cameras have this widescreen setting as the default. Old televisions used to have a 4:3 ratio, but not many people use them anymore. Leave the strategic changing of aspect ratio to Wes Anderson.



For most projects, stick with the 16:9 ratio as it looks good pretty much everywhere and still allows you to get plenty of things in your scene without having to add motion to your shots.

On many modern cameras, you may not be able to find the aspect ratio setting, but it will be a product of settings related to video resolution. They may appear as the options:

720p HD at 30 fps
1080p HD at 30 fps
1080p HD at 60 fps
4k at 30 fps

The numbers can be translated as the amount of lines of pixels down the vertical side of the screen, and are generally in a ratio of 16:9 (typically what the HD means). Modern HD screens have a resolution of at least 1080p¹, the highest resolution that standard Blu-ray video is stored at.

You may find a 4K setting, which has a higher resolution, but retains the same 16:9 aspect ratio. This can be great, especially if you want to 'punch into' a shot for a close-up when editing, yet still want to maintain a decent HD resolution when your film is published. Beware though, it may use a lot of disk space!

¹ Incidentally, the 'p' means '*progressive*', suggesting each frame in the video is made up of all the lines in the picture. i.e. All 1080 lines are captured. The alternative is 'i' or '*interlaced*' where each frame is made up of alternating lines of the image. Each interlaced frame looks like someone has dragged a comb across it.

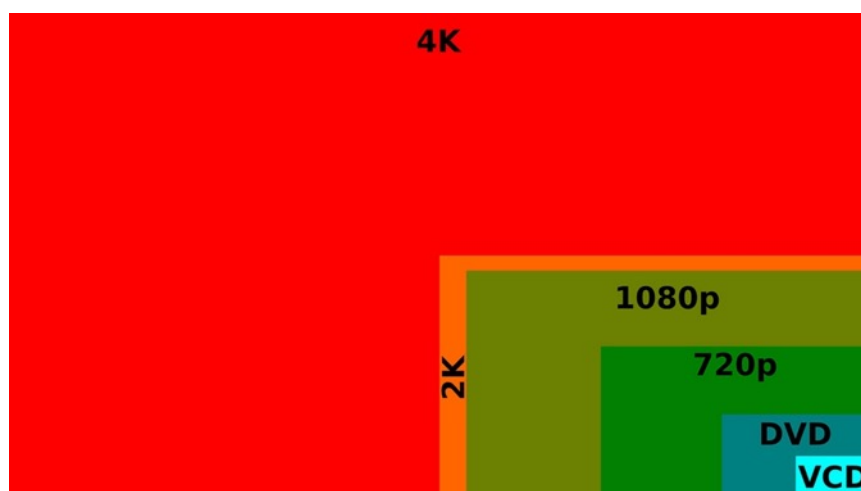


Fig. 8. Common settings for resolution set on cameras and screens (Not to scale).

On an iPhone, the following file sizes are for a minute of footage at the resolutions above:



iPhone video setting	File size of 1 minute video
720p HD at 30 ² fps	60 MB
1080p HD at 30 fps	130 MB
1080p HD at 60 fps	175 MB
4k at 30 fps	350 MB

Table 1: Typical camera settings for a mobile phone

Is the light flickering on your iPhone screen when you look at your video? The default iPhone settings are to record video at 30 or 60 frames per second. However, in the UK and Europe, LED light bulbs flicker at 50Hz. To stabilise the flickering, go into the camera settings on your iPhone [Settings > Camera > Record Video] then switch on the option to 'Show PAL Formats'. Now you can select the option to film at 25 fps PAL in the camera.

Your camera may have different ranges of numbers for fps, a legacy of the differences between the speeds at which television pictures are shown. In the UK, this is typically 50 fps (*PAL format*), while the US uses 60 fps (*NTSC format*). While 60 fps is smoother and often used in videogame play, 30 fps is considered sufficient for web-based video. In the UK, TV programmes may be broadcast and streamed at 50fps, but the actual frame rate of the programme is usually only 25 fps, with each frame shown twice. So, you won't need to go higher than that unless you have a real reason to.

In your camera settings, you may find you have 25 fps and 50 fps, maybe even 24 fps. Traditionally, 24 fps provides the cinematic look of movies (alongside other means), so ignore that for now. 50 fps is twice as smooth as 25 fps, but you may not always see these benefits. Why?

² The last number (fps) is 'frames per second' or how many single images are going to be captured in one second of filming. The higher the number, the smoother it will look, but the larger your files will be.

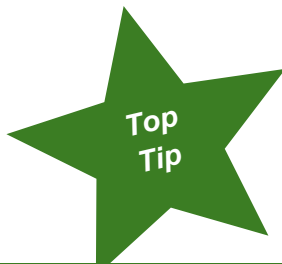
Well, you may be doing all post-production editing in *iMovie* on a Mac. While brilliant and free software, it comes with some quirks. For instance, it always exports 50 fps projects at 25 fps anyway, so you might as well record at 25 fps and save some disk space.

If you must use *iMovie*, and you need supersmooth footage, (and you **aren't** using LED lights in the three quarters of the world that operates at 50 Hz), set your camera to record at 60 fps. Also remember that **the very first clip you drag on the timeline of *iMovie* will set the frame rate** for the whole project. If you film at 60 fps, make sure you drag one of these clips into the timeline first.

You always have the option to step it down to a lower frame rate using free software like Handbrake, but you will never gain any extra smoothness converting it from 30 fps to 60 fps later. If you need it to be super-smooth, film at the higher frame rate, ditch the LED lights, and you have options.

Slo-Mo Settings It is possible to use much higher frame rates on a camera via a slo-mo mode. For instance, an *iPhone* will easily shoot 1080p footage at 240 frames per second. So, when the video is played back at a normal speed of 60 or even 30 fps, everything appears in slow-motion: silky smooth, yet at quarter speed or even an eighth. It is possible to further slow things down in post-production but if you can capture it at the faster speed to begin with, you should do that. Slowing clips filmed at frame rate native to the rest of your footage 'in post' will not retain the smoothness and they may appear jerky. Again, you may notice flickering of lights, so do what you need to ensure you can rely on natural lighting or incandescent bulbs if possible.

Lens Choice and Field of View Even if you are filming on a phone, this is something you can control and consider. If you are using an action camera like a *GoPro*, then while the lens choice is not a physical thing, you do have options over the *field of view* (FOV). These cameras can shoot a 'super-wide' frame that captures a wide field of view, or something more 'linear', both in a 16:9 ratio. These are demonstrated below. Your phone uses different lenses instead. An *iPhone* will offer a 0.5 and 1x option on the camera screen.



Select a field of view closest to the look of a DSLR as possible so that the footage you take on another camera blends nicely when edited. Nice straight lines are what you want. However, a little distortion is rarely intrusive in the viewing experience.



Fig. 9. GoPro shots in 'linear' and 'superview' fields of view from the same point.

The wider field of view captures more of the scene and makes fuller use of the sensor the image is captured on. It looks good but is slightly distorted. This distortion is much more pronounced when filming close to the camera and when camera motion is included in the shot. However, the 'linear FOV' digitally focuses on the central part of the lens and sensor to prevent the distortion at the edges of the image. With a higher quality action camera, you won't notice a drop in quality by using this 'digital zoom'.

Your phone may use a combination of different lenses digital zoom. An iPhone will offer a 0.5 and 1x lens option on the camera screen, as well as what happens when zooming into the scene using your fingers. Lens choice will be dictated by what you need to film, either a close-up or a wide shot. If you keep zooming in using your fingers, at some point, you maximise the resolution of your camera sensor and just make your pixels

bigger. Try to avoid using digital zoom if you have the option to move the camera closer to what you want to film. On the other hand, a camera positioned too close to a face can feel intrusive. Alternatively, film in 4K resolution, and crop to 1080 in post, which you can output a good quality film at.

With a DSLR, you can be swarmed with options regarding lens choice. You will see filmmakers with huge collections of lenses to attach to their camera. They will favour a selection of 'prime' lenses, which will have a fixed focal length, such as a "fast 50mm prime". It will be a lens that does not zoom, so it requires fewer glass elements between the world you are capturing and the sensor in the camera. This means that a prime lens lets in lots of light, and you can film in lower light conditions without relying on bigger and brighter lighting rigs. Incidentally, this is also the reason the simple lens systems of action cameras and mobile phones can film quite well in low light, despite such tiny lenses and sensors.

However, you are likely to have a zoom lens on your DSLR. While it blocks more light than a prime lens, you don't have to physically move the camera as much to frame your shots. To increase the light, you can adjust the ISO value, or sensitivity of the camera sensor; but be aware that higher ISO numbers increase noise in your images and can make them look grainy. For now, set your ISO to 800, we can tweak it later if needed.

Exposing Yourself Setting the exposure looks complicated but you can let your camera guide you before you tweak it. They may get it right, but they can't always decide which is the most important aspect you want filmed just right. As soon as a cloud moves over the scene, an automatic camera will adjust the brightness of the scene to compensate. It does not know you don't care about the cloud, but are concerned with the face four foot from the lens. It's your job to decide what's important, hence you may wish to manual set the camera to be right for the one thing you want it to capture correctly.

*...for iPhones and
Mobiles* On an iPhone, you can set the exposure and focus simultaneously, and then tweak the exposure. Point your phone at a scene and move it about between bright and dark areas to watch it darken and brighten automatically. This

frustrating wandering of exposure isn't what you want, so hold the phone still and tap the screen on whatever subject you want to be correctly exposed, such as a person talking. The phone will temporarily set exposure and focus for that subject.

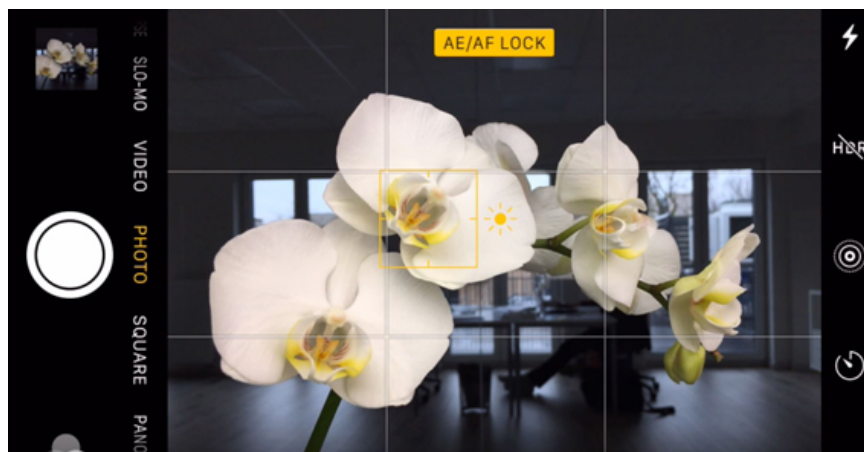


Fig. 10. Tap and hold a finger on an iPhone to lock the auto-exposure and focus

You'll notice that the slightest movement and the camera will reset both focus and exposure again. To lock the auto-focus and auto-exposure hold your finger on the subject you want to exposure for. After a short while, it will tell you it has locked both. You can now tweak the exposure by sliding your finger up and down the screen to fine-tune the brightness of your shot. Hit record when you are happy and action!

