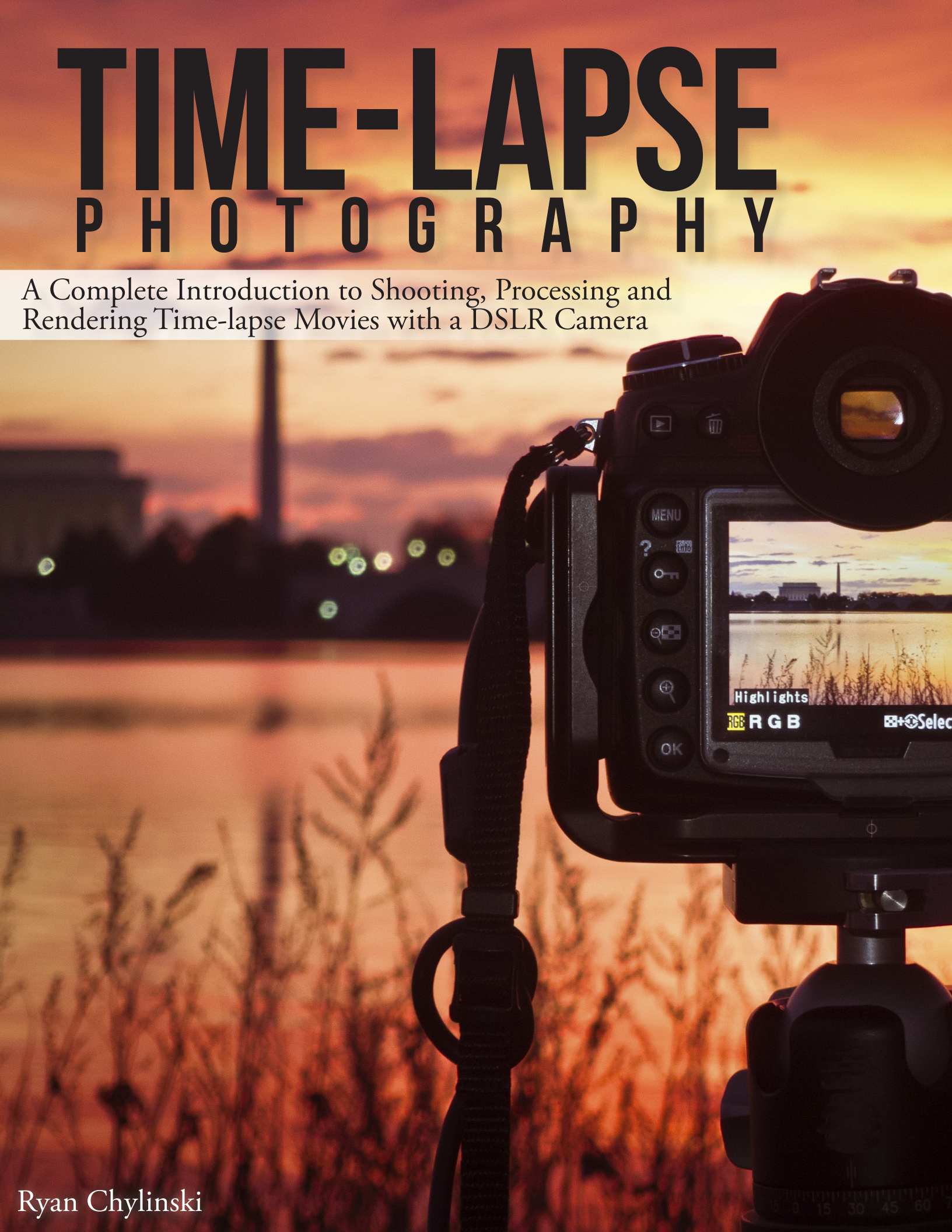
TIME-LAPSE PHOTOGRAPHY

A Complete Introduction to Shooting, Processing and Rendering Time-lapse Movies with a DSLR Camera



Ryan Chylinski

Time-lapse Photography:
A Complete Introduction to Shooting, Processing, and Rendering Time-lapse Movies with a DSLR Camera
By Ryan Chylinski

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DEDICATION

To my family who always believes in me,

to my mentor Jim Rohn who taught me that the ultimate reason for setting goals
is to entice myself to become the person it takes to achieve them,

and to the time-lapse community whose patience, helpfulness and creativity inspires me to no end.

Thank you.

"Don't wish it was easier; wish you were better."
"Don't wish for less problems; wish for more skills."
"Don't wish for less challenges; wish for more wisdom."

"Today is a big day. How would you like your eggs?"

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“THERE WAS NOWHERE TO GO BUT EVERYWHERE, SO JUST KEEP ON ROLLING UNDER THE STARS.”

- JACK KEROUAC

IT'S 2:20 IN THE MORNING.

The alarm on my phone starts to sound and I fumble for it in the dark. 36+28=64, 84-13=71, 9x6=63, no wait 54! The third correct answer finally stops the beeping and I'm now awake enough to remember what I set it for. I'm on Cape Cod for a family trip and I'm not going to let a night in a precious low-light pollution green zone go to waste. The excitement carries me the rest of the way out of bed. I throw on thermal socks and pull my last battery from the wall charger grabbing my tripod and camera bag on the way out.

