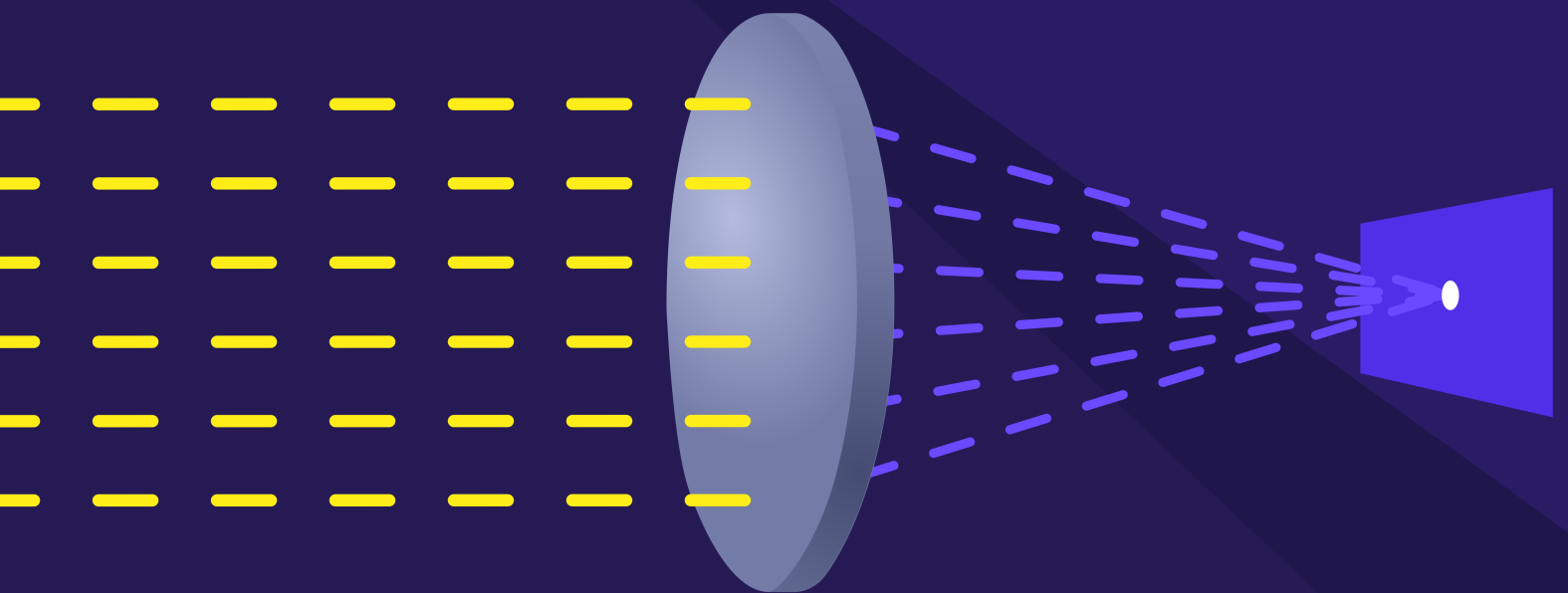




Camera Lenses Explained

Vol. 1

By  studio binder



Camera Lenses Explained

Understanding the Different Types of Lenses and What They Do

Brought to you by StudioBinder

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Foreword

The impetus behind StudioBinder was simple — to create a holistic [production management solution](#) that could handle everything from screenwriting and storyboards, to shooting schedules and call sheets.

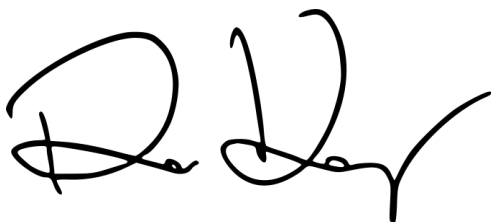
But once this was done, it became clear that creating the software wasn't enough, we had to educate as well. Navigating the world of advertising, filmmaking, photography, music videos, etc. is a daunting task full of jargon, new technologies, and moving pieces.

The [StudioBinder Blog](#), which hosts over two thousand articles and millions of readers every month, and our [YouTube channel](#),

rapidly approaching 1 million subscribers, were born out of this goal to educate.

StudioBinder's business and educational aspirations have aligned in ways that continually inspires me. And it has been a real honor and joy to watch the StudioBinder community grow.

Which brings us to this latest resource: *Camera Lenses Explained – Understanding the Different Types of Camera Lenses and What They Do*. There's a good deal of confusion about the various lenses at our disposal, and the unique storytelling effects each imbues. Our goal with this book is to help you decode the unique technical aspects of each lens type, and to more confidently know which lenses will serve your story best.

A handwritten signature in black ink, appearing to read 'Robert Kiraz', with a stylized, cursive script.

Robert Kiraz, CEO
StudioBinder



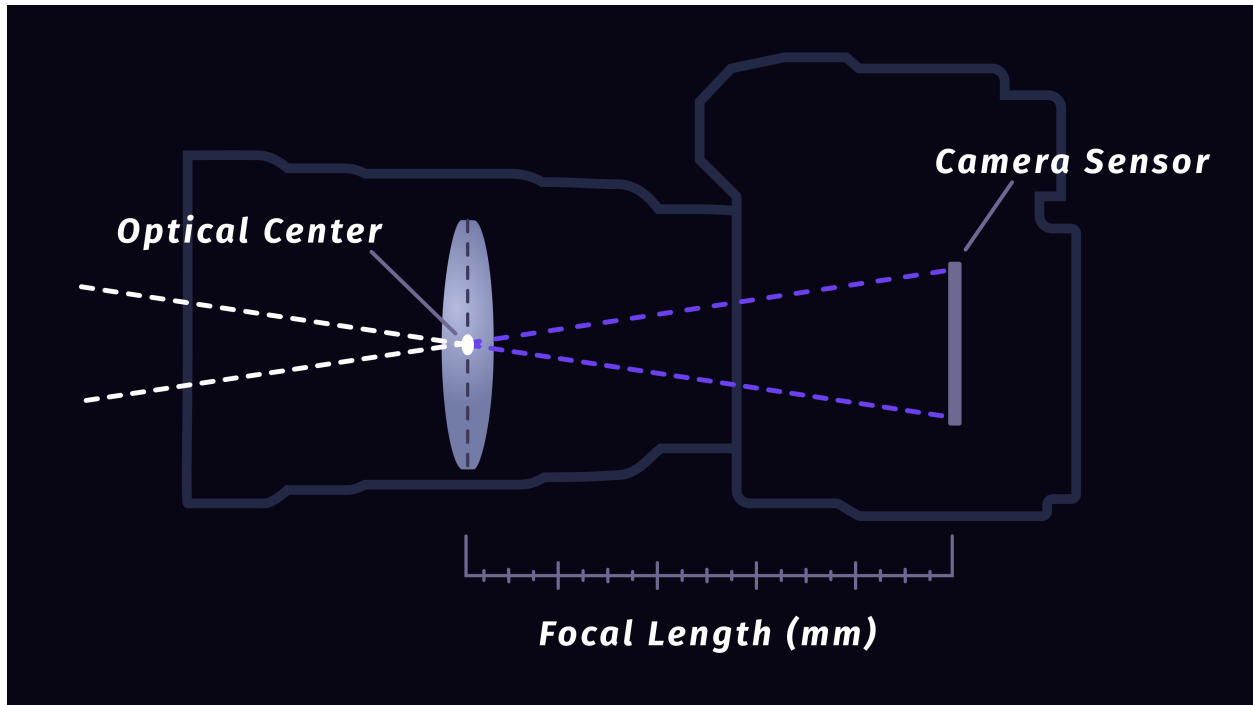
CHAPTER 1

Introduction



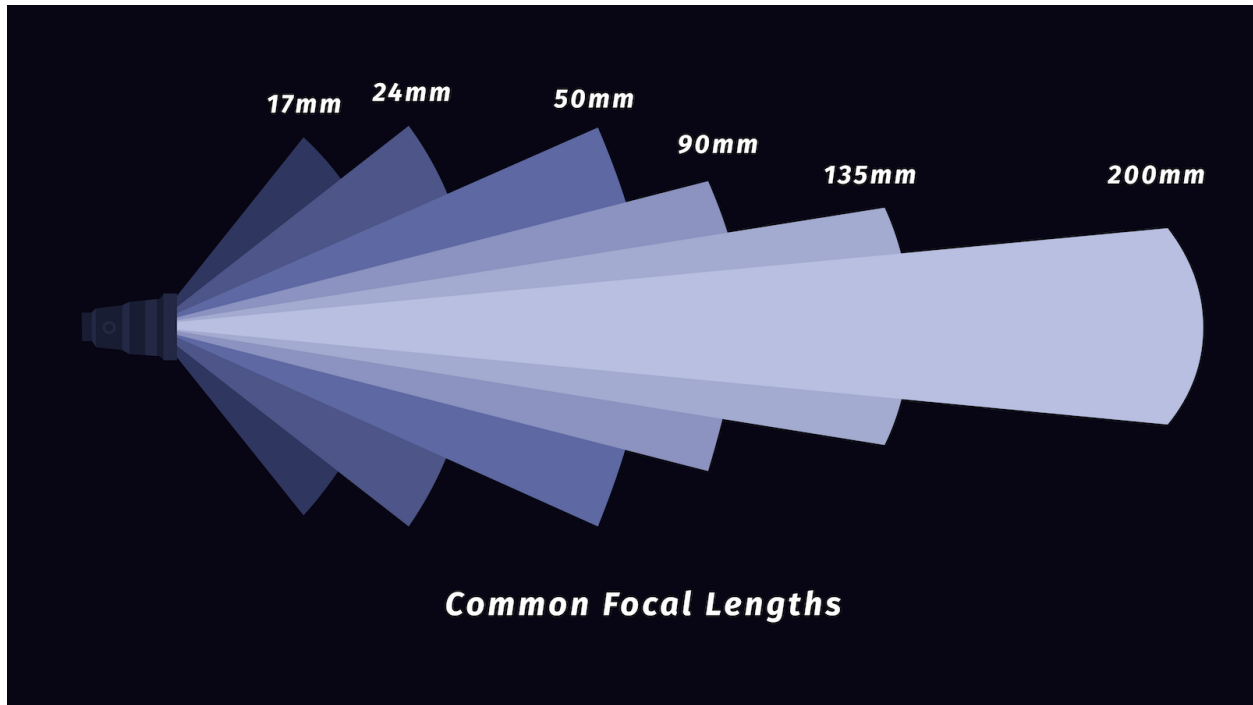
Finding the right lens for your camera can vastly improve your images and overall production. But learning what you need to know about video and photo camera lenses can be time-consuming, often wrought with trial and error.