You may also find that newer phones and even mirrorless cameras can lock onto a face and track the autofocus as it moves towards and away from the camera. If you have these options, practice using them before you need to use them.

...for DSLRs On a DSLR there are other ways of increasing the amount of light coming in, other than adjusting the ISO or sensitivity of the sensor, with its incumbent drawbacks of increasing grain in the film. It is through opening the aperture, the mechanical equivalent of the iris of your eye. To let more light in, open the aperture until you can capture video at the brightness your subject deserves. If your image is still not bright enough, go back and increase the ISO or consider some additional lighting.



Fig. 11. Adjusting the exposure on a DSLR camera:
(from left) shutter speed, aperture, exposure compensation, ISO

On a Canon camera switched to 'movie' mode you will see the following settings. From left to right these are shutter speed, aperture, exposure compensation, ISO and a zoom tool. Whichever setting is currently active is adjusted using the thumbwheel. Ideally, you want to **set the shutter speed at twice the fps you have set**. i.e. If you are choosing to film at 50fps, set the shutter speed to 100. Check the picture, does it look nicely exposed? If not, adjust the next value of aperture; the lower the number, the wider the aperture. If the picture still is not exposed right, use the Av button and thumbwheel to adjust the exposure compensation setting. Hopefully, it should now be looking good.

If you are struggling to get enough light into the scene, you can either set up more subject lighting or go back to halve your global settings to 25 or 30 fps. You can then set your shutter speed to 50 or 60 respectively. That gives you more latitude with shooting in a darker room.

Depth of Field and Focus

Now you are looking at the scene, you may notice that it is not all in focus. This focus is obvious on an iPhone, but you may need to press a button on the front of your DSLR to preview what is in focus and what isn't. To achieve a 'cinematic look' you want only a single point to be in focus, with the background slightly blurred so we won't be distracted by it. This is how your eyes focus. Even if you're not after a 'cinematic' look, you want to influence where people look on screen when watching your video.

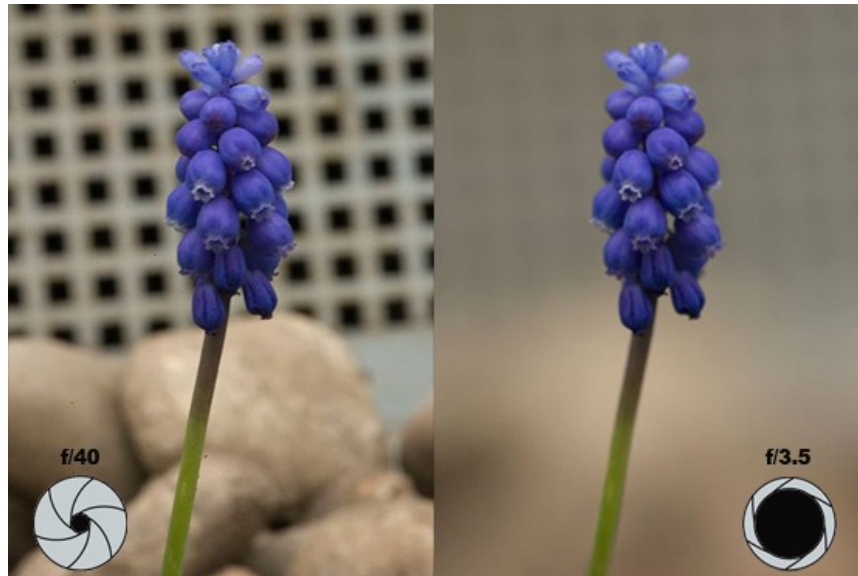


Fig. 12. Opening the aperture increases light and shortens the depth of field for focus.



What do you want to zoom into when you are setting the focus of something large like a person talking? Usually, it is the eye of the person speaking, yet this may mean that any gestures in front of them are blurred. If they are, revisit your aperture setting to close it down and widen your depth of field so that all the important aspects are in focus.

This effect is achieved by opening the aperture. The wider the aperture, the shallower the depth of focus will be, but the harder you need to work to get your focus 'pin-sharp'.

On one hand, it can be very effective, such as in the example above. However, very narrow depths of field can mean that the slightest change in distance between the camera and the object being focussed will result in the object falling out of focus. Even when you try hard to stand still when talking to camera, but you will still be surprised how much you move forwards and backwards when being expressive.

If you are thinking that this is what auto-focus is supposed to address, think again. You want to switch that feature off. You've already done this by locking it on your iPhone, but DSLR users may find it on the side of the lens. Switch from **AF** to **MF** and you are then able to use the small ring at the end of the lens. On the screen you will see the difference. It's not easy to see what is exactly in focus using the viewfinder or the screen at the back of the camera. That is what the zoom feature is for on your camera's digital monitor. Take a shot, view it, zoom in and check you have pin-sharp focus. Move around the scene to find the subject of your critical point of focus.



Fig. 13. Canon 18-55 zoom lens showing auto/manual focus buttons and focus ring (far left).

Don't be tempted to rely on the zoom on your lens to get close to the subject and then focus. It may help a little, but there is no guarantee that it will retain that focus at a different focal length on your zoom. More on the perils of 'zoom' later.

Focus, like sound, is something that when it is done correctly, nobody will notice it. Unfortunately, if it is done badly, it will stand out and distract hugely from the production value of your film.

White Balance and Colour Correction

As we've moved from old filament light bulbs, through fluorescent tubes to energy efficient bulbs and now LED bulbs, you might have noticed how they affect the colour of objects in your environment. Some bulbs will have a warm colour, while others are described as 'cool'. Even daylight will have a variable colour temperature. Light on a cloudy day is not the same as a bright sunny day. Even times of the day will present different temperatures. Consider the warm glow of a sunset painting the landscape with oranges and yellows, compared to the blue-grey light of early morning. Cameras don't try to adjust for these different light conditions and need to be setup to tell them what sort of light you are shooting in. To do this we use a setting called *white balance*.

White balance allows the camera to record a scene, factoring in these unwanted *colour casts* by providing weighting to the three primary colours it captures: red, green, and blue. Fortunately, this is easy to do, and you're best doing it while filming each shot.

1. Set your scene, including any lights you have decided to use. Make sure they are up to temperature and have reached the desired brightness.
2. Get an assistant to hold up a white sheet of paper in front of your subject. It needs to be big enough so that when you fully zoom in, it fills the frame of your camera.
3. Navigate through your cameras settings to set the white balance to the current view of that white sheet.
4. You can then zoom back out and get ready to tackle the next set up.



Fig. 14. Checking focus and white balance as the light falls on the subject of the shot.

Most mobile phones don't give you control over white balance, and you will have to adjust it in post-production. Therefore, it is very useful to record a short clip of you preparing for this before each scene is shot. Whenever you move the camera, the light visibly changes, or a camera setting is changed, you should include this in your shot list. A further problem can arise when you import all your footage into *iMovie* to find they are all mixed up.

How do you make sure you have the right white card reading for each shot? Yes, it's time to start feeling like a filmmaker! Mark up your *slate* using a wipe clean marker and don't forget to keep a written record of what scene number and take you are filming. The white back of the slate is also perfect to set your white balance on.

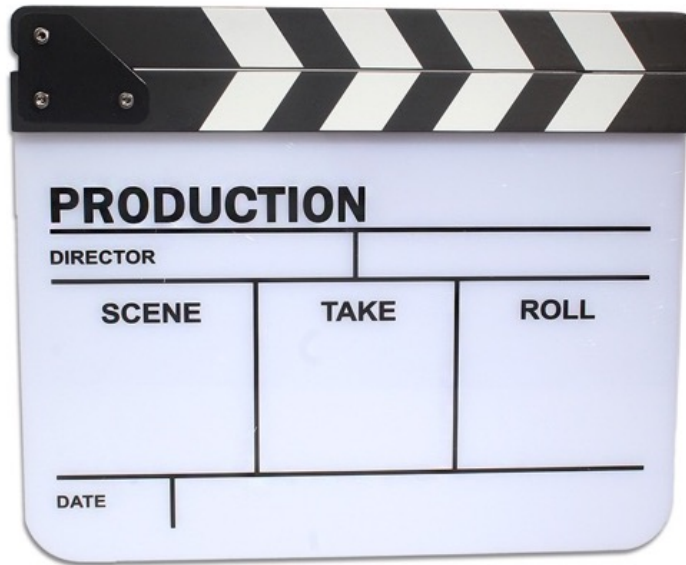


Fig. 15. The slate: The perfect tool for identifying what you've filmed, recording your white balance, and syncing your film and audio.

When you get into post-production, phone camera users will also use this slate in each shot to set the white balance when colour-balancing. The clip with the slate in can then be made to be consistently the same colour under all lighting conditions and the software knows that.

Preparing to Capture Sound The slate also serves another purpose. That visualised 'clapping noise' allows an editor to *sync* the images with any sound recorded on any external devices such as microphones linked to digital recorders. You will need to do this if the microphones you are using are not being captured on the same device you are recording images on. The sound quality recorded natively by phones and cameras will be terrible without the use of external microphones, but you should be able to hear enough to use it as a guide to add your better audio in post-production.

When you import both sound files and video files into the *iMovie* timeline, you will want to line them up exactly so that speech is in perfect sync with the movement of the face. You can physically see where the sound of the clap is as well as the exact frame where the slate closes, allowing you to line them up perfectly. Later you can then choose between the best audio out of the two feeds: that from the camera or that from the external device. One can be muted as you are editing.



"Filmmaking is needlessly ritualistic"

The use of the slate in front of the camera while speaking the words, "Scene [whatever]; take [whatever]" [CLAP!] is done for reason. Film was always recorded separately to the sound because film was just that, a stream of still images. To sync them up, the information about each take needed to be marked on both images and sound recording. Hence, both the closing slate is used and the words spoken. [CLAP!]



Fig. 16. Syncing externally recorded audio (green) with video (blue) by lining up claps, or the closing of the slate.

Even when it comes to the setup of your DSLR there aren't many settings at your disposal. The first thing to do is switch off any automatic audio settings. What these do is boost quiet moments and normalise the audio you want to record. Sounds useful, but it isn't. The result of this is that when you want things quiet, it boosts sensitivity to capture all the background noise in the room, which you don't want. Then when you start talking, you can hear the sound dip as it switches from high sensitivity to low, before rising back to normal. Set it to manual and then you adjust the slider to the right amount for a good signal to noise ratio.

A very useful feature of DSLRs is the ability to see the *sound bars* bouncing up and down when you test your microphones. You are looking for them to peak around the mark specified on your camera. On a Canon DSLR, this is between 12dB and 0dB. Keep the audio peaking between these when people are speaking, and all should be good. If it goes to the end of the scale, adjust it down.

It would be best to be able to hear it at the same time. A decent pair of headphones is very useful as they present a good range of sound to the ears. Not all cameras allow you to do this, so if you are looking for a camera to shoot film rather than photos, this is a big consideration.

Microphones You will realise that most in-built microphones on cameras and phones are poor. You need either something else to record sound on alongside your on-board audio, or to upgrade the microphone used on your camera. Each type of microphone has strengths and weaknesses.



Shotgun mic

It focuses on the sound it is pointing at, so doesn't pick up much background noise from the sides. Great if only one person is speaking, but not so good if you need to record two people talking in close-up. Very sensitive and often has a boost function.



Lavalier mic

This needs to be clipped or taped to the person speaking, which often makes them visible on camera. They are also sensitive to rustle from clothing. But they are nice and close to the voice. Wireless ones are easy to use, even possessing level meters. Best placed on the chest, about a hand span away from the mouth.



Boundary Mic

These are very useful to capture ambient audio around a space. Place in various places where action is going to happen. They are omnidirectional so pick up sound from all around them.

**Top
Tip**

Sometimes, these microphones require separate power. Keep them charged or replace the batteries regularly and don't forget to switch them on. Always check before you shout 'action!'

These microphones, or their wireless receivers, tend to have the usual 3.5mm jack plug which plug nicely into most DSLR cameras. However, to use one on an iPhone or GoPro you will need to use an adaptor and there may be no option to be able to monitor the sound you collect live. These adaptors can be quite expensive, sometimes more expensive than buying a small digital recorder you can plug a microphone into. Later you can compare the native audio with that recorded from the external device.

It is worth playing back your audio to ensure there is nothing untoward, such as fridges switching on, mobile phones clicking, people coughing, crackling from loose cables, or popping as percussive sounds are made down a microphone placed too close to a person speaking. Look out for percussive pops from 'p' and 'b' sounds. If you have them, the mic is too close to the mouth.

Remember the more mics you set up in an environment, the more recorders you need to have running, or you need to invest in a *mixer*, which you will need to balance and monitor. This is the work of a whole other person. Don't expect to pay attention to the video, the audio mix and getting the best from your presenter all by yourself. Filmmaking is a team effort.

Other equipment can help you get close to the source of the sound? A *boom*, attached to a shotgun mic will get you close to the speaker. Again, you want another person to hold it. They are called the 'boom operator'. Even if you work out regularly, get a light one if you need one, and make sure it doesn't drop into shot when filming. If there is any wind, you will want to use a '*dead cat*' too. This doesn't solve the issue but does limit the amount of wind noise.



Fig. 17. A 'Dead Cat' wind shield. Smaller ones are called 'Dead Rats'.

Lighting ("yes, it's supposed to be in your eyes!")

The good news is that cameras are very good at capturing scenes in a good range of lighting conditions, everything from candlelight to bright sunlight on a snow scene, but only if you set them up right for it. However, you will soon realise that you need to give it a hand, highlight a subject in a certain way, or create an emotional tone in a scene.

Two things are essential when you consider lighting: the colour/temperature of the light you are using and where you place those light sources. The first of these we've covered when

we set our white balance. Beware how colour casts from certain lights dominate on camera without being balanced (fig.4). But using this colour cast can be useful to achieve a look you want. If you want something else, consider using gels of coloured films in front of your lights. Just be mindful of how hot lights get!



Fig. 18. Uncorrected colour cast from sodium streetlights and fluorescent tubes.

Placement of lights can add depth and dimension as well as reflect mood and emotion. The type of lights and how many you have will enable you to create the feel you want. Typically, you will use three light sources: a *key light*, *back light* and *fill light*. There are no hard and fast rules for placing them. The example below is a textbook example of the *three-point lighting* setup.

Top
Tip

Remember what we said about 'tone' earlier. The colours you choose can enhance the tone or feel of the scene or film you wish to make. Think about the cartoon styling of the original Batman movies, and the dark, grainy look of the Christopher Nolan movies.

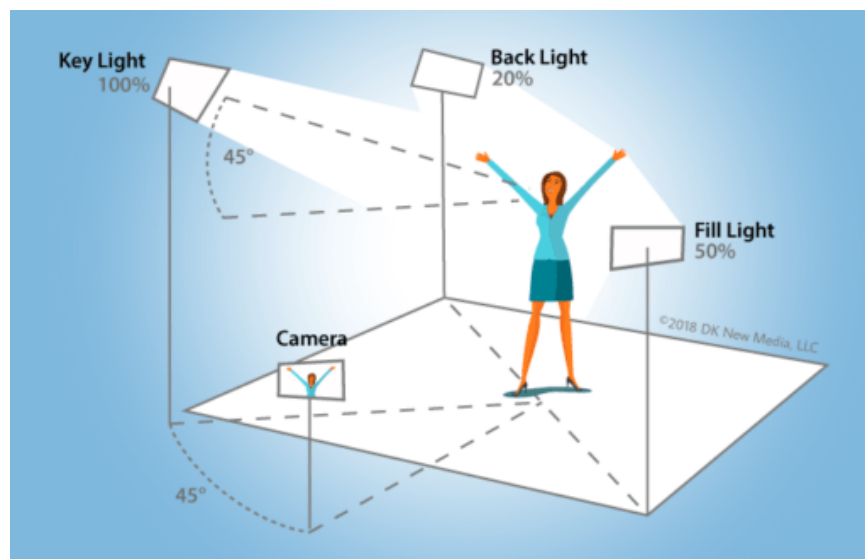


Fig. 19. The starting basis for a three-point lighting setup.

Each light will create definition to the subject and will be presented at different intensities. Not all lights allow you to adjust the brightness with the turn of a switch. To create a lower intensity, you may move a light further away from the subject, attach a soft box, or bounce the light off a reflector or wall/ceiling to get the balance right. If you bounce off a

coloured wall, then the light will take on some of the characteristics of that colour. There is no law about these lights not being seen in the frame, but expose your shot for the subject, not the bulb of the light or everything will turn out dark.

*You've been framed
(notes on
composition)*

It's okay to break the rules on composition, but you must first learn those rules and at least attempt to do them justice. We're talking about where things sit in your camera frame in relation to other things, even in the third dimension. Luckily, a simple framing guide is built into your cameras, and it's called the *rule of thirds*. You will find these grid lines will help, so switch them on.



Fig. 20. The 'Rule of Thirds' with key actions taking place at the intersections.

Note in the image above how key aspects of importance to the shot are at the junctions of the lines on the screen. We read emotion from eyes at one junction and action from the hand at another. Also note that the camera is usually at the same height as the eyes! Avoid framing your subject centrally, but along one of the lines that dissect the screen instead. The same applies to the horizon. Think about positioning this along either the upper or lower third lines. The subject in focus will dictate which of the two is more appropriate.

How close you position the camera to the scene will affect the placement of objects visible on the screen, relative to each other in the third dimension. Positioning the camera close to the action and using your zoom lens at the shortest focal length will ensure distant objects are placed further away in the

Top Tip

If you are using a green screen or plain backdrop, ensure there are no shadows cast on it. Move the subject forward, the camera back and use the zoom to bring the two appear closer, just like you see in the 200mm example opposite. Focus well on the subject and the green background you will 'key into' will become blurred so that any creases, imperfections or shadows are greatly reduced.

frame. If the camera is moved back and the zoom lens used to the maximum, then distant objects in the frame will appear much closer the front of the scene, but your depth of focus is greatly reduced and the background blurs to achieve a cinematic look.



Fig. 21. Camera positioning and zoom lens length, distortion and depth of field.

One further issue of using the zoom at the longer focal length is that you need to hold the camera very still or use a tripod. The slightest motion will be amplified in the frame of the camera.

As well as this, you need to ensure that microphone booms don't drop into the top of the frame, or lighting equipment and crew don't appear at the edge of frame. You are ideally looking for nothing that distracts from your subject.

Let's look at the main types of shot often filmed. How you storyboard the order of the shots you film will help the audience follow the narrative of your story. For instance, the first shot may be the Extreme Long Shot, which sets the scene; sometimes called the 'establishing shot'. It allows the audience

to become immersed with the players, in the environment that the action is to take place in.



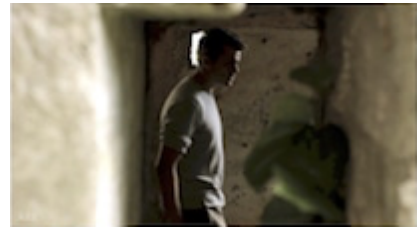
Extreme Long Shot (XLS)



Long Shot (LS)



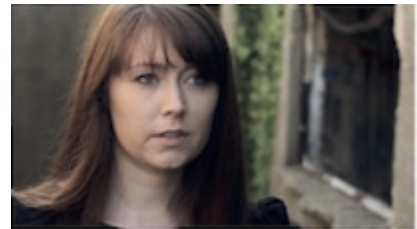
Medium Long Shot (MLS)



Mid Shot (MS)



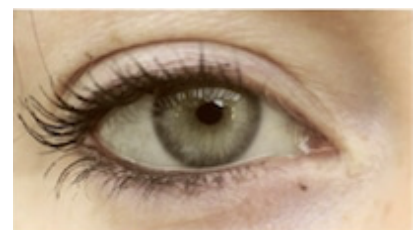
Medium Closeup (MCU)



Closeup (CU)



Big Closeup (BCU)



Extreme Closeup (XCU)



Insert (I)



Cutaway (CA)

Fig. 22. Common compositions and typical nomenclature.

The bottom two are extremely useful for highlighting details but also allow you to make sneaky edits between different takes. Keep the audio running over the cutaway or insert and nobody will notice.

Regarding the height of the camera, keep the camera at eye level to maintain a neutral influence over the scene.

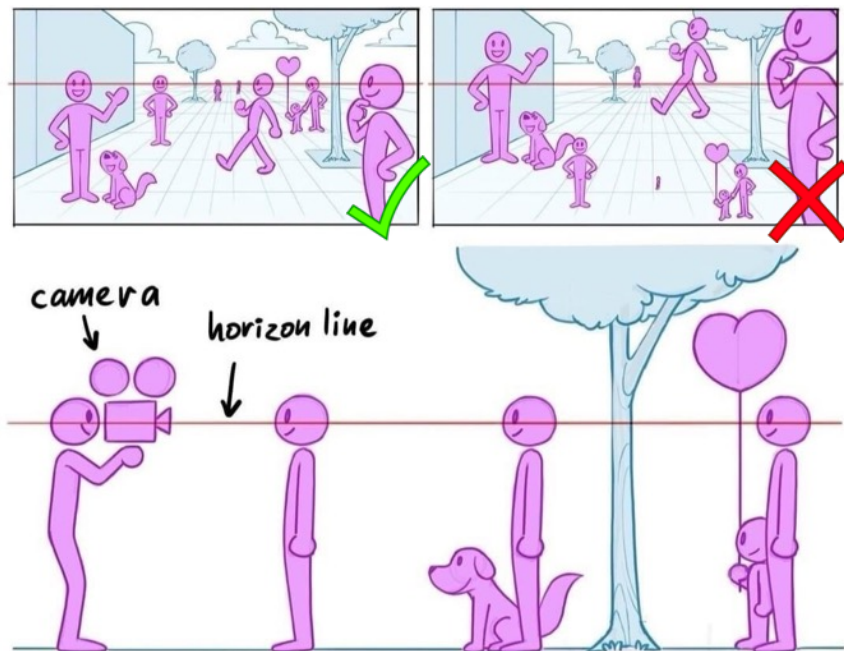


Fig. 23. Put characters correctly in the background.