In this book, we aim to clarify the different [types of camera lenses](#) so that you can understand which lens, or set of lenses, will be your best option moving forward. The main criterion with which lenses are categorized is their [focal length](#). Essentially, focal length is a measurement between the optical center of the lens and the image plane, either the film strip or camera sensor.



Focal length measured in millimeters

These focal length distances (measured in millimeters) have a direct relationship with the field of view — how wide or narrow you can capture an image.



Field of view based on focal length

Different lenses are used for different situations, and this isn't limited to photo lenses or video lenses. It's important to think about your lens decisions before you step on set, especially before firing up your [shot listing software](#). That way, you'll know what kind of equipment (and supporting gear) you'll need to rent or purchase beforehand. Let's break it down.

CHAPTER 2

Anamorphic vs Spherical Lenses

If you're shooting film or video, the first question you to need consider is whether to use [anamorphic or spherical lenses](#). The main differences between these two types of lenses has nothing to do with focal length — let's go back to the '50s to see the circumstances that gave rise to the anamorphic lens.

The short answer is that all lenses prior to the 1950s (and most of them since) were “spherical” lenses. The "sphere" in spherical comes from the basic shape of the lens elements which are

circular. Spherical lenses are still the most common type of lens, and are assumed unless specified otherwise. They capture images onto the sensor without affecting their [aspect ratio](#).



Spherical lens with circular elements

When TV was stealing audiences away from Hollywood, the Studio bosses wanted to give people a reason to come back to theaters. Widescreen was the answer — a giant, rectangular frame could give us sprawling vistas that the square TV frame could not.



Widescreen vistas • Paddington 2 (2017)

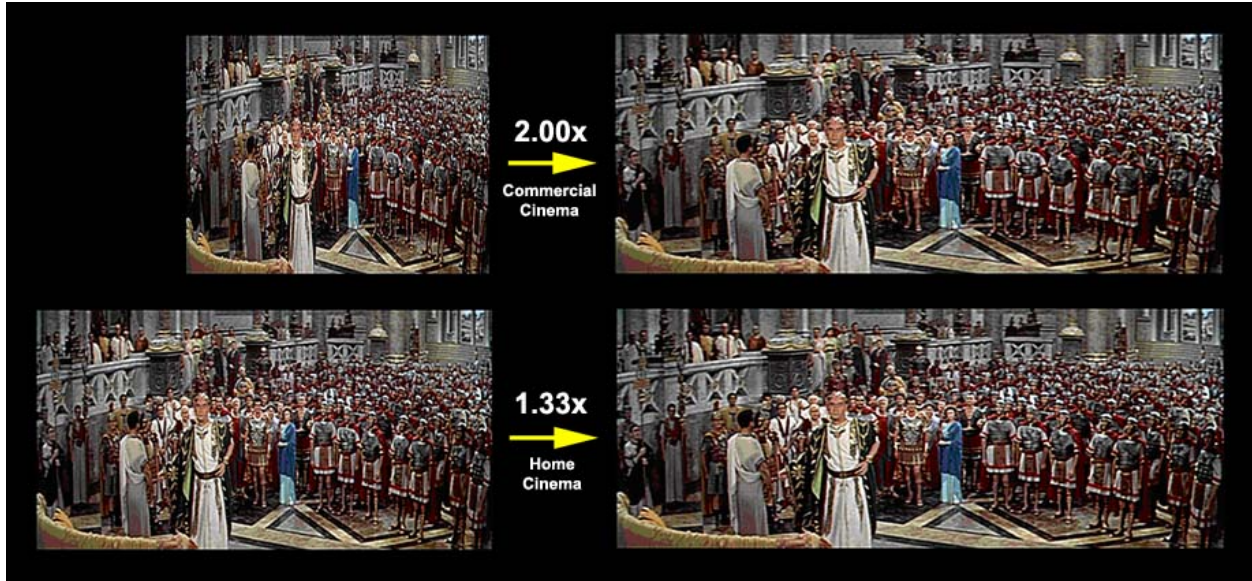
But here's the problem — how can you get a rectangular image onto a standard film frame?

Squish it. The anamorphic process "squeezes" a wide image (usually by a factor of two) onto the camera sensor while filming, and then "unsqueezes" during the [post-production process](#) or within the projector, in order to be properly displayed. This is accomplished with oval-shaped lens elements as opposed to the circular elements found within typical spherical lenses.



Anamorphic lens with oval-shaped elements

Anamorphic lenses were originally designed to fully utilize the vertical area of standard 35mm film frames. Anamorphic lenses often use either a 1.33x or 2x “squeeze.” All this means is that they capture either 33% or 100% more horizontal information than a spherical lens would. This is how to achieve extremely widescreen images out of a square-shaped film frame or camera sensor.



2x and 1.33x anamorphic squeeze

When unsqueezed, anamorphic lenses can yield a 1:85:1 or 2:39:1 aspect ratio. This wider ratio became known as [CinemaScope](#).



CinemaScope • The Bridge on the River Kwai (1957)

With CinemaScope, the studio executives of the '50s found their differentiator versus television. If you wanted to experience total immersion within epic landscapes and larger-than-life worlds, than movie theaters were (and still are) the best option.

These days, most digital sensors support a wider aspect ratios natively so spherical lenses often record sufficiently wide images with minimal to no cropping (“crop factor”). Anamorphic lenses therefore are only needed when a wider aspect ratio is desired, such as with [action classics](#) or [sci-fi epics](#).



Anamorphic 2.39:1 • Interstellar (2014)

Pro Tip: Besides the aspect ratio, a giveaway of an anamorphic lens is the **bokeh** (out of focus rings of light in the background). Due to the squeezing effect, anamorphic lenses then to result in oval-shaped bokeh.

Considerations

When choosing between anamorphic and spherical lenses, there are 5 main visual elements to consider — aspect ratio, bokeh, distortion, falloff, and **lens flare**.

1. ASPECT RATIO

Perhaps the main advantage that inspired the development of anamorphic lenses was their ability to produce widescreen images. Today, both spherical and anamorphic lenses can be used for widescreen aspect ratios, from 1:85:1 to 2:39:1.



2.39:1 aspect ratio shot with a spherical lens • Parasite (2019)

For projects shot on video, high-resolution images are simply cropped to create a widescreen form factor. It's important to make sure that you know exactly how the image will be cropped so that your compositions will work.

2. BOKEH

Aside from the “cinematic” look of anamorphic lenses, there are other reasons you might want to use one. If you're trying to capture bokeh — anamorphic lens will give you a unique look.



Anamorphic bokeh • Blade Runner (1982)

As you can see in the example above, the shape of the bokeh from an anamorphic lens is oval as opposed to circular. Like many of the visual characteristics an anamorphic lens brings, oval bokeh pushes the imagery just slightly past "reality." This comes down to an aesthetic choice as to which you think looks better.

3. DISTORTION

Due to the oval shape of the anamorphic lens, there is some visual distortion to the image. This is perhaps most easily noticed when straight lines can be seen around the edges of the frame to have a

slight bend. In *The Dark Knight* example below, notice the slight bend of the ceiling, window frames, and neighboring building.



Anamorphic distortions • The Dark Knight (2008)

Again, this is just one of the qualities of anamorphic lenses that image-makers consider cinematic but, it just comes down to aesthetics and preference.

4. FALLOFF

A notable consideration when using an anamorphic lens should be its “falloff,” which refers to the degree of blur that creeps in

towards the edges of the frame. This varies depending on how the shot is lit and focused but it's certainly something to bear in mind.



Anamorphic falloff • Moonlight (2016)

In the image above, notice the drapes along the window. The bottom of the drapes, near center frame, are much more in focus than the top.

This is something an audience member wouldn't necessarily notice but it does add an "imperfect" texture that many filmmakers actively choose.

5. LENS FLARE

Lens flares using anamorphic lenses can appear like stripes of light and are often used in science fiction or futuristic films. Lens flares have become a staple in director J.J. Abrams' directing style. But even he admits he went too far with it in *Star Trek*.



Lens flare overload • Star Trek Into Darkness (2013)

Many directors fall in love with the idea of lens flare regardless if their cinematographers are using anamorphic lenses. But these lenses do provide for some really cool looking flares that add a lot to the scene.

Conclusion

The decision to shoot with either anamorphic lenses or spherical lenses should be made first. Every decision that follows will depend on this choice — from the [basic lighting](#), [camera framing](#), [production design](#), and even budget.

There are the visual characteristics of each lens type that are more than just aesthetic concerns. For example, you might want a sharp, realistic look to keep your story grounded (spherical). If your story leans away from strict realism, the dreamy, cinematic qualities of anamorphic will help get you there.