Changing the height of the shot will change the dominance of the character you are capturing. This will change the emotion of the shot, perhaps to portray intentions or some aspect of narrative, known or unknown to the protagonist. Notice how the high and low angles imbue a sense of authority either to the subject or the viewer.



High Angle



Canted or Dutch angle



Low Angle



Over the Shoulder

Fig. 24. Changing the angle of the camera changes the dominance of the subject.

Choosing the right shot for your scene

The skill of a filmmaker comes in deciding which of these shots to use. How can the emotional power of a scene be strengthened by choosing the right shot? Here are a few tips:

- Ask whose point of view is this scene from? If one person is more important, then you might wish to focus on the reaction of the other, giving them more screen-time in the edit, or even more shots.
- Use the OTS shot even if the near subject is out of focus or you can see little detail, such as just a shoulder. It brings the scene towards an interaction and provides a line of vision for the distant subject to focus on. That's where your audience will be looking. It's often a two-person shot, potentially showing confrontation.
- Fill the screen with a close-up that draws attention to facial features and emotion. Today, we view a lot of material on small screens, which make any body language unclear when a long shot is used.
- The mid-shot captures about half of the body and is good for showing the person holding or using an object. The character's expression isn't the entire focus of the shot.
- If you adjust the height of the camera to imply a position of authority or submission, be subtle. You aren't recreating Citizen Kane, where extreme angles are used, as they can look tacky if overused.
- The Dutch angle is used to deliberately show that the world is off-kilter or disturbed in some way. The character in the scene will appear in a state of confusion. A slow rotation to the Dutch angle, coupled with a slow zoom, can show a realisation that something is wrong for your subject.
- Follow the focus so that action takes place in the same part of the frame from shot to shot. To create tension, force the viewer to shift their eye to another part of the screen by moving the action in the frame. If the shot length is very short, this introduces an element of confusion into the scene, where the audience is forced to wait to process.
- Each new shot should provide new information that provides the thread through the scene. Remember 'show, don't tell'? This is how you practice it.
- Emphasise the close relationship of the people in the scene by grouping them together and using a narrow camera angle, perhaps even utilising a telephoto lens to compress

them physically in the space. Using a wide-angle lens will place a character in a more menacing open space and expand the depth of the shot. This can emphasise an emotional distance between two subjects in the scene.

- Where should the person look? If one character is looking close to the camera, they are more powerful. The character that is looking away is more distant. Have people look normally, so the key character in the scene becomes more powerful when they look closest to the camera.

*Crossing the line
(the '180° rule')*

This shot note requires a little attention. It is one of 'those rules', which isn't a rule, more of a guideline. Of course, rules are meant to be broken, but you must have a good reason for doing it.

You may wish to film a conversation between two people, capturing the natural flow of dialogue. You have three cameras, each positioned as in the bottom of the picture on the next page. That way, the pink subject is always on the left side of the frame; the blue subject is always on the right. We are used to reading the world in this way, so don't break the 180° rule by putting a camera on the wrong side of the dialogue.

Crossing the line would swap the speakers from their side of the frame. It can be effective in creating tension, but you should learn the rule before you can break it. If the performance of your actors is great, you may find you can get away with it, but consider why you need to make life hard on your audience.

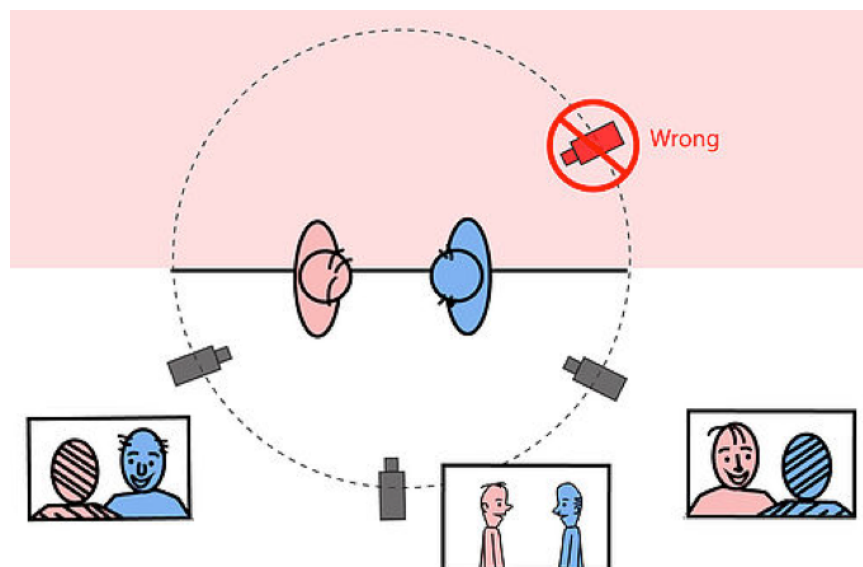


Fig. 25. Stick to the 180 degree rule by keeping your characters on their own side.

Camera Motion For many shots you will likely be using a tripod and capturing a static shot, but that doesn't mean you can't purposely move the camera.

Ask yourself: Do I want movement in this shot? Why do you want it? What feel will it bring to the shot, and the scene? What type of movement do I want? Smooth or jerky? How fast? What equipment do you have to create that movement? Then you will need to pre-visualise and block out the movement you are planning to make! Here are the basic movements you may use:



Most camera movements should mimic real life movements, such as pan and tilt. However, we don't naturally zoom into objects, and it disorients the viewer, taking them out of the real world feeling. Even auteurs like Wes Anderson can't make it feel real. Leave the zoom lens at one length in a shot if you can.

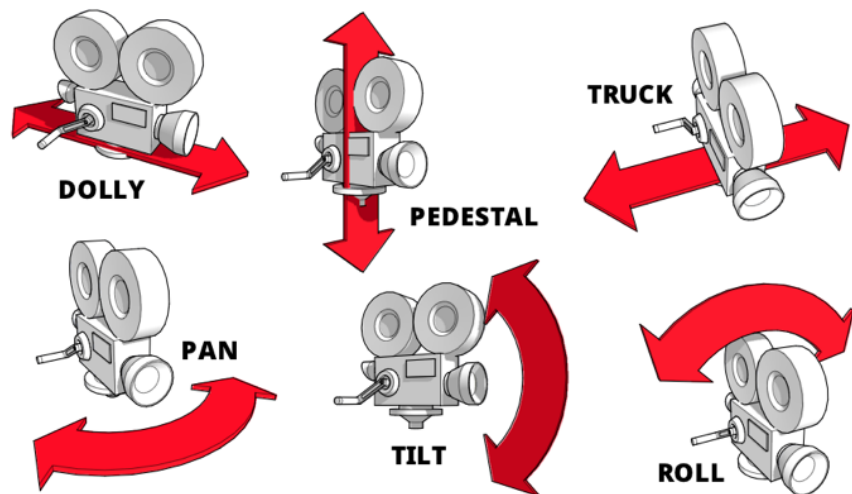


Fig. 26. Descriptions of camera movement.

On a tripod, we can use these examples. You may not have equipment to be able to accomplish all of these, but a decent tripod will not only be able to provide a stable platform but also allow some of these. But not all tripods are created equal. There is a reason tripod heads for filmmakers are more expensive; they will have fluid dampening systems that cause the movement to be extra smooth. Cheaper versions may be jerky and create noisy vibrations that are picked up by the on-board microphone.

"Action!" Only when you are ready does the Director get to say these immortal words. For most people, that's not you. This document is training you for the position of Assistant Director. The Director is responsible for getting the best out of the performers; the right messages delivered in the right way, with the right emotion. Your job is to ensure that the sound and

vision of what the Director sees is captured accurately. Are you ready? Run through your checklist:

- Lights are on and warmed up.
- Camera settings: Correct resolution, aspect ratio, frames per second, shutter speed, ISO and white balance.
- Script to hand and you know what you're capturing.
- Any camera movement is blocked out.
- On-board sound is live and within correct levels.
- Any external microphones are on and recording.
- Slate is marked up and ready.
- The composition of the shot is framed.
- Your subject is comfortable and ready to start.



Your first shot of any interview? As soon as you have set audio levels, press record and ask your subject for their name; how they spell it and what their job title is. That way, when you come to add the ASTONs (AKA 'lower-thirds') in post-production, you will be able to spell them correctly.

If all the departments are set, the following commands are how you call a shot as an Assistant Director.

When the director is ready to call action, the pressure turns over the subject. If you are the subject then you need to relate to your audience, even though you can't see them beyond the people behind the camera. Your job is now to throw away the script and talk to the camera like you are sharing the wonderful things you want your audience to hear.

Assistant Director	<i>"Ready for take?"</i>
Director	<i>"Let's do it."</i>
Assistant Director	<i>"Quiet on set!" (Gets people quiet so you can call for attention and assess background noises.)</i>
Assistant Director	<i>"Roll sound!"</i>
Sound Recordist	<i>[Starts recording.] When recording begins, replies, "Speed!"</i>
Assistant Director	<i>"Roll camera!"</i>
Camera Operator	<i>[Starts recording.] When recording begins, replies, "Speed!"</i>
Camera Assistant	<i>"Scene 1, [production], Take one" or whatever the slate count is at. [Claps the slate in front of the camera.]</i>
Camera Operator	<i>Sets the frame.</i>
Director	<i>"Action!" (The scene happens now. Ensure to leave a beat at the end.)</i>
Director	<i>"Cut!"</i>
Assistant Director	<i>"Another one, or move on?"</i>
Director	<i>"Let's do another"</i>
Assistant Director	<i>"Back to one!"</i>

Again, you are going to want patience; lots of it. Filming takes much longer than you imagine. You need to be able to communicate clearly with everyone involved, including your subject. Be kind and clear. Let people know why you think another take is needed.

Notes on Directing Some people worry about freezing or not having anything to say. Remind them that they are the expert; and know this subject better than anyone. You will be asking questions to draw out their answers. It's more likely that during the interview they will lose focus, go off on a ramble, or a random question takes them on a tangent.

Directions to help your subject give their best performance:

- **Look at the lens.** Make sure they have eye-contact with their audience, which means looking straight at your camera, not you.
- **Chat to the camera** like they are chatting to a mate; use stories, jokes and relatable examples where they can.
- **Aim for soundbites.** Some people will automatically build very long sentences, so encourage them to slow down and pause between each point. If you can't remember where the sentence started, it's too long; let them finish and ask them to summarise what they said in twenty words or less.
- **Be themselves.** An audience doesn't want to hear a robotic, AI voice, they want to listen to a human. And as humans we sometimes use the wrong word, make slip-ups, drop things, laugh when something isn't funny. All that is fine, and it may give personality to your video when appropriately used. Remember the ideas and tone you are trying to convey, not exact words.
- **Keep the presentation bouncy**, but not annoying. If they can show the audience something rather than tell them, then do so (don't do both).
- **Enjoy it.** If they look like you're having fun and are engaged with what they are saying, then your audience will be too.

Remember that your subject is often doing you a favour. Be kind and mindful of what it is like for them at that moment. That said, don't be afraid to ask them to repeat a sentence again if there was a loud distraction. It will make your edit easier.

Just like time invested at the pre-production stage makes your filming easier, remember that the smoother your filming goes, the easier your editing will be. You'll be glad you left that beat in before calling "Cut!"

Feel like a filmmaker? Excellent start. When you've got everything 'in the can' it is time to go to 'post'.

3

POST-PRODUCTION: (HOURS IN THE DARK, WITH A COMPUTER)

The following guide has been put together using *iMovie* as it's free on a Mac and is pretty good for most simple projects. Software on other platforms may look slightly different, yet the principles are the same, regardless of where the buttons are situated. Free, open-source examples for Windows or Linux users are *Shotcut* or *DaVinci Resolve*. Check the appendix for popular options. Tutorials for some popular editing software can be found on the *Science StoryLab* channel on *YouTube*. Choose a non-linear editor (NLE) then use the QR code in 'Further Reading' to follow their great tutorials specific for your choice.

However, as software is updated, features change, and buttons move, this guide will focus more on your *workflow* rather than a detailed account. However, the general layout is as below:

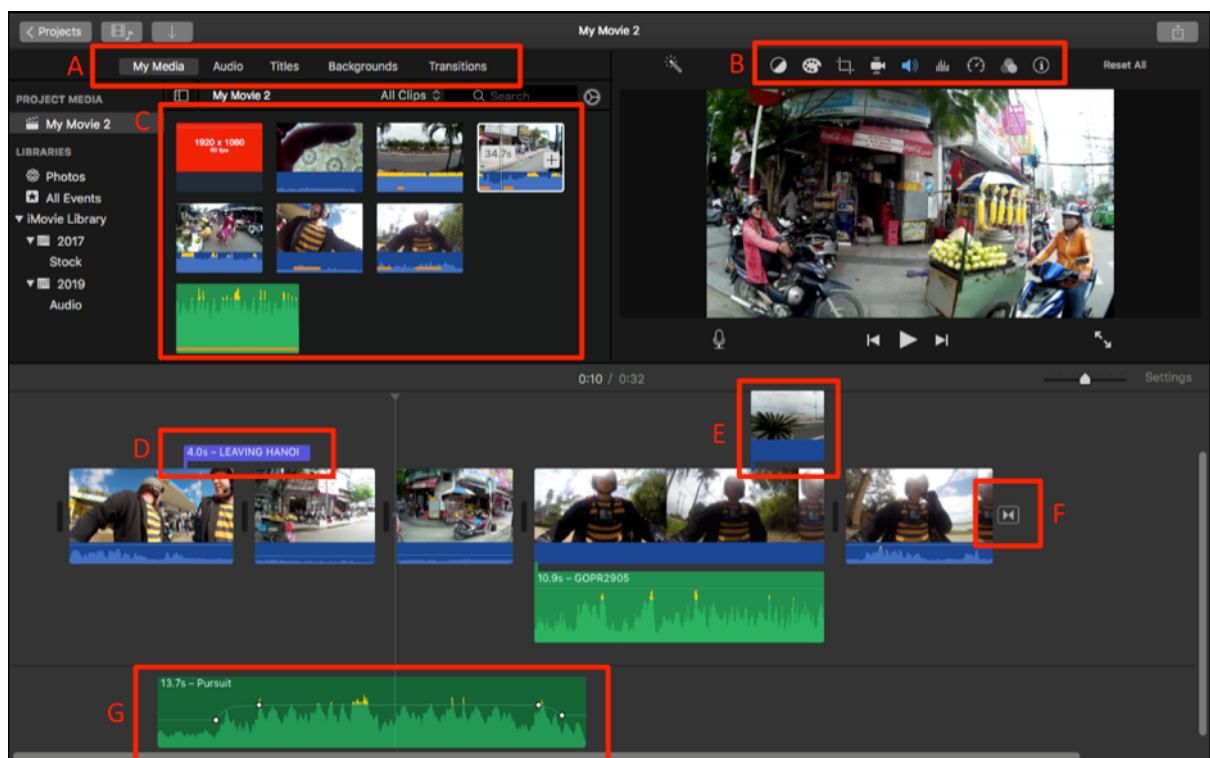


Fig. 27. The workspace of iMovie.

These can appear very complicated to begin with, and this guide will describe most basic actions. Remember that the better the quality of your work during both pre-production and principal photography, the easier this final task will.

The top half of the screen shows the media you have imported (**C**), whether clips, still images, or audio with the preview screen to the right. As you *skim* your cursor over any clip you will see it played in that window. You'll also hear the audio as you skim so a set of headphones will help you here. The preview window is also where you can playback your work so far. The top window (**A**) also hosts any *titles* (**D**), *transitions* (**F**), and stock audio and *foley*³ elements (**G**) you may choose to use in your film.

Any sections of clips or other elements you want to use are dragged from (**C**) to the timeline window at the bottom. Here is where you construct your film in order. When a clip is in position you can make changes to it using the editing tools (**B**). From left to right, these are *Colour Balance*, *Colour Correction*, *Cropping*, *Stabilisation*, *Volume*, *Equaliser*, *Speed*, and *Clip Filter* and *Audio Effects*.

Keyboard shortcuts are very useful to speed up your editing experience. The Help section in iMovie is very useful, but some common ones are: **cmd+x** (cut) **cmd+c** (copy), **cmd+v** (paste), **cmd+b** (split clip), **m** (add marker), and the **space bar** will start and stop playback from your position. Other useful shortcuts are **cmd+z** (undo), **cmd+y** (redo) and **←** (delete selection).

Workflow in non-linear editing

Begin by dragging clips you want into the timeline. To rearrange them, just click and drag sideways. You can add a cutaway (**E**) by dropping a clip into the space above the main timeline. Notice how the audio from the cutaway clip has been lowered to zero so that it doesn't interfere with the audio over the lower clip.⁴

To adjust the volume of audio within a clip, hover over the audio waveforms and you will see it change to tiny up and down arrows. Click and drag to increase or decrease the volume of that audio. You can also select and adjust just a

³ Foley is the word used to describe sounds you add to the film, such as telephones ringing, rain falling, and other noises. Capture these on set if you have the chance. It saves Googling for them later.

⁴ Audio for this clip has also been detached to show how it looks when audio has been imported from another source.

Top Tip

Typically, your sound should sit between -24dB and -8dB. If your video includes dialogue, then that should hover around -18dB and -9dB. Should you include music, consider setting that between -18dB and -22dB. If the music's being used alongside dialogue, then you could lower the track's volume even more, to around -30dB and -35dB. This kind of balance will keep the music in the background while allowing the viewer to concentrate on what you're saying – if it's too high, the soundtrack will get distracting. If you're throwing in extra sound effects, aim to have them between -10dB and -20dB. Anything higher, and the audio will become distorted. To nail the balance, use a good set of headphones when editing your videos.

region of the audio (**G**) by clicking and holding on the audio until a selection window can be dragged sideways.

The edit tools (**B**) include the *Colour Balance* tool which allows you to select the white of the slate you filmed so that iMovie can recognise the temperature of the light shining on it. It will adjust any colour cast on that clip. If you want to adjust contrast, brightness or add tint, then use the *Colour Correction* tool instead.

This window is dynamic and if you select a cutaway clip, it will add a Video Overlay button allowing you to choose how you see that second clip. Options include *Cutaway*, *Green Screen*, *Split Screen* and *Picture in Picture*. If you have filmed against the green screen, you will be able to crop the area, so you tune the image till it looks correct. Imagine that you don't have to just use footage you have filmed to be your background when filming green screen; you can also create animation.⁵



Fig. 28. Before and after of using a greenscreen.

⁵ PowerPoint is good for creating animation and exporting as a movie. Make sure you set your video size correctly, so it exports at the native resolution for your project. If you use a Mac, Keynote is MUCH smoother at exporting animation in presentations as video.

When you are happy with the order of clips, you can add music, foley, titles and transitions. *Titles* can also be used as *ASTONs* in the *Lower Third*. How you use sound effects and transitions is up to you, but don't go mad. It's like using all the animations in PowerPoint in one presentation. The stock audio does contain some jingles and musical themes of different lengths. These are royalty free so imagine how many people with a Mac have used them to death.

Other than the stock media in iMovie, you have options for licensing other royalty-free images and music. Websites like the *Audio Library* in the *YouTube Studio* are great sources. In the credits of your film, you should include all attributions as directed in the instructions provided by the library used. In fact, you have a responsibility to ensure that even brands visible in your film are cleared for use!

When everything is finished, use the **Share** button in the top right corner to export as a **File**. Check your resolution and quality settings. You'll never need to export in *Pro-RES* setting by the way, so select **Medium** but go with your maximum resolution. Finally, let iMovie put it all together. Well done!

Once it's finished you should watch it back in its entirety. Treat your finished version as your master file, which you will probably want to archive somewhere safe. One idea is to create a backup of the entire iMovie Library you have just edited your film together in. You will need to consolidate all the clips into that library and then store it somewhere else. That way, you can always reload that entire library and re-edit your film.

You'll likely notice that the file size is way bigger than you expected. The next stage will help with solutions, depending on where you wish to publish your video.

*Compression &
Distribution*

At this stage you have a great video and yet nobody can see it. You need to make it available to your audience. Depending on your audience, this could be in any number of places.

If your video is for the public

Go where they are! Hopefully you've made something they will want to watch, so now make it easy for them to access and share it.



If you upload to most video hosting platforms, you likely won't need to compress your master file or change the format from the one output by your editing suite. Simply upload it. Platforms like YouTube will look after the worry of streaming it at the right quality to each viewer that clicks on your video. They may also auto-generate captions, providing you have spoken clearly, and your audio is good.

Some platforms are free to view, yet require a subscription to upload onto, such as *Vimeo*. Others, like *Facebook*, require you to register as a member to post or view. Some platforms only allow short videos, while others may try to crop the frame of your video. Social media platforms occasionally change what they permit you to upload in terms of format and length. More importantly, the trend of the audiences that use them also drifts. Social media platforms are high fashion accessories and fall out of favour quickly as audiences age. There's lots to consider, so remember your target audience before publishing it.

Big video hosting platforms are ubiquitous in many countries, providing free, unlimited hosting, free access to viewers, and with apps available on screens, big and small. Sounds great, but they may not be available everywhere because of political reasons. For instance, while not illegal, *YouTube* is currently not available in China. However, if this is not an overly important consideration, then YouTube can be a very quick way to get material online.

Wherever you put your video, remember that it is only one part of your digital strategy. You will need to prepare your stakeholder audience, build anticipation, create a following, be available to talk with them, ensure your content is accessible by providing transcripts of your video, or additional resources for screen readers to use. All this essential preparation takes time and a lot of effort. Keep regular content coming after your first video. Work doesn't end when you post your video; there is just a different phase of work to be done!

If your video is for teaching

Universities have virtual learning environments (VLE) and big files soon fill them up. Some may have limits to the course or module; others may impose limits on the size of a single file you upload. Your file size may still be unnecessarily big, so consider compressing it.