CHAPTER 3

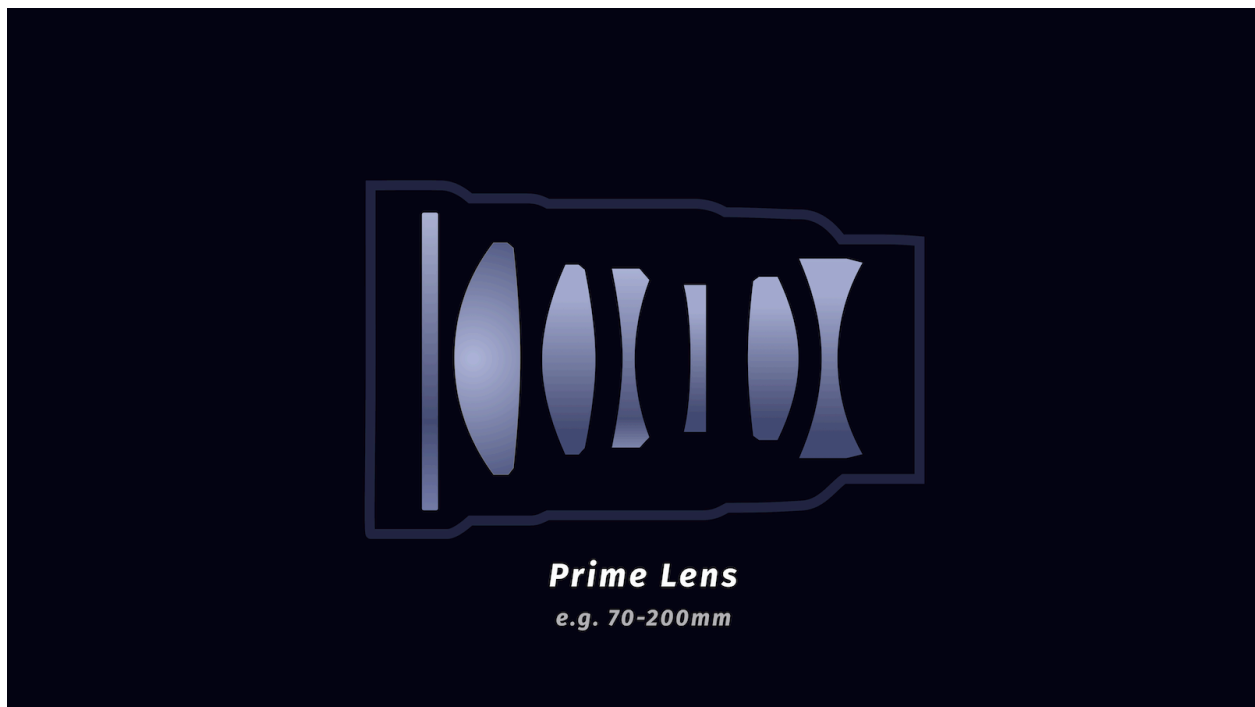
Prime vs Zoom Lenses

The next consideration to be made when choosing a lens is whether it is a "prime" or a "zoom" lens. All lenses fall into one or the other category. The key determining factor is the lens' ability to adjust the focal length of the lens using a zoom function.

The prime vs. zoom lens debate is based on a few characteristics. Since their resulting images could be on par, the main differences can boil down to the optical mechanisms within the lens and the behavior of the shooter. Let's talk about each type of lens individually and then we'll compare the pros and cons of each.

What is a Prime Lens?

A **prime lens** is a fixed focal length lens that doesn't let you zoom in or out. Focal length is the distance between the point of convergence in the lens to the sensor in your camera. You can see the "elements" inside the lens in the following cross section. These are made of convex and concave glass lenses that angle the light entering the lens to form an image on the sensor.

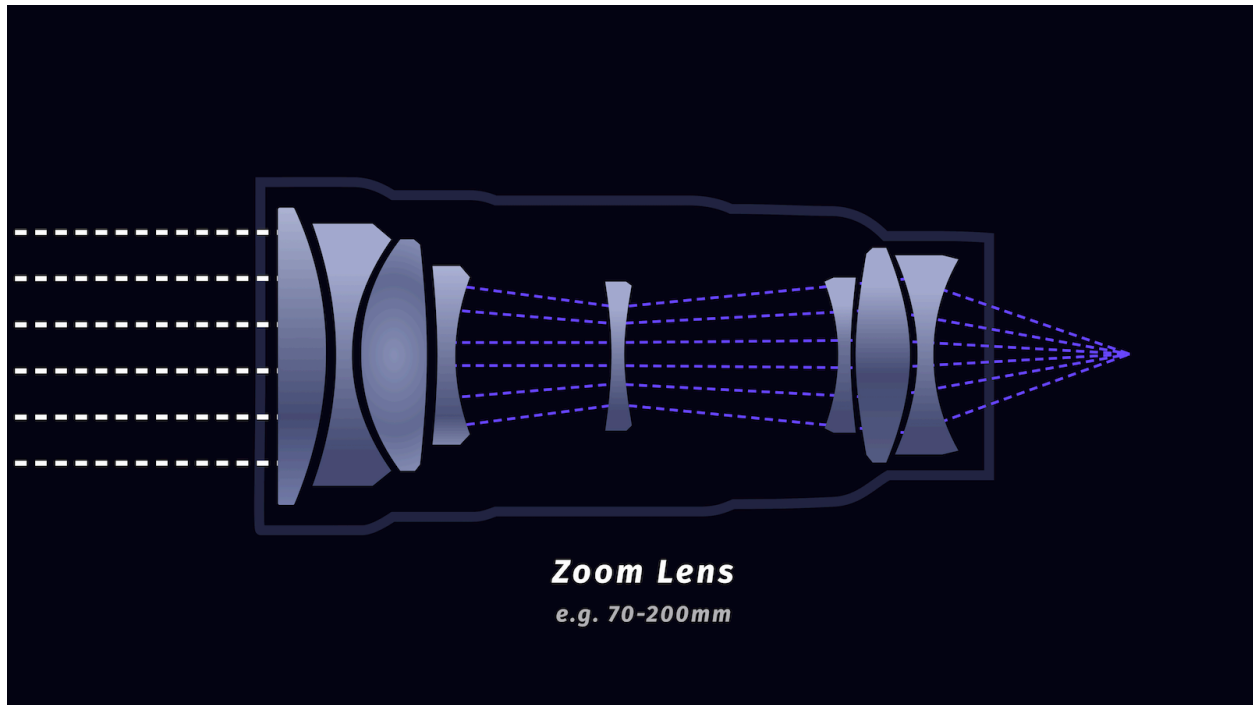


Prime lens with fixed lens elements

Prime lenses also have very wide or large aperture, an adjustable opening inside the lens to regulate how much light passes through.

What is a Zoom Lens?

A **zoom lens** is any lens with a variable focal length. Therefore, it can be “zoomed” in or out to transform the focal length and field of view. This magnifies or demagnifies the image, giving the appearance of moving closer or further from the subject without physically moving the camera. This is accomplished with moving various optical mechanisms inside the lens.



Zoom lens with adjustable lens elements

When exploring zoom lenses, something to consider is whether it is a parfocal or varifocal lens. Parfocal lenses stay in relative focus while the focal length of a zoom lens is changed. So if you plan zoom in or out while recording, it's better to have a parfocal lens.



Kubrick's masterful zoom • The Shining (1980)

Filmmakers such as [Martin Scorsese](#), [Wes Anderson](#), [Quentin Tarantino](#), and of course, [Stanley Kubrick](#) use zoom lenses to great effect. When combined with camera shake, parfocal zooms can create a raw, documentary look such as in *The Big Short*, *The Office*, and *Parks & Rec*.

Keeping your subject in focus while also changing the focal length is a nearly impossible task on a varifocal zoom lens. The benefits of a varifocal lens are typically limited to still photography when focal length adjustments aren't happening during the shot.

Pros and Cons

A major responsibility of any cinematographer or photographer is to identify the appropriate lenses for any given scene or shot. Considering the limitations we've discussed thus far, why would anyone opt to use a prime over a zoom lens?

Let's dig into the advantages and disadvantages of both.

PRECISION

Prime lenses sharpen your technique. With the fixed focal lengths of these lenses, you can't rely on zoom to get the shot you want. *You* are the zoom. And your physical positioning will affect the angle and zoom of the shot. This requires an inherent discipline in your decision-making.

You really need to consider the pros and cons of each setup because you don't have the luxury of zooming. Connected to that, a prime lens minimizes some of the second-guessing that is part and parcel when you have an overabundance of focal distance at your fingertips.

But that is not to knock the convenience-factor of using a zoom lens! The ability to have multiple focal lengths can come in very handy in certain circumstances where quick decisions to adjustments need to be made. However, there are a few more technical considerations to keep in mind.

APERTURE

As we discussed in our free companion book *The Ultimate Guide to Exposure*, prime lenses have a wider range of apertures, typically ranging from f/1.2 or f/2.8, whereas zooms tend to have smaller apertures. As a refresher, the aperture of a lens is essentially how much it can be opened or closed to control the light that is captured. This mechanism affects two important aspects of any shot: how range of brightness of a shot and the depth of field.

Therefore, the wider aperture of a prime lens means that is capture *more* light, which is ideal when you are shooting in low-light scenarios like dark interiors or night-time exteriors.

Therefore, in darker lighting scenarios, you might consider primes over zooms.

Secondly, when a lens' aperture is larger (or more open), you get a **shallow depth of field**. This means the plane of focus becomes narrower and your background can be thrown out of focus.



Shallow depth of field • Arrival (2016)

Conversely, smaller (or more closed) apertures produce a **deep depth of field**. This is useful when you need to see subjects along the z-axis like this:



Deep depth of field • Little Women (2019)

As a result, a prime lens may serve you better if your project calls for low-light scenes or you want a shallower depth of field.

COST

The cost between primes and zooms can be significant. Knowing what we've covered so far, the cost differences makes sense. Prime lenses have fixed, simple construction whereas a zoom lens has a more complex construction composed of moving optical mechanisms.

But when weighing the pros and cons, remember that a single zoom lens is almost like 3 or 4 lenses in one. If a single prime lens costs \$400, you could buy 5 of them for the cost of a \$2,000 zoom lens. When you compare the costs, they essentially even out.