Three things you can do to make your file size manageable:

- Lower the resolution.
- Lower the frame rate (fps).
- Lower the bitrate.

Fortunately, help is at hand. One piece of software is *Handbrake*, available at handbrake.fr. It is available for most computer platforms and is free to use, and easy to set up for the most part.

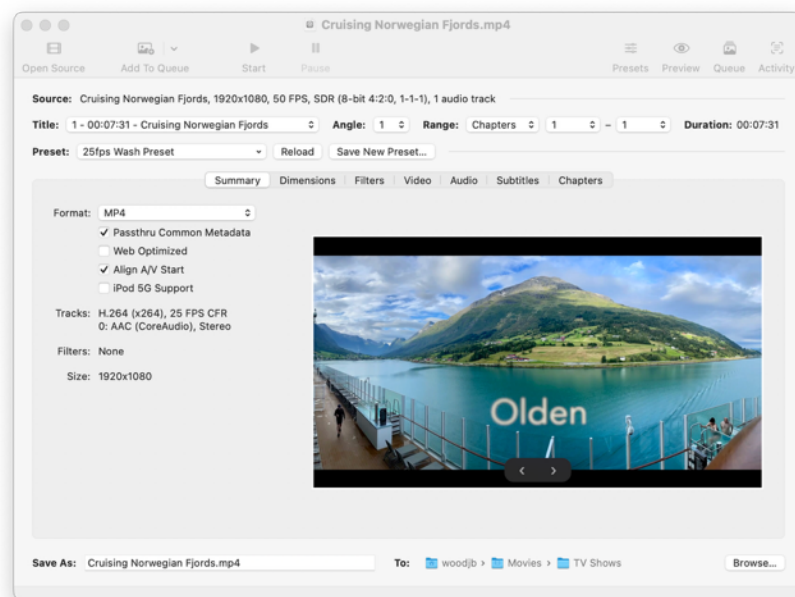


Fig. 28. Main interface of Handbrake.

Install it, open it, and either drag your video file into the window or locate it using the **File, Open** route. After a few seconds, you will be able to flick through a summary of your video. Reading the screen from the top, we can see:

- Information about the **source file**, including the resolution, frame rate, and the total length of the video we are going to compress.

- The **preset** of your target file. It is easy to make your own default specific to your workflow from filming to output. For now, leave it at the default (Fast 1080p30) because we're going to make changes.
- A selection of tabs; most of which we can ignore, but two we are going to adjust:
 - **Dimensions**, where you can change the resolution. To make life easy, toggle the **anamorphic** setting to *Off*. Now, if you adjust the first number in the **storage size** box to 858, the second number will automatically change to maintain the correct aspect ratio. In this example we have gone from HD to DVD quality resolution, (858 x 480).
 - **Video**, where we may make some more changes. Depending on what the **framerate** of your source file is you may wish to lower it using the dropdown box on the left. For instance, if your source file is 50 fps, then you can safely halve it to 25. It won't be as smooth, but the file size will be smaller. If you have output at 60 fps, you will find 30 is also fine. If your source says 29.97 fps, or 25 fps, then select Same as Source. While we are here, there is a **Quality** slider next to this, which you can safely adjust so the RF value is around 24. This will lower the bit rate of your finished file. The bitrate is merely the average amount of data your file needs to make one second of film. You can manually set this using the average bitrate button below instead of the slider. If you do, then 3000 kbps is usually more than good enough.
- The **Save As:** box, which allows you to choose a default place to make the compressed version of your video. Use the browse button to select that. You may also want to choose a filename that allows you to distinguish this from your master file.



Meanwhile, feel free to save your new preset using the appropriate button, even making it your default if you are not going to change your workflow through filming and editing next time. You should still check each time that nothing has changed though.

Once all that is done you can hit the green **Start** button at the top. It may take some time, depending on the length of your video.

After a while, you will have your video containing all the same scenes, yet it may be smaller in screen size and file size. Tinker with the settings to get something that is a balance of the quality you want and what you know can be easily viewable by your audience on the hosting service you have.

4

TLDR? RT*M

If this seems like a lot to take in, then the five pages in this section are the least you should read. It will cover what to prepare, how to direct, how to set up your camera for best sound and visuals, how to edit, and what your editing workflow should look like. Some of this information complements the guidance in the main text and isn't just a copy and paste of it.

WHAT TO PREPARE

- **Brief your subject.** Give them time to carefully craft their explanations to your questions. Consider using visuals to bring it alive; comparators to give a sense of scale; analogies to help with complex, more abstract ideas.
- **Spend time condensing your message.** A digital audience is much less forgiving and much more easily distracted, so get to the point, and fast. Say something interesting within the first 20 seconds to hook your audience. No-one needs or wants to hear a long introduction. Aim to keep the video short.
- **Practice what everyone is going to say.** Keep short prompts just out of shot, but don't try and remember a script word-for-word. While practicing, listen out to minimise impenetrable jargon; words your audience won't know. (You may ask your subject, "What does ----- mean to you?") Meanwhile, ensure your content is pitched for your audience, not you as an interviewer.
- **Cutaways.** Make sure you plan to capture extra footage to allow you to cut away from the focus of the interviewee and hide your *edits*. Sometimes you can have a static camera plus a second hand-held camera from a different angle.

HOW TO DIRECT

Some people worry about freezing or not having anything to say. Remind them that they are the expert; and know this subject better than anyone. You will be asking questions to draw out their answers. It's more likely that during the interview they will lose focus, go off on a ramble, or a random question takes them on a tangent.

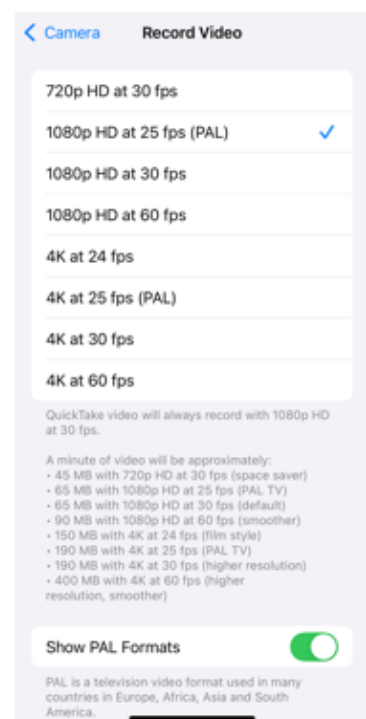
Directions to help your subject give their best performance:

- **Look at the lens.** Make sure they have eye-contact with their audience, which means looking straight at your camera, not you.
- **Chat to the camera** like they are chatting to a mate; use stories, jokes and relatable examples where they can.
- **Aim for soundbites.** Some people will automatically build very long sentences, so encourage them to slow down and pause between each point. If you can't remember where the sentence started, it's too long; let them finish and ask them to summarise what they said in 20 words or less.
- **Be themselves.** An audience doesn't want to hear a robot, they want to hear a human. And as humans we sometimes use the wrong word, make slip-ups, drop things, laugh when something isn't funny. All that is fine, and it will give personality to your video. Remember the ideas you're trying to convey, not exact words.
- **Keep the presentation bouncy,** but not annoying. If they can show the audience something rather than tell them, then do so (don't do both).
- **Enjoy it.** If they look like you're having fun and are engaged with what they are saying, then your audience will be too.

Remember that your subject is often doing you a favour. Be kind and mindful of what it is like for them at that moment. That said, don't be afraid to ask them to repeat a sentence again if there was a loud distraction. It will make your edit easier.

WHAT WE SEE: CAMERA SETUP

- A resolution of 1080p HD is plenty sufficient for most filming. 4K can be a bit overkill for most people, and fills your memory fast. Filming at high resolutions can also be taxing for a lower spec computer to edit later.
- In this age of LED lights, set your camera to film at 25 or 50 frames per second (fps) so they sync well with the flicker of the lights. You may need to switch on the PAL settings of your camera in order to see 25 or 50 fps.
- Once you've picked a lane, stick in it. Your exception is when you are filming some shots in slow motion. They can be multiples of what settings you have fixed.



WHAT WE SEE: COMPOSITION

- **Film in 'landscape'** unless you are intending to exclusively post to TikTok, Instagram, Snapchat, or YouTube Shorts. It makes your footage more accessible to wider audiences watching on laptops, via monitors, on TV, and in schools.
- **Consider where the 'safe zone' in the frame is.** Certain video platforms may crop your video to their ever-changing whims, or superimpose **like** or **share** buttons over your video, where you have framed crucial details.
- **Hold the camera still.** You may simply be able to rest it on something, as long as it is at the right height for the subject of your scene. Use a stable tripod for larger cameras, or a desktop tripod for phones.
- **Keep it Simple.** People respond better to someone genuine, so make sure your subject is the focus, not the surroundings. Keep your background as least distracting as possible; not bland, but nothing abnormal. No open doors, no mirrors, or blank walls. Move around the space and try different locations for variety.
- **Use the 'Rule of Thirds'.** Position key things in the junctions of the boxes as in the examples below. Break the rules when you've learned them.
- **Compose for purpose.** How you frame each shot in a scene will not just tell the story, but will portray emotion. See more on page 40 for common options.



Fig. 29. Observing the 'rule of thirds', keeping the action on the hot spots.

WHAT WE SEE: LIGHTING

- **Keep lots of light behind you.** Don't shoot into the light, as your subject will be made to appear very dark, in contrast. Position the camera and subject so their face is lit. If they are telling you that the light is in their eyes, it's in the right place, but might be a bit too bright; try turning it down or moving it back, even bouncing it off the ceiling can be a good solution.

WHAT WE HEAR

- **Audio is king.** Relying on the mic on your camera or phone is never great. If you can, place a microphone in the right place on your subject.
- **Balance Signal to Noise.** Try to film in a quiet room. Soft furnishings can help soften an echoey room. Avoid using surfaces with 'loud' tops (like glass or metal) or wearing jewellery that could bang, rattle, and make distracting noises.

HOW TO EDIT

All editing software looks slightly different, yet the principles are the same, regardless of where the buttons are situated. So, let's focus on the workflow rather than a detailed account. A general layout (from *iMovie*) is as below.