VERSATILITY

Let's start with the more obvious reasons to use a zoom lens. Given its ability to zoom in or zoom out, they are great when you want to change the [shot composition](#) or camera framing without moving the camera. If you need to save time during a shoot, a zoom can eliminate the need for changing lenses and/or setups. With a prime lens, it is impossible to make your subject larger without physically moving the camera closer to it. This forces you to move the camera to a more intentional angle rather than just zooming in from your last setup.

IMAGE QUALITY

Despite recent advancements in zoom lens quality, prime lenses often win in this category. Prime lenses yield sharper and clearer

images because they are built around a specific number of set parameters rather than constantly fluctuating parameters like in a camera zoom lens.

When there are fewer focal lengths to account for, there is less distortion or aberration. It is much simpler to create sharper, better quality images. But, again, zoom lenses are catching up on image quality in the last few years. The sharpest zoom lenses aren't exactly cheap, but they may be worth it in the long-run.

WEIGHT

Lastly, because of the moving parts and optical mechanisms, zoom lenses are typically much heavier than primes. Super zoom lenses are especially heavy. This is something to remember when using [camera rigs](#) such as [stabilizers](#), jibs, or drones.

The less mechanics inside the lens, the lighter the lens, which makes it incredibly beneficial when traveling or trekking long distances. Even if you do have to bring two prime lenses of

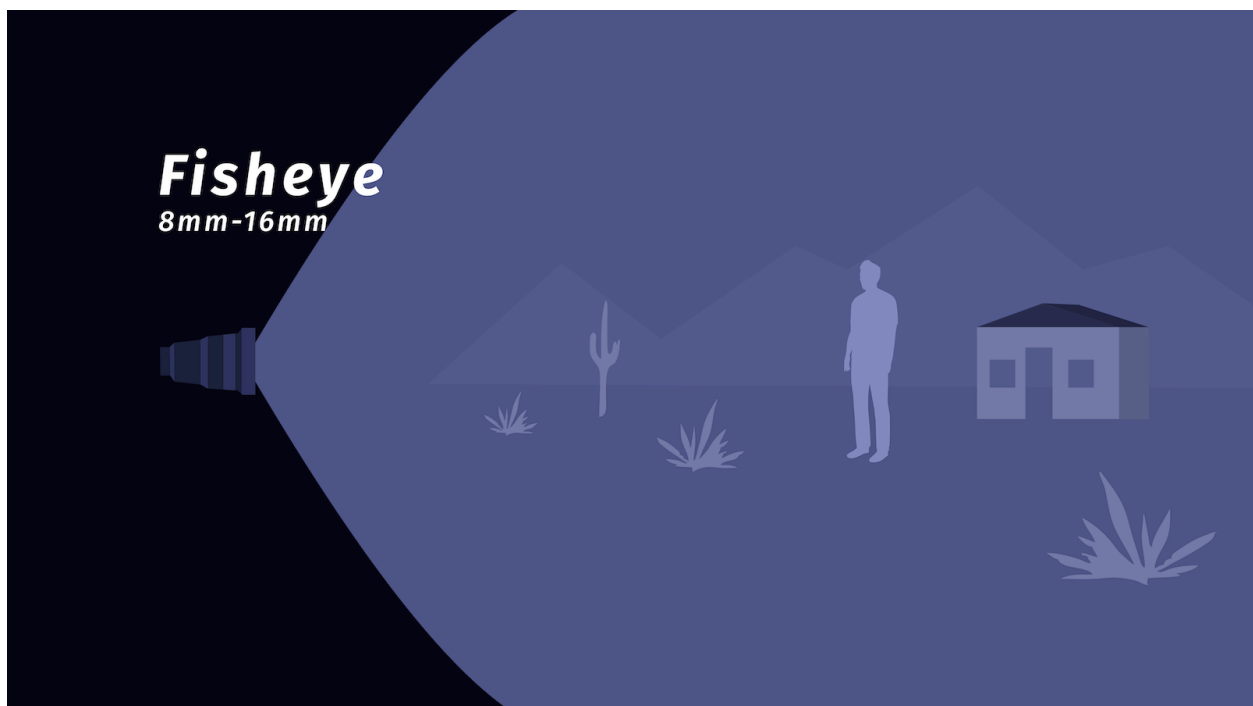
different focal lengths with you, they're generally both lighter than a single zoom lens.

Conclusion

When you approach your next project, be mindful of your lens choices. As we've seen there are reasons why you might choose either a prime or zoom lens. Hopefully, with these factors in mind, you'll be able to make the best choice for your particular needs.

CHAPTER 4

Fisheye Lenses



Fisheye lenses create a wrapping effect

The [fisheye camera lens](#) is an extremely wide lens, popular for outdoor photography and sports videos, particularly when it's necessary to provide wider visual context like in skateboarding or surfing shots. Shooting close-ups of architecture or crowds may also necessitate this lens, but what is it precisely?

A fisheye lens is any lens with a set focal length that is significantly shorter than the length of the sensor or film (measured diagonally). For a full frame sensor, which is a sensor measuring 35mm, your fisheye focal length would be anything below 23mm.

A fisheye lens is used for shooting extremely wide angles, sometimes a full 180 degrees. Also referred to as a “super wide” or “ultra-wide” lens, it produces an image that appears distorted, giving it a more abstract yet dynamic aesthetic.



Ultra-wide fisheye lens

Often any lens with a focal length that falls between 1mm and 22mm can be categorized as a fisheye lens. You can see why the fisheye lens would be considered one of the specialty types of camera lenses. The distortions it produces are certainly stylistic but completely "unnatural" compared to human vision.

There are two main variations of a fish-eye lens: full-frame and circular.

A full-frame shot will have the distorted image taking up the entirety of the frame.



Full frame fisheye photography

Meanwhile, a circular shot will have a black border surrounding the spherical shot.



Circular fisheye photography

FISH-EYE LENSES ARE COMMONLY USED FOR:

- Extreme sports
- Stylized **POV shots** (e.g. looking through peepholes)
- Depicting altered mental states (inebriation, paranoia, etc.)
- Simulating security cam footage

A fisheye lens provides an incredibly wide angle of view. As opposed to other lenses that create images with straight lines of perspective, fisheye photography depends on special mapping. This gives off a convex, non-rectilinear appearance.



Fisheyes have an extremely wide field of view

Fisheye lens photos have roots dating back to 1906. Inventor and physicist Robert W. Wood developed a lens based on how a fish would view the world from beneath the water. The lens would grow in prominence in the 1920s when it was used to study cloud

formations in meteorology. But the lens didn't really rise to prominence until the 1960s. This was the time when this particular lens was finally mass-produced. You can see the fisheye lens in action in the 1966 film *Seconds* from director John Frankenheimer. It's an eerie, frightening scene, and the lens distortion aids in creating anxiety in the viewer.



Extreme imagery for an extreme scene • Seconds (1966)

Over the years, fish eye lens images have become more advanced, they have gone on to appear in numerous other films for a variety of purposes. For one, they're able to create a distinct feeling or mood.

In other situations, fisheye lenses are highly practical, allowing the shooter to pack more of the surrounding area into the frame.

Lastly, they can also be simulative, reproducing an objective perspective. For example, if you want a shot of a character peering through a peephole, then a fisheye lens provides a similar aesthetic to what you would get in real life.

Mid90s ends with a short movie filmed with a fisheye lens, which was incredibly popular in the time period the film takes place. Combined with the fact the movie follows a group of young skateboarders, it makes sense why he would have filmed everything using such a lens.



Skateboard culture of the 90's embraced the fisheye • Mid90s (2018)

In *Mid90s*, the fisheye was not necessarily used to create a mood. It's an aesthetic choice to visualize a culture and time period.

But what about creating disorientation?

A fisheye lens is used prominently throughout *The Favourite*. The film is a surreal experience where you're never quite sure where characters' allegiances lay. In this instance, the fisheye lens does

an excellent job heightening and exaggerating the emotions of the characters. It emphasizes the bizarreness of Queen Anne's court.



Absurdity accentuated with a fisheye • The Favourite (2018)

The fisheye lens is fairly rare in the world of cinema, and for good reason. The exaggerated look often makes the audience conscious of the lens itself. Consequently, they become aware that they are watching a fictional film, [breaking the fourth wall](#).

But there is a medium where high style, and breaking the fourth wall is readily accepted:

Music videos.

Here's a shot from the classic Beastie Boys music video "Shake Your Rump."



Beastie Boys and the fisheye lens

The fisheye lens grew in prominence during in the 1960s when it became a staple of album covers. Look no further than the famous album cover for *The Jimi Hendrix Experience*.



Fisheye lenses can produce a psychedelic effect

The lens became a staple on album covers thanks to the way it made the subjects look almost larger than life. In this particular