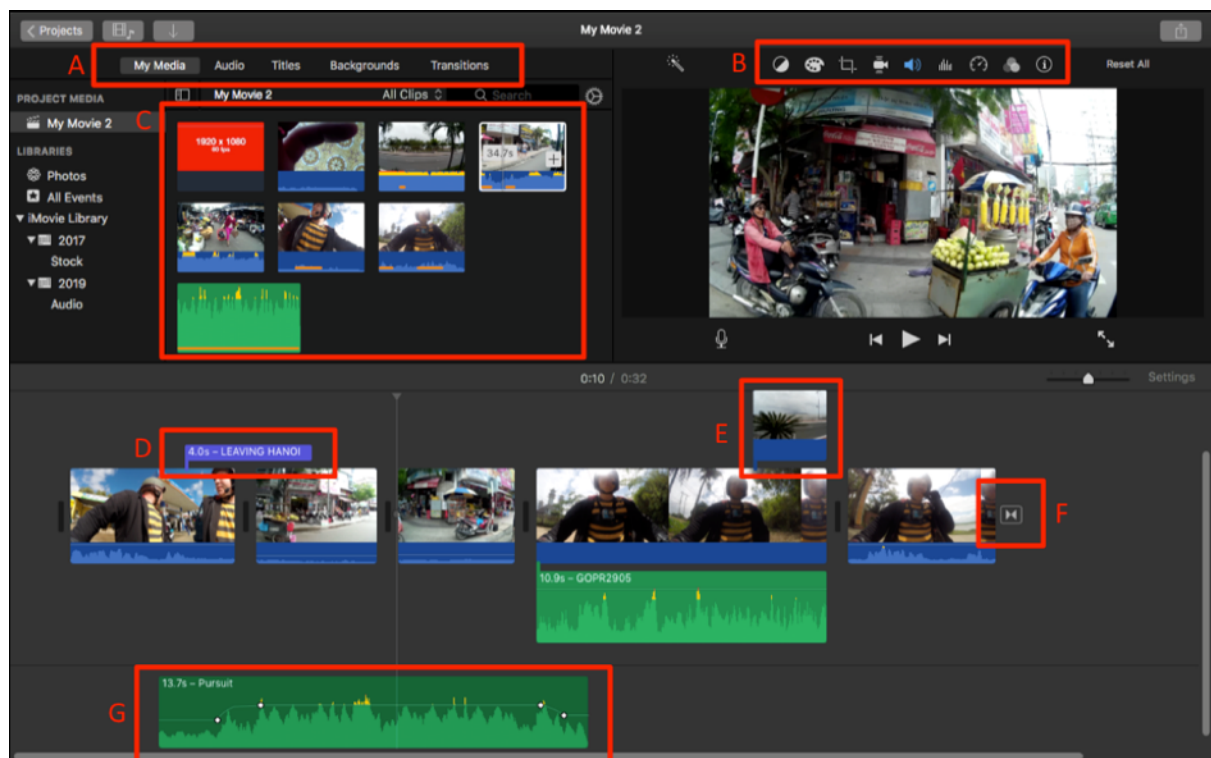


Fig. 30. Annotated iMovie workspace.

The top half of the screen shows the media you have imported (C), whether clips, still images, or audio with the *preview screen* to the right. As you skim your cursor over any clip you will see it played in that window. You'll also hear the audio as you skim so a set of headphones will help you here. The preview window is also where you can playback your work so far. The top tab (A) also hosts any *titles* (D), *transitions* (F), and stock *audio* and *foley* elements (G) you may choose to use in your film.

Any sections of clips or other elements you want to use are dragged from (C) to the *timeline window* at the bottom. Here is where you construct your film in order. When a clip is in position and selected, you can apply changes to it using the *editing tools* (B). From left to right, these are *Colour Balance*, *Colour Correction*, *Cropping*, *Stabilisation*, *Volume*, *Equaliser*, *Speed*, and *Video Filters* and *Audio Effects*.

Keyboard shortcuts are very useful to speed up your editing experience. The *Help section* in any software is very useful, but some common ones are: **cmd+x** (cut) **cmd+c** (copy), **cmd+v** (paste), **cmd+b** (split clip), **m** (add marker), and the **space bar** will start and stop playback from your position. Other useful shortcuts are **cmd+z** (undo), **cmd+y** (redo) and **delete** (delete selection).

WORKFLOW IN NON-LINEAR EDITING

1) Assemble your Clips in the Right Order. Begin by dragging clips you want into the *timeline*. To rearrange them, just click and drag them sideways. You can add a *cutaway* (**E**) by dropping a clip into the space above the main timeline. Notice how the audio from the cutaway clip has been lowered to zero so that it doesn't interfere with the audio over the lower clip.

2) Get your Audio Just Right. To adjust the volume of audio within a clip, hover over the audio waveforms and you will see it change to tiny up and down arrows. Click and drag to increase or decrease the volume of that audio. You can also select and adjust just a region of the audio (**G**) by clicking and holding on the audio until a selection window can be dragged sideways. Audio for the clip above has also been detached to show how it looks when audio has been imported from another source, such as a digital recorder.

3) Adjust the Appearance of your Clips. The *Colour Balance* tool (**B**) adjusts the *White Balance* so your software can be reminded what 'white looks like' with that temperature of the light shining on it. It will adjust any colour cast on that clip. If you want to adjust contrast, brightness or add tint, then use the *Colour Correction* tool instead.

4) Add any Foley and Music Cues. When you are happy with the look of your clips, you can add music, foley, and transitions. *Foley* is the word used to describe sounds you add to the film, such as telephones ringing, rain falling, and other noises. How you use sound effects and transitions is up to you, but don't go mad. You may include other royalty-free images and music. The *Audio Library* in the *YouTube Studio* is a great source; (login to *YouTube*, select your account and then *YouTube Studio*. The Audio library is found in the left-hand navigation bar). In the credits of your film, you should include all attributions as directed in the instructions provided by the library used. In fact, you have a responsibility to ensure that ANY brands visible in your film are cleared for use!

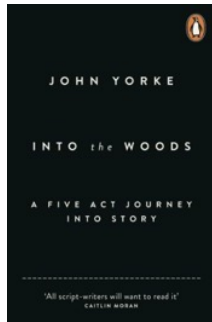
5) Add your Titles. Titles in the lower third of the screen can be helpful. Many styles may be available, and you can use titles creatively, but it's best if they are in keeping with the purpose and messages of your video.

6) Share or Export your Project. When everything is finished, use the **Share** button in the top right corner to export as a **File**. Check your resolution and quality settings. You'll never need to export in Pro-RES setting, so select **Medium** but go with the maximum resolution you filmed with. Finally, let your software export your film.

7) Compress your film. Films that are exported straight from the editing software tend to be HUGE and would use all your data just to watch once. Use a video compression software such as *Handbrake* to make the file size more manageable. You have options to reduce the resolution (not great) or lower the bitrate (better option). Balance what looks best and gives you a file size you want.

5

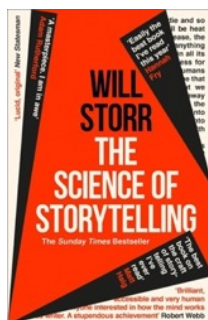
FURTHER READING



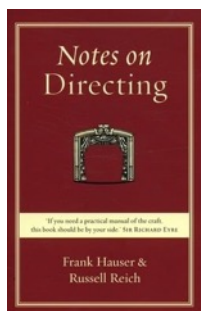
Why do we love and tell stories? And why do all stories function in an eerily similar way? John Yorke, creator of the *BBC Writers' Academy*, has brought a vast array of drama to British screens. Here he takes us on a journey to the heart of storytelling, revealing that there truly is a unifying shape to narrative forms - one that echoes the fairytale journey into the woods and, like any great art, comes from deep within. From ancient myths to big-budget blockbusters, he gets to the root of the stories that are all around us, every day.



A practical manual for anyone who wants to turn scientific facts into gripping science stories, this book provides an overview of story elements and structure, guidance on where to locate them in scientific papers and a step-by-step guide to applying storytelling techniques to writing about science. A variety of writing techniques and approaches are presented as a way of framing science stories in ways that are informative and compelling in different media – from short films to news articles.



Why stories make us human and how to tell them better. There have been many attempts to understand what makes a good story, but few have used a scientific approach. In this incisive, thought-provoking book, award-winning writer Will Storr demonstrates how master storytellers manipulate and compel us. Applying dazzling psychological research and cutting-edge neuroscience to the foundations of our myths and archetypes, he shows how we can use these tools to tell better stories – and make sense of our chaotic modern world.



Frank Hauser's *Notes on Directing* addresses a wide range of topics, from understanding the script and defining the director's role, to casting, how to handle a first read-through of a script, rules for rehearsal, how to talk to actors, how to get a laugh, and the key elements of staging. It is full of good advice expressed in assertive, no-nonsense language, insightful quotes and examples



Over a series of 10 videos Greg Foot introduces tips and techniques to help you talk with the public about anything from the world of STEM. The course has a focus on helping practising scientists communicate their work with non-experts, but it's written to also be useful to anyone interested in science communication.



Huw James from *Anturus* leads step-by-step tutorials on many common non-linear editors, including *iMovie*, *Final Cut Pro*, *Filmora*, *DaVinci Resolve*, *Adobe Premiere Pro/Rush*. Moreover, there is additional focus on storytelling for scientists.



If you have an interest in filmmaking, then *WolfCrow* is a great place to nerd out over the world's finest directors and cinema. Sareesh Sudhakaran is a film director and award-winning cinematographer with over twenty-four years of experience.



6

APPENDIX

The first part of this section is a resource bank. Links may change and companies change hands, leading to new products. However, at time of print, this list should be a decent starting point. You will find options for Mac, Windows and Linux, and either free, on a single payment, or subscription basis.

ROYALTY-FREE MEDIA SOURCES

NON-LINEAR EDITORS

Secondly, here are blank forms for you to adapt for your own needs. You may want any of these for all the people and locations that will appear in your film. There are many available online, and if you are affiliated with a university, they may have versions available for you to use. **IMPORTANT:** These example templates are sourced from *SetHero*. They do not constitute legal advice and should be reviewed by a lawyer before use.

PARTICIPANT RELEASE AGREEMENT

LOCATION AGREEMENT

RISK ASSESSMENT

BLANK STORYBOARD TEMPLATE

JON'S ABRIDGED STORYBOARD EXAMPLE FOR PIXAR'S LUXO JR

ROYALTY-FREE MEDIA SOURCES



Pexels is a free stock photo and video website and app that helps designers, bloggers, and everyone who is looking for visuals to find great photos and videos that can be downloaded and used for free. Very searchable, and easy to use. The cover images for this booklet are from Pexels.



The *Audio Library* in *YouTube Studio* is a useful resource for free music to use in your films. It is searchable by genre, mood, and length. A variety of licenses are available, some free, some requiring attribution.



The *BBC Sound Effects Archive* is available for personal, educational or research purposes. There are over 33,000 clips from across the world from the past 100 years. Find clips made by the BBC Radiophonic workshop and special effects made for BBC TV and Radio productions, as well as 15,000 recordings from the Natural History Unit archive.



MobyGratis offers free music for non-commercial purposes. However, a commercial license is required for any monetized or commercial uses. Also, the music cannot be used to promote right-wing politics, meat, dairy, or other animal products.



NON-LINEAR EDITORS



If you are using a Mac, begin with *iMovie* until you start meeting its limitations. You then have the same choices as Windows users, but may wish to pursue *Final Cut Pro*. If you work in educational institutions, you may benefit from the 'Educators bundle' via the link to the right for £199 which includes a whole suite of apps for creatives.



Filmora is known for its user-friendly interface that caters to beginners and semi-professionals. The free version will add a watermark to your final film and limits the AI functions.



DaVinci Resolve, used by professionals for editing, colour correction, visual effects, motion graphics, and audio post-production. It is available in a free version with a comprehensive set of features and a paid version, *DaVinci Resolve Studio*, which adds advanced capabilities.