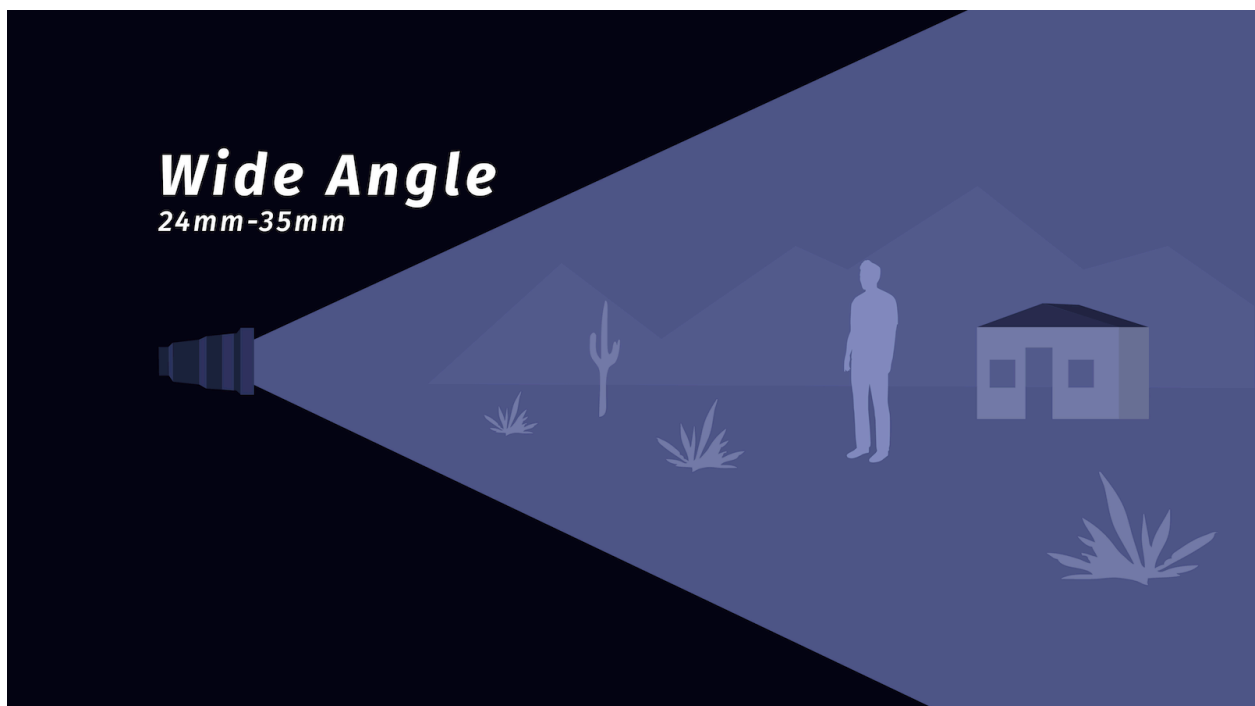
example, the circular image mask and curved typography enhances the fisheye effect, providing a suitably psychedelic vibe.

Conclusion

While the novelty heyday for the fisheye lens may have come and gone, you can still find a use for it today. As we've seen, the fisheye lens creates highly exaggerated and distorted imagery. Whether you're aiming for pure style and novelty or utilizing the extremity for storytelling value, the fisheye lens can be an essential part of any image-maker's toolkit.

CHAPTER 5

Wide Angle Lenses



Wide Angle Lens

While there are several focal lengths that may fall under the wide lens category, it is important to fundamentally understand what is considered a wide angle lens by definition.

What *exactly* is a Wide Angle Lens?

A [wide-angle lens](#) is any lens with a focal length that is shorter than the length of the sensor or film. For a 35mm sensor, wide angle lenses would range between approx. 24mm-35mm.

Quite commonly, any lens with a focal length that falls between 35mm to 23mm can be categorized as a wide-angle lens. To go down any further would push the lens into fisheye territory, which can still be considered wide-angle technically, but the “fisheye” label more accurately calls out its warping effect.

A WIDE ANGLE LENS PRODUCES A WIDER FRAME, WHICH HELPS...

- Establish locations and settings
- Clarify character geography in master shots
- Accentuate camera movement

How does a wide angle lens work?

Simply put, a wide angle lens has a short focal length and thus a wider field of view. Wide angles can come as fixed prime lenses or wide angle zoom lenses. To better understand wide lenses, it's important to understand how they compares to other lenses both technically and visually.

Wide angle lens photography is popular among adventure and outdoor photographers because they are able to fit vast landscapes into a frame.

Visually, it differs from a telephoto lens, which makes far away subjects appear closer. In wide angle lens photography, the subject is pushed further away. We'll cover telephoto lenses in more detail in the next chapter. In the meantime, in the image below, notice how the wide angle lens (left) makes the mountain look further away whereas the telephoto lens (right) flattens the image and brings the mountain closer.



Wide angle (left) vs. Telephoto (right)

Now that we've brushed up on how to use a wide angle lens in photography, let's dive into wide lens uses in filmmaking. One of the most practical reasons to use a wide lens is simply because you can fit more into the frame. Normal and telephoto lenses often do not create frames large enough to capture the details of a location or the production design of a scene.

This is where a wide angle lens comes in.



Wide angle lenses showcase production design • Crimson Peak (2015)

Wide angle lenses are ideal for shooting establishing shots since they create frames wide enough to capture expansive settings like empty deserts, concrete jungles, or eerie hotels.



Wide angles used for establishing shots • Skyfall (2012)

Wide angle lenses provide a multitude of options for [camera framing](#) and [shot composition](#). Notice the scale that is created when a subject is juxtaposed against their surroundings.

Additionally, [wider angle shots](#) are frequently used to emphasize a subject's full body so the viewer can process their movements, body language, and how they interact with their environment.



Wide angles communicate geography • Blade Runner 2049 (2017)

One of the most notable examples of this can be found in [Steven Spielberg's directing style](#). Spielberg is notorious for his loyalty to the 21mm lens. This wide lens creates a perfectly sized frame for capturing Spielberg's complex compositions, actor blocking, and propensity for [long takes](#).

To keep these one-shot scenes engaging and entertaining without cutting, Spielberg utilizes a wide lens to create space for both the scene's setting and the blocking and staging.



Wide angle blocking and staging • Minority Report (2002)

While the wide lens can be used at a distance to communicate complex shots, what does it do in close proximity to a subject?

In a standard dialogue scene, a wide lens is the difference between the audience feeling like they are watching a conversation versus feeling like they're *in* the conversation.



Subject and environment • Neon Demon (2016)

Wide angle lenses can also make you feel like you are in the middle of the film's action. Normal lenses or telephoto lenses create a somewhat distanced, objective perspective that makes the viewer feel like an observer. A wide lens, on the other hand, when used in close proximity to a subject makes the audience feel like they standing are in the middle of the action. The result is a more immersive experience. This is because wide angle lenses mimics the human eye more than a telephoto lens.

Lastly, a wide lens is an effective way to amplify movement whether it be a fast [dolly shot](#) or a slow push in.



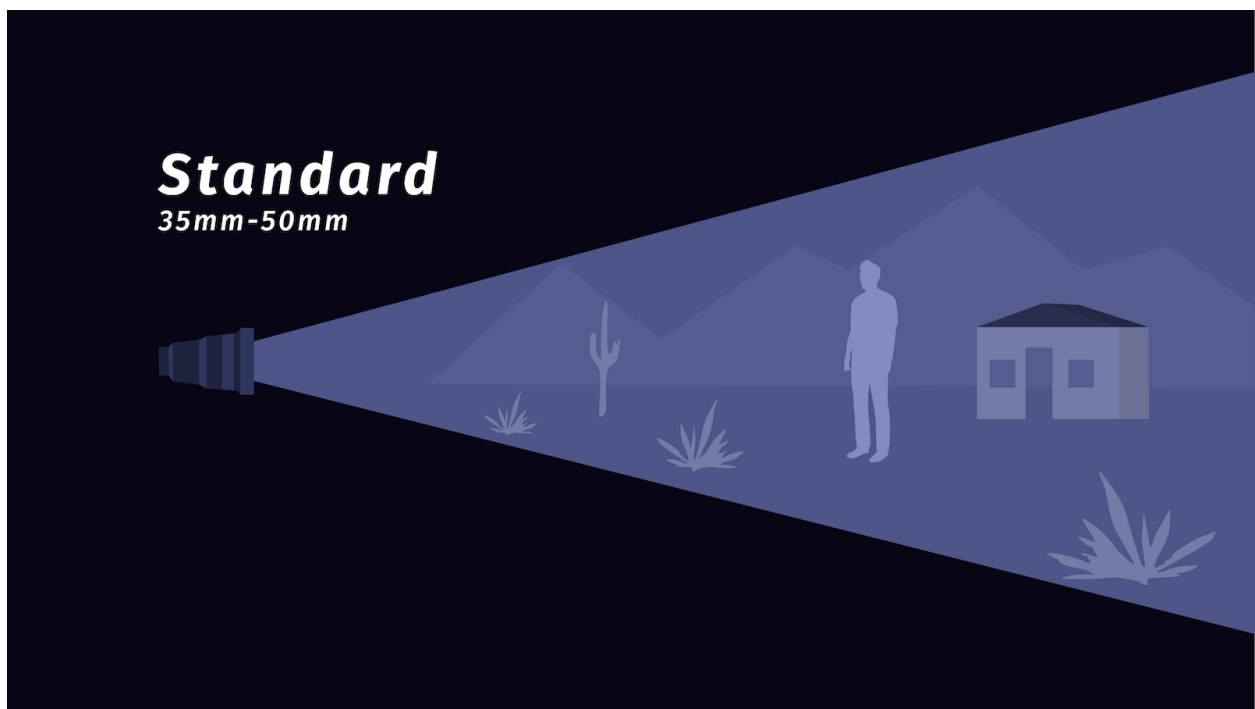
Action and movement in a wide frame • Spectre (2015)

Conclusion

Wide lenses are a great tool in any filmmaker's toolkit. While there are obvious practical reasons to use a wide lens, the psychological effects should be considered as well. Whether you want to create an immersive experience for the audience, establish setting, or give your actors space in the frame to perform, a wide lens is a versatile option that should be present in every lens kit.

CHAPTER 6

Standard Lenses



Standard Lens

A standard lens has a set (prime) focal length that is around the same length as the camera sensor or film gauge, measured diagonally. For a full frame sensor, your focal length would come in right around 42mm. Often a lens with a focal length that falls between 35mm to 55mm can be categorized as a standard lens.

Standard lenses are purported to have a similar field of view to that of the human eye, though this has been disputed considering that the human eye has a true field of view closer to that of a lens between 17mm to 25mm lens, with a f/3.2 aperture rating.

Some say the reason that 35mm to 55mm standard lenses are likened to the human eye is due to our cone of visual attention. This limits what we're actually focusing on within our field of view — the rest is peripheral vision.

Because of their "vision equivalent" field of view, standard lenses give your shot more "naturalism" than the other lenses. In other words, if you want the audience to feel like they are present in the scene, you might consider using a standard lens.

In his film *Call Me By Your Name*, director Luca Guadagnino made the decision to shoot it exclusively with a 35mm lens. He was after a grounded visual style to enhance the intimacy of this love story. Guadagnino says, “We only shoot [the film] with 35mm for me to get the sense of the human eye and simplicity.”



The intimacy of a standard lens • Call Me By Your Name (2017)

Unlike wide angle lenses which are ideal for communicating setting, standard lenses make it easier for viewers to focus on the characters themselves.

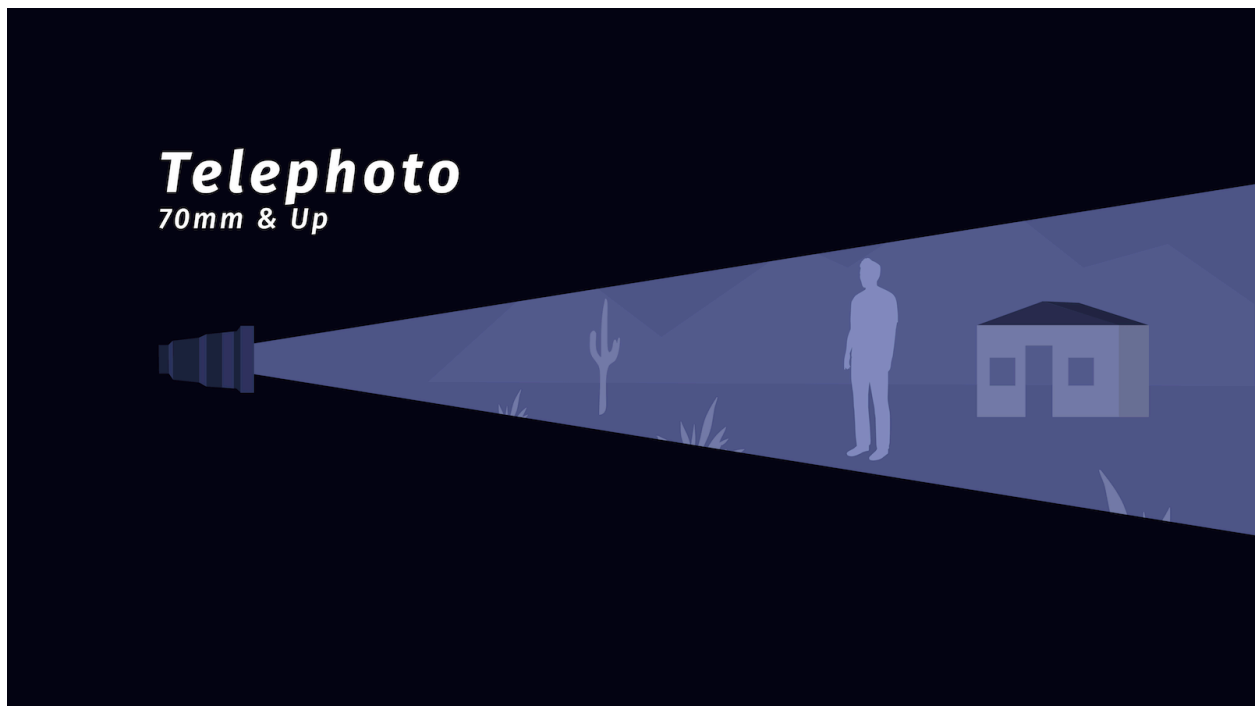


Full attention on Arthur • Joker (2019)

As you plan out your shoot, if the priority of the moment is the character, a standard lens might be your best option. We can give our full attention to the subject without the "distractions" of the background. In the next chapter, we'll cover telephoto lenses which can also capture even more intimate [close-ups](#), but from a slightly impersonal perspective.

CHAPTER 7

Telephoto Lenses



Telephoto
70mm & Up

Telephoto Lens

A long-focus lens is any lens with a set focal length that is significantly longer than the length of the sensor or film, measured diagonally. For a full frame sensor, a long-focus lens would be anything between 55mm to 500mm. You may also hear a cinematographer or camera operator refer to them simply as “long lenses.”

Some long lenses are also [telephoto lenses](#). A telephoto lens has a special lens group built inside, known as a telephoto group. A telephoto group is an extra element inside the lens to extend its reach without needing a physically larger lens.

But, as we've seen with prime vs. zoom lenses, extra elements inside the lens can reduce picture sharpness and the amount light hitting the sensor.

A telephoto lens has a longer focal length than a standard lens, yielding a magnified image and a narrow field of view, allowing you to photograph faraway subjects.

Telephoto lenses can be either zoom or prime lenses and come in a variety of focal lengths, from “medium telephoto” (70-200mm) through “super telephoto” (longer than 300mm).

They flatten facial features and are often much more flattering than a wider angle lens. Because telephoto lenses bring far away subjects closer, they also work extremely well for landscape shots.

WHAT IS A TELEPHOTO LENS USED FOR?

- Bring far away subjects closer to the camera
- Emphasize blurred backgrounds
- Longer focal length is great for portraits
- Great for wide-scale landscape photography

There are distinct advantages for using a telephoto lens in certain situations. One of the most direct and perhaps obvious ways to use a telephoto lens is to mimic a POV shot through binoculars. Here's an example from *Mad Max: Fury Road*.



Telephoto simulating binoculars • Mad Max: Fury Road (2015)

Using a longer lens can also be helpful when shooting a variety of different subjects from a distance. Wild life comes to mind.



Mustn't get too close!

The same can be said for sport photography and videography.



Shooting from the sidelines

A telephoto lens is also a popular choice for capturing massive landscapes and skylines. And for good reason. The lens is capable of compressing depth, bringing backgrounds closer to the foreground to create a more imposing backdrop.



Telephoto lens used to compress and enlarge distant skyline

Typically, the longer the lens and the wider the aperture, the more blurred background effect you'll get. Consider the following scene from *Tinker Tailor Soldier Spy* — notice how the space between the characters and the plane is not only flattened, but thrown out of focus with a shallow depth of field. Although the plane looks quite close to the subjects, it is safely distant from the actors.



Depth is compressed and flattened • Tinker Tailor Soldier Spy (2011)

The isolation that results from a shallow depth of field is exceptionally useful when shooting portraits and closeups. As mentioned above, a telephoto lens compresses or shrinks the subject relative to what's in the background. If used for a closeup shot, this compression can make facial features more congruent, proportional, and aesthetically flattering. When paired with a shallow depth of field, the isolation of the subject results in both an intimate and objective perspective.



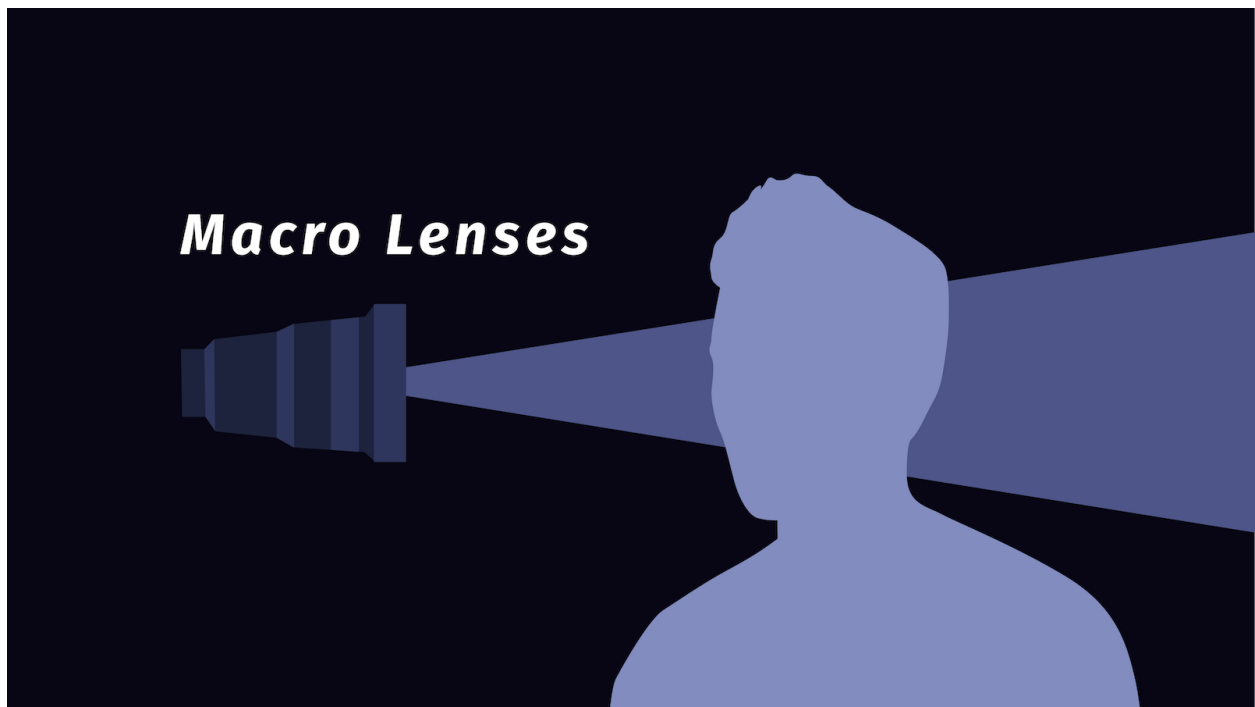
Telephoto closeup • Once Upon a Time in the West (1968)

Conclusion

How many times have you snapped a photo only to think “the picture just doesn’t do it justice.” There is, of course, a multitude of reasons like lighting and other camera considerations, but keep track of when a telephoto lens could be just the ticket to compress z-space, isolate subjects, and create a more imposing effect.

CHAPTER 8

Macro Lenses



Macro Lenses

A **macro lens** is designed to capture small subjects at close distances with extremely sharp detail. There are two major distinctions that separate macro lenses from all others:

- 1. Miniature Subjects** — The first benefit of macro lenses is how they capture tiny subjects such as insects or small objects like a coin. They typically project a 1:1 ratio, meaning the subject appears the exact same size as it is in real life. Some macro lenses also allow for magnification, where the subject appears much larger than their actual size.
- 2. Minimum Focus Distance** — Secondly, macro lenses have a shorter “minimum focus distance” than a regular lens. This means that you can get very close to the subject and still stay in focus to capture as much detail as possible.