Adobe Premiere Pro is known for its deep integration with other Adobe Creative Cloud applications, such as *After Effects*, *Photoshop*, and *Audition*. Run on a subscription basis, it has a 7-day free trial followed by an extra 14 days during which you can cancel and receive a full refund.



OpenShot is simple and easy for beginners, though it can struggle with large projects. It features include 3D animations and over 400 transitions. It is free, and open source. Also available for Linux operating systems.



Shotcut is a more robust and faster video editor better suited for experienced users. By utilising hardware acceleration, it handles higher resolution video better. It also offers more control over the colour and grading of you film clips.



PARTICIPANT RELEASE AGREEMENT

This is a **Participant Release Agreement** dated _____, between _____
(PRODUCTION COMPANY) and _____ (PARTICIPANT).

PRODUCTION COMPANY AND PARTICIPANT AGREE AS FOLLOWS:

1. PARTICIPANT assigns to PRODUCTION COMPANY the right to record PARTICIPANT'S voice and likeness for use in a media production ("Production") that is tentatively titled _____ to be recorded (date) _____.
2. In assigning the rights in this Agreement PARTICIPANT grants to PRODUCTION COMPANY and its successors, assigns, and licensees the full and irrevocable right to produce, copy, distribute, exhibit or transmit PARTICIPANT'S voice and likeness in connection with the Production by means of broadcast or cablecast videotape, film, audiotape or any electronic or mechanical method now known or hereafter devised.
3. PARTICIPANT acknowledges that any picture or recording taken of PARTICIPANT under the terms of this Agreement becomes the sole and exclusive property of PRODUCTION COMPANY in perpetuity and throughout the world.
4. PARTICIPANT further acknowledges that PRODUCTION COMPANY has the right to use PARTICIPANT'S name, portrait, voice, or biographical information to promote or publicize the Production, and to authorize others to do the same. PARTICIPANT agrees that no photographs, footage, or other material need be submitted to them for approval prior to usage.
5. PARTICIPANT agrees that this release is not and in no way represents a promise or guarantee of consequent employment or remuneration. PARTICIPANT also agrees that nothing *requires* PRODUCTION COMPANY to use PARTICIPANT'S name, voice, or likeness in any of the manners described or to exercise any of the rights in this Agreement.
6. PARTICIPANT warrants that PARTICIPANT is free to enter into this Agreement, and that this Agreement does not conflict with any existing contracts or agreements to which PARTICIPANT is a party. PARTICIPANT agrees to hold PRODUCTION COMPANY and any third parties harmless from and against any and all claims, liabilities, losses, or damages that may arise from the use of PARTICIPANT'S voice or image in the Production.
7. PARTICIPANT acknowledges that this Agreement is not valid or binding upon PRODUCTION COMPANY until signed by a representative of the PRODUCTION COMPANY.

If the releaser is not yet 18 years old, the following must be completed and signed: I, the undersigned, hereby warrant that I am the parent / guardian [circle whichever applies] of _____ [print name], a minor, and have full authority to authorize the above Agreement for him/her, which I have read and approved.

PARTICIPANT (OR PARENT / GUARDIAN IF MINOR)

Printed Name: _____

Signature: _____

Address: _____

Date Signed: _____

PRODUCTION COMPANY REPRESENTATIVE

Printed Name: _____

Signature: _____

Title/Position: _____

Date Signed: _____

LOCATION AGREEMENT

This Location Agreement ("Agreement") is entered into on _____, by and between _____ ("Production Company") and _____ ("Grantor").

- IDENTITY OF FILMING LOCATION:** Grantor hereby agrees to permit Production Company to use the property located at the address _____ ("Property") in connection with the film tentatively titled _____ ("Picture") for rehearsing, photographing, filming and recording scenes and sounds for the Picture. Production Company and its licensees, sponsors, assigns and successors may exhibit, advertise and promote the Picture or any portion thereof, whether or not such uses contain audio and/or visual reproductions of the Property and whether or not the Property is identified, in any and all media which currently exist or which may exist in the future in all countries of the world and in perpetuity.
- RIGHTS GRANTED:** Grantor hereby grants to Production Company, its successors, assigns and licensees, all rights of every kind in connection with the Picture including, but not limited to, the right to photograph, make recordings of any and all scenes and sounds photographed or recorded at and of the Property, and otherwise enter and use the Property, which use includes but is not limited to the interior and exterior portions of the Property, for and in connection with the Picture, and any such other motion picture, theatrical production, television production (including, without limitation, movies-for-television, television mini-series, television pilot and television series, whether produced for exhibition on network television, free over-the-air syndicated television, pay cable, basic cable, pay-per-view, Internet, worldwide web, all electronic transmissions, such as through iPods, iPhones or cell phone downloads or otherwise) or any other production (including, without limitation, home video productions) and to exploit the Picture in any and all media, whether now known or discovered, as Production Company and its licensees, sponsors, assigns and successors determine and to exhibit, advertise, promote and exploit such photographs and recordings, or any portion thereof, in any manner whatsoever, whether or not such property is identified, at any time, in perpetuity, throughout the universe. Grantor hereby acknowledges and agrees that Grantor, any tenant, and any other party now or hereafter having an interest in the Property, shall have no right or interest whatsoever in any photography or recording of the Property or any results and proceeds of Production Company's use of the Property.
- RIGHT OF ACCESS:** Production Company shall have the right to bring personnel and equipment (including props and temporary motion picture sets) onto the Property and to remove same after completion of its use of the Property hereunder. Production Company shall have the right but not the obligation to photograph, film, videotape, record sound and use in the Picture the actual name, if any, connected with the Property or to use any other name for the Property, including taking down Grantor's signs and replacing with Production Company's own signs. Grantor agrees to have no right to inspect or approve recordings.
- TERM:** The Term of this Agreement shall commence on or about _____ and continue until approximately _____. The Term may be extended by Production Company at a later date to be mutually agreed upon if there are changes in the production schedule, delays due to weather conditions, or illness of actors, the director or other essential artists and crew. The within permission shall also apply to future retakes and/or added scenes.
- PAYMENT:** For the amount of £_____ and other good and valuable consideration, the sufficiency of which Grantor acknowledges, Grantor shall provide access to Production Company to the Property according to the statements and conditions stated in this Agreement.
- ALTERATIONS TO LOCATION:** Production Company shall leave Property in substantially as good condition as when received by it; and Production Company shall indemnify and hold Grantor harmless from and against damages for injury to persons and for damage to or destruction of property occurring during and as a result of Production Company's use of said Property. If there is a dispute as to whether there are any damages to the Property caused by Production Company, Grantor must first deliver to Production Company a detailed list of those items and provide Production Company with a reasonable opportunity to inspect the Property to determine the need for repairs, if any.
- ASSIGNMENT:** Grantor gives Production Company the right to assign all terms stated in this Agreement.
- AUTHORITY:** The undersigned understands the terms described in this Agreement. The undersigned is over 18 years of age. The undersigned has the authority to execute this Agreement on behalf of Grantor and grant Production Company the rights given under this Agreement.

9. **RELEASE:** Grantor releases and discharges Production Company, its employees, agents, licensees, successors and assigns from any and all claims, demands or causes of actions that Grantor may now have or may from now on have for libel, defamation, invasion of privacy or right of publicity, infringement of copyright or violation of any other right arising out of or relating to any utilization of the rights granted herein. All rights of any kind in and all photography and sound recordings made hereunder shall be solely owned in perpetuity by Production Company, and neither Grantor nor any tenant or other party now or hereafter having an interest in said Property shall have any right of action including, without limitation, any right to injunctive or equitable relief against Production Company and/or any other party arising out of any use or non-use of said photography and/or sound recordings and in no event shall Grantor be entitled to rescind the rights granted herein, restrain or enjoin the production, distribution, exhibition or exploitation of the Picture or any such other motion picture, television production (including, without limitation, movies for television, television mini-series, television pilot and television series, whether produced for exhibition on network television, free over-the-air syndicated television, pay cable, basic cable, pay-per-view, Internet, worldwide web or otherwise) or any other production (including, without limitation, home video productions). Production Company shall have no obligation to use the Property or to include the Property in the Picture, or to produce, release, distribute or otherwise exploit the Picture.
10. **APPLICABLE LAW:** This Agreement shall be construed and enforced in accordance with the laws of the United Kingdom
11. **ENTIRE AGREEMENT:** This Agreement sets forth the entire understanding of the parties thereto relating to the subject matter hereof and supersedes all prior agreements, whether oral or written, pertaining thereto. No modification, amendment, or waiver of this Agreement or any of the terms or provisions hereof shall be binding upon Production Company or Grantor unless confirmed by a written instrument signed by authorized officers of both Production Company and Grantor.

IN WITNESS WHEREOF, the parties have executed this Agreement as of the year and date first above written.

ACCEPTED AND AGREED TO:

GRANTOR

PRODUCTION COMPANY

Signature

Signature

Print Name

Print Name

Position

Position

Location Address:

Company Address:

RISK ASSESSMENT TEMPLATE

PRODUCTION TITLE: _____

ASSESSOR: _____ DATE: _____

SCENE #: _____ SHOT #: _____ LOCATION: _____

[illegible]

Shot #: _____
Shot Description:

(circle) Tripod Dolly/Slider Handheld Other

Shot #: _____
Shot Description:

(circle) Tripod Dolly/Slider Handheld Other

Shot #: _____
Shot Description:

(circle) Tripod Dolly/Slider Handheld Other

Shot #: _____
Shot Description:

(circle) Tripod Dolly/Slider Handheld Other

Shot #: _____
Shot Description:

(circle) Tripod Dolly/Slider Handheld Other

Shot #: _____
Shot Description:

(circle) Tripod Dolly/Slider Handheld Other



Storyboard

Watch Luxo Jr. and describe the narrative by drawing storyboard frames. You've only got a maximum of 12 frames, so you'll have to choose the key story beats that best represent the overall story. Remember, you can pack more information into a single frame using arrows, annotations, and a written description.



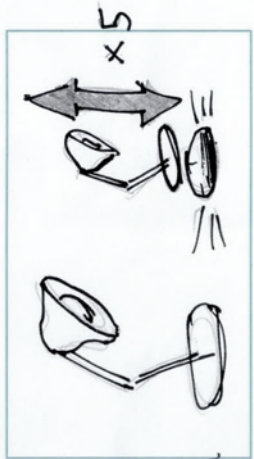
Ball entering, observed by senior. It stops at the base of Jr.



Sr bats back the ball



Ball reenters at speed, chased by Junior who then returns ball.



Jr bounces on the ball several times. The ball appears quite elastic, until...



... a pop! and the ball deflates slowly beneath Jr.



While Sr leans in to see, Jr shimmies backwards to explore event



Jr flips into the ball, which flops over, lifeless.



Jr sinks low in sadness at the loss of the ball. A beat!



Jr bounces off screen with mild (!) enthusiasm. A beat!



Sr becomes alarmed, before we see a giant ball enter at speed through the frame.



Jr bounces joyfully after it, as Sr looks to the 4th wall for...

Bring STEM to Life!

2

willmarler ANIMATION & DESIGN

Bring STEM to Life!

3

willmarler ANIMATION & DESIGN