WHAT IS A MACRO LENS USED FOR?

- Magnifying subjects
- Capture smallest details

- Create shallow depth of field to make subjects pop
- Maintain focus at close distances

You might use a macro lens if you're a nature photographer or videographer, to get those close-ups of flowers, insects, and raindrops. Take this example.



Macro photography

Due to the focus distance, macro lenses also have very small or shallow depth of field, which keeps only a narrow field of view in focus, creating a blurred background. This helps to isolate the subject and can create high-quality looking images or footage.

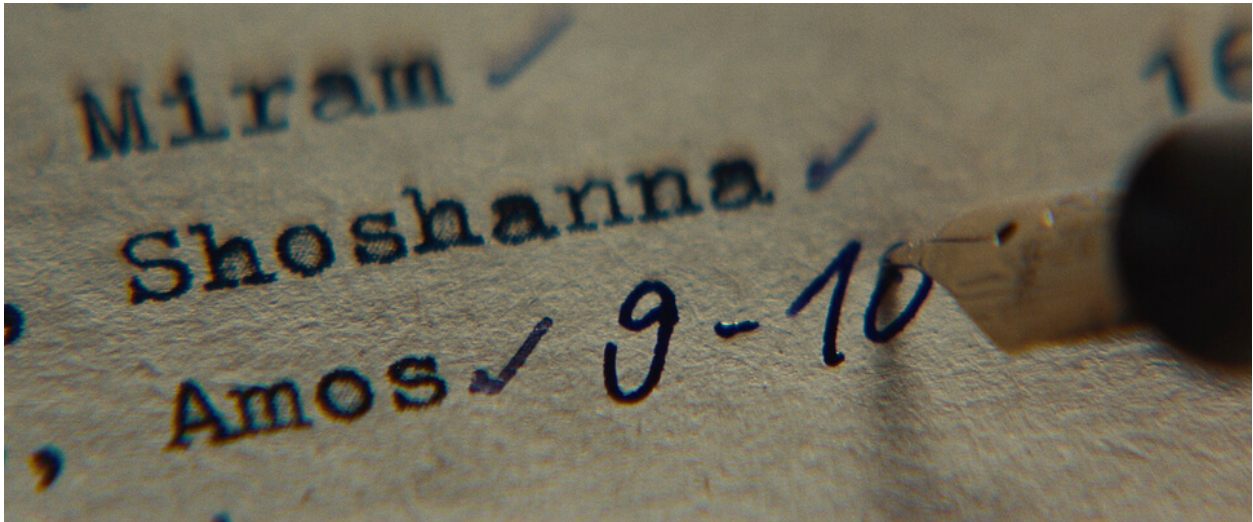


Macro lenses capture sharp images in extreme detail

But if you want to capture the sharpest image, you'll need to close your aperture as much as possible. The challenge is that you'll be

letting in almost no light into the lens. Therefore, macro lenses are best used in well-lit environments.

Macro photography or videography doesn't have to be all insects and raindrops. Consider this moment from *Inglourious Basterds* — where importance of each name is amplified.



Macro lens used for extreme closeups • Inglourious Basterds (2009)

Now that we have a solid understanding *what* macro lenses are and *when* to use them, let's go over *how* they work.

Here are some best practices and considerations when shooting macro shots.

DEPTH OF FIELD

Remember, macro lenses have a very small depth of field. Blurred backgrounds are great, but what if you want to decrease the blur a bit. How can you increase the depth of field?

In order to increase the focus area, you'd have to decrease the aperture (make the size of the opening in the lens smaller). This will make your background sharper. This is done by increasing the f-stops, or the "f value" on the lens. For example, f/16 closes the aperture quite a lot. At this number, you're shooting through something as small as a pinhole. While this increases your depth of field, it simultaneously limits the light allowed into the lens, essentially darkening your image. If necessary, raise your camera's [ISO setting](#) to brighten the image. Just be wary of increasing digital noise. You can see why beneficial to shoot macro shots in bright, well-lit environments.

Free Download: To learn more about exposing the perfect image every time, download our **free** ebook [Exposure: The Ultimate Guide](#), where we break down aperture, shutter speed, ISO, and more.

LIGHTING

For reasons mentioned above, make sure your subject is surrounded by a lot of light when using a macro lens. Also, because a macro lens is so close to the subject, sometimes the camera itself could get in the way of your light source. Try using a [ring light](#) around your lens.

COMPOSITION AND COLOR

Even if you increase the depth of field, it's likely your macro will still have blurry backgrounds. Be mindful of the colors of the background and the subject, shoot against background colors that make your subject in the foreground pop. Complementary (contrasting) colors can really change the game.

STABILIZATION

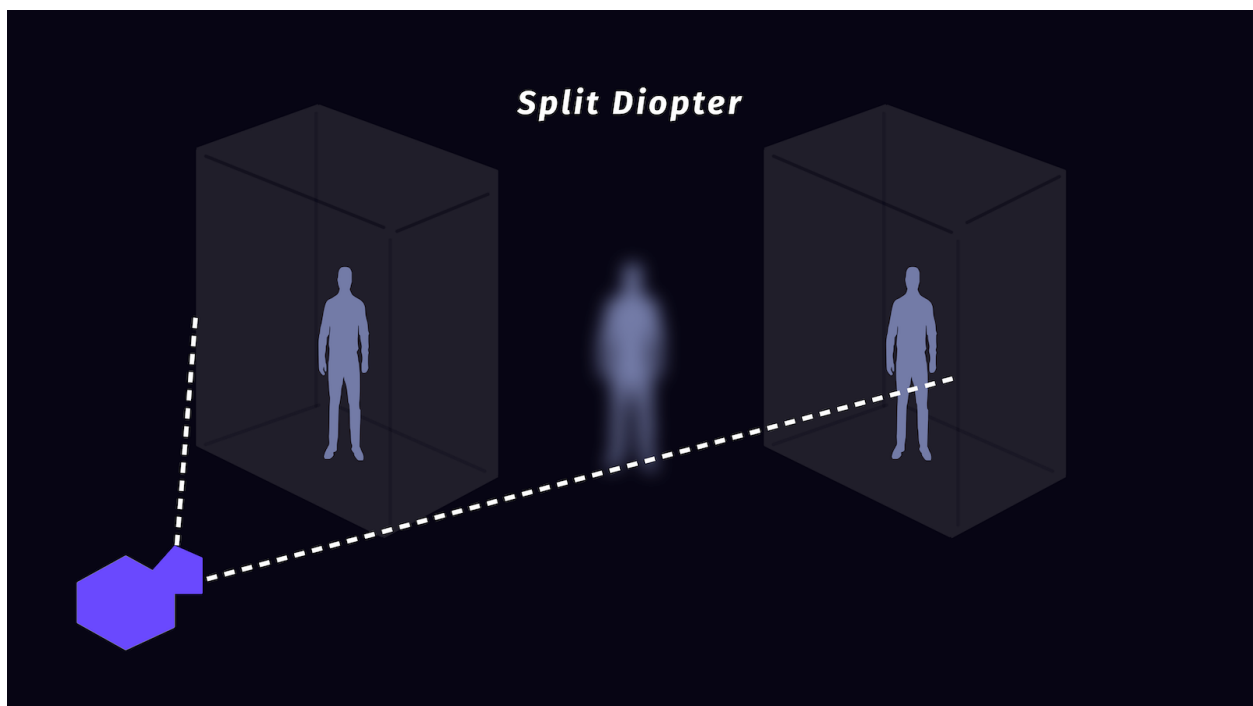
For the clearest images, shoot with a tripod. The camera shake will be more noticeable on video than with still photography, especially with a shallow depth of field going in and out of focus.

Conclusion

The macro lens is a specialty lens that can bring a level of intimacy and intensity to your portfolio. In many circumstances, using a macro lens might be the only option so it would be wise to keep one around just in case. And if you're thinking that you needn't bother with macro lenses because you won't be taking nature photos of insects any time soon, don't forget about extreme close-ups and insert shots. Remember, there are many applications of the macro lens.

CHAPTER 9

Split Diopter Lenses



Split Diopter Lens

A [split diopter lens](#) is a piece of half convex glass that affixes to the main lens of the camera. This makes half the lens nearsighted while the other half remains farsighted. This creates the illusion of a deep focus.



Split Diopter

In most movies, there are two ways to approach focusing a frame. You can use deep depth of field, where everything in frame is in focus. Or you can use shallow depth of field where only the foreground, middle ground, or background is in focus (while

everything else is not). That was until the split diopter lens came along by "splitting" the difference. We're going to look at how this single element can transform shots into something eye-popping.

What differentiates this type of shot from a traditional deep focus is that there is no continuous depth of field. The audience can see the space between the two objects is out of focus.



Split Diopter Shot • The Untouchables (1987)

BENEFITS OF A SPLIT-DIOPTER EFFECT:

- Provide more information in a single shot

- Highlight the relationship between two subjects
- Create a sense of unease in the viewer

A key attribute of the split field diopter is that it allows the filmmaker to convey multiple pieces of information in a single shot. In lieu of cutting back and forth between different subjects, the split diopter lens has multiple pieces of information right there in front of you, which makes for more economic storytelling.

But there is a possible downside to using a split diopter that we need to recognize. Let's try a quick experiment.

Put your hand in front of your face. If you focus on your hand, you can't see what's in the background clearly. If you focus on the background, then your hand becomes blurry. It's not natural to see the world in the way a split-diopter can, so it makes sense for the effect to be used in moments of unnatural tension.

The split focus diopter shot has a lot of potential in modern cinema. Let's look at some use cases. For our first example, consider the following shot from *Jaws*.



POV of Brody's divided attention • Jaws (1975)

In this instance, Martin's attention is divided, *literally*. It doesn't matter what the man is talking about because Martin's primary focus is on the girl swimming the background. She starts screaming, and although it's a false alarm this time, we're put inside Martin's mind. There's danger out in those waters, and he can't pay attention to everything all at once.

A split focus shot is also effective for revealing insight into characters. More specifically, it can be used to juxtapose two radically different characters. One of the best examples of this can be found in the original *Carrie*.



Aligning disparate characters • Carrie (1976)

This shot juxtaposes the all-American jock, Tommy, with the social outcast, Carrie. They come from different worlds, and yet, they can both relate to the same poem. The two become connected, which **foreshadows** Tommy's eventual prom invitation to Carrie.

In this moment from *Pulp Fiction*, Butch is on the run from Marcellus (who you can see behind him in the alley). Like so many great split diopter shots, we get two stories at once — the hunter and the hunted.



The hunter and the hunted • Pulp Fiction (1994)

And the same tension is at place in this split diopter shot from *Toy Story 4*. Gabby Gabby and Forky are both in focus as the film suggests a sinister ulterior motive.



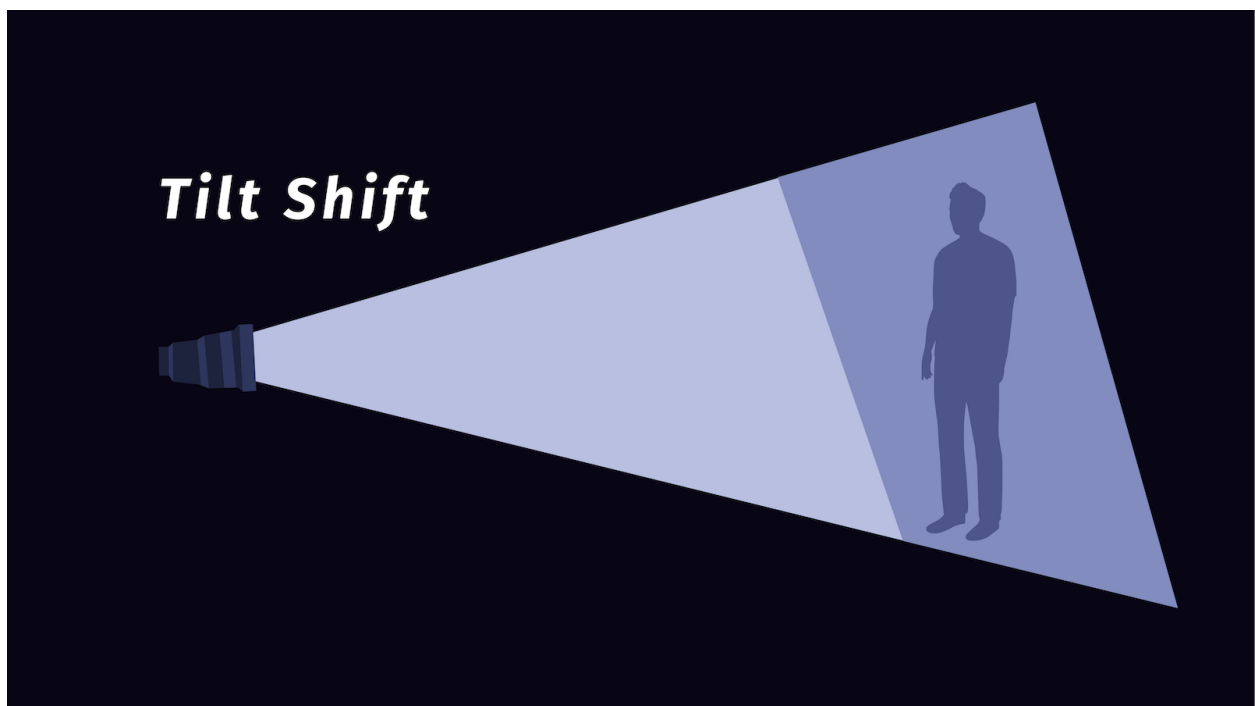
Something's not quite right • Toy Story 4 (2019)

Conclusion

A split diopter lens is an incredibly useful tool. But just like any other tool, you need to know when to use it. With an artist's vision and a commitment to intentional framing, the split diopter shot is a unexpected way to split the focus, draw parallels between subjects, or communicate a looming danger.

CHAPTER 10

Tilt Shift Lenses



Tilt Shift Lens

For visual artists, every new method or tool they find becomes an opportunity to explore creative territory. And the tilt shift lens is no exception. Typically, a lens and sensor are parallel to one another on the same plane. However, a [tilt shift lens](#) has the ability to tilt and/or shift the lens in different directions.



Tilt (top row) and Shift (bottom row)

This geometric relationship of the lens to the camera, known as the Scheimpflug Principle, shifts the entire plane of focus to create a unique warping, blurring and miniaturization effect. The intensity of the effect can be subtle or extreme, invisible or visible.



This is not a miniature

By changing the angle of the plane between the lens and the camera's sensor, one can change the scale of focus and the depth of field. Changing the scale can allow your images to appear miniature. And shifting or tilting can also minimize or maximize the blur behind your subject.

WHAT IS A TILT-SHIFT LENS USED FOR?

- Correcting vertical converging lines
- Panoramic shots
- Blurring select sections
- Changing scale — creating a 'miniature' effect

Creative Uses of the Tilt-Shift

Now that we know the basics, let's look at how and when to use a tilt shift lens.

SHIFT UP OR DOWN

A tilt shift lens can serve as a perspective adjustment tool. Whether tricking the audience into seeing something smaller than it is, or managing perspective by "fixing" angled lines on buildings — this lens can do a lot.

Shifting your lens up or down can eliminate the angle your camera captures. Tilt shift photography can straighten out the converging lines and is often used for architectural photos for this reason.



A tilt shift can straighten up lines and angles

SHIFT LEFT OR RIGHT

Furthermore, shifting the lens left or right makes it perfect for capturing panoramic shots without moving the actual camera. By keeping the camera body still, a series of photos can be taken by adjusting only the lens position.



Shifting the lens allows for panoramas

TILT FORWARD AND BACK

Lastly, tilting the lens makes the focal plane more pliable. As a result, you can narrow the field of blur as desired. The combination of a super shallow depth of field and slight warping effect makes the image appear like we're peering into a diorama at a miniature. The tilt shift effect in the following image is quite noticeable and warps reality in very interesting ways.



Tilt shift lenses create a miniature effect

In *The Social Network*, director [David Fincher](#) shot the Henley Royal Regatta sequence with a tilt-shift lens.



Miniature rowers • The Social Network (2010)

Watch the scene and ask yourself what qualities or subtle meaning the tilt shift lens adds to the scene.

Using a tilt shift lens can provide a number of interesting aspects to your images. From simply "correcting" the angle of a tree or building, to creating more extreme visuals like a miniature stadium, there is no end to the creative uses of the tilt shift effect.

The Deakinizer Lens

When [Roger Deakins](#) was preparing for *The Assassination of Jesse James by the Coward Robert Ford*, he wanted a distinct vintage photography tilt-shift look. But he wasn't satisfied with the lens options available at the time. So, he reached out to Dan Lopez and Steve Hamerski at Otto Nemenz to see if they could customize tilt-shift lenses with special elements. The resulting lens was aptly dubbed the *Deakinizer Lens*.

A Deakinizer lens is a modified tilt-shift lens that creates visual elements such as color diffraction and vignetting around the edges. In short, the look of a Deakinizer lens is based on these imperfections and the textural qualities they produce.



Edge aberrations like a vintage photo • The Assassination of Jesse James (2007)

In essence, Deakins wanted a lens that looked like it might have been developed at the time. It is the perceived 'imperfections' of the lens that create its vintage look — resembling photographs of the time period. What they invented was a lens that produced dreamy and soft images, with clarity in the center and edges that blurred and smeared.



Deakinizer's vintage look • The Assassination of Jesse James (2007)

QUALITIES OF A DEAKINIZER LENS

- Vignetting
- Color diffraction
- Blurring and smearing along edges
- Warped scale and miniature effect

Like any specialty lens, the tilt-shift lens isn't something you'd use every day, but it has a wide range of benefits and effects, earning it a spot in any filmmaker's kit.

CHAPTER 11

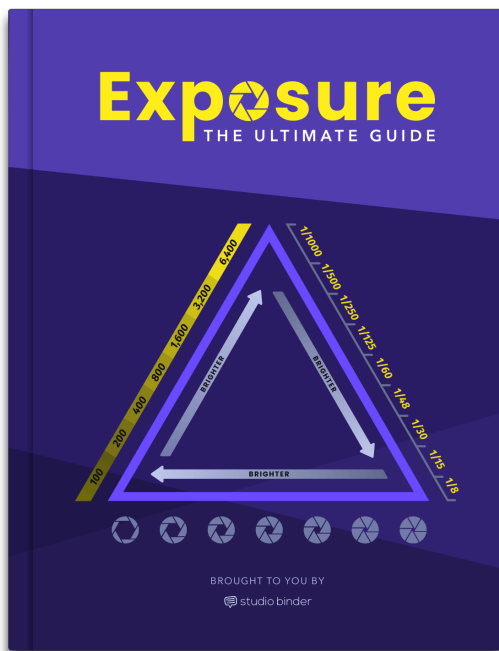
Conclusion

Choosing a camera lens is an important decision that should be made early on in any photoshoot or film production. When you understand the various qualities each type of lens provides, you'll be able to focus your storytelling. Do you want the claustrophobic qualities of a telephoto lens, or the scale of a wide angle? Will a tilt shift lens capture your character's disorientation? Or will the naturalism of a standard lens bring your audience into the story? Depending on the tone, style, and intent of a shot, having a firm understanding of each lens will support your visual storytelling.

As an image-maker, you have a multitude of options at your disposal. Like a musician perfecting their instrument, the sooner you master each camera lens, the sooner you'll be able to turn the vision in your head into the image on screen.

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