It's only about a quarter mile walk to the small east facing pier I found on Google Earth. I make my way down the bank, set up the camera and carefully focus in at infinity. A few more test shots and I think I've got a good composition. The dock off to the side provides a nice foreground, a moored boat should add some fun movement and of course the Milky Way, barely visible outside of my camera's preview window, but I know it should move slowly clockwise before the moon rises just off to the right.

I check everything over one last time: exposure and the rule of 600, good; manual settings, check; interval, set. The test images look good, I begin.

It's cold tonight, but not too cold and as a blip of a shooting star diverts my attention to another part of the alive night sky, I can't help but think "I'm going to be here for a while... a very long while..."

"...and that's a beautiful thing."

WHY TIME-LAPSE?

For me it's freedom. Time-lapse is a strange thing: It can free you from the normal flow of your routine and all the busyness of life, yet at the same time it can connect you to your surroundings more than anything else. It is an *awareness* we seldom experience. As Lindsey Clark comments, time-lapse can be "a reminder that we are on a massive, moving orb and definitely not the most important thing even in our own lives."

I first saw it in the faces of family members: the fascination and the amazement when I shared a clip hot off the rendering queue. It's not just an image or a scene - it's how that place moved and worked; it was that place's story, at least for the brief time I was there. It starts to make people think and it gets them energized. It allows them, even if for a small moment, to armchair travel in the most incredible ways to what seems like impossible places.

Time-lapse has a way of slowing the world for the photographer while at the same time accelerating it for everyone else. I shoot time-lapse because it alters the way I think, it challenges my view of the world and teaches me things that I hope to bring back and share with everybody else. It's also pretty amazing to watch!

The entrepreneurial aspect of the art is extremely exciting. So many photographers and filmmakers, having looked around and not found what they need to achieve the time altered shots they envision, have gone ahead and built the tools themselves - often creating new companies or open source communities in the process.

The level of innovation, especially over the last few years, is incredible. Not only are we quickly fixing problems that have plagued photographers for years, but advanced camera controls and processing tools that used to be cost prohibitive are now becoming affordable for the most basic hobbyist.

This is the change and energy that gets me fired up. This is why I'm so excited to share this with you. The more people that become involved with time-lapse the bigger the ideas, the better the innovations and the more amazing the stories we can tell.

It's a real honor and privilege to partner with you on this training journey. I hope this book is helpful and I would love to hear from you.

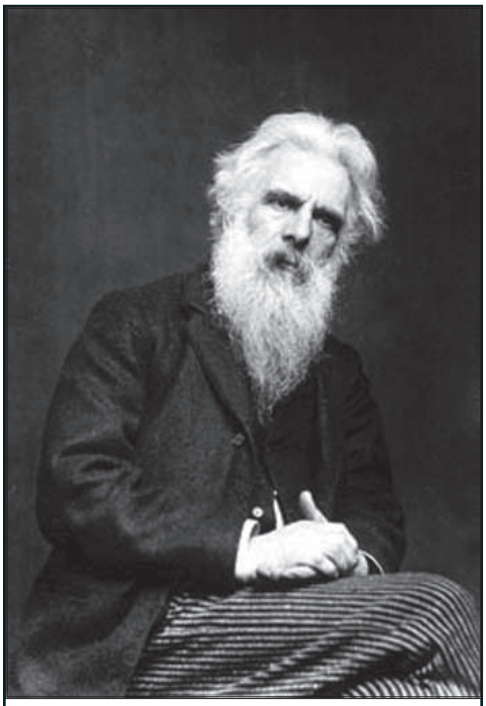
Best of luck,
Ryan Chylinski

LearnTimelapse.com
@Timelapsejunkie

“I AM GOING TO MAKE A NAME FOR MYSELF. IF I FAIL, YOU WILL NEVER HEAR OF ME AGAIN.”

- EADWEARD MUYBRIDGE

THE WAGER



Eadweard Muybridge (1830-1904)

Cathy Curtis of the Los Angeles Times points out that Muybridge was famous for three things: 1) the strange spelling of his name, 2) his sensational acquittal for the murder of his wife's lover and 3) his indisputable photographic proof that horses gallop by lifting all four feet off the ground.

The year is 1872. Leland Stanford, the Governor of California is steaming mad and red in the face. How long had he been arguing with his colleague one bar stool over? Two hours? Maybe three? *It had been at least twice that many rounds and this debate had gone nowhere.* "Unsupported transit" *was* real, he could see it in his mind. As a race-horse owner he was convinced that during the trot *all* four hooves left the ground. His companion would have none of it.

"How about a wager?" Stanford asked as he wiped the froth from his mustache. Maybe it was that *one* more drink, or maybe he stood up too fast from the stool, but as he drew back his arm from the handshake his stomach tightened into knots. Hands had met and the deal was sealed. $25,000 was not a problem... How to prove it scientifically was.

Stanford quickly hired landscape and war photographer Eadweard Muybridge to settle the debate. Over the next few years Muybridge toiled and experimented at the race track. To capture the horse at the "magic" moment he designed and built a series of large glass plate cameras to be activated by thin threads which tripped as the horse passed (24 still cameras in all, 21 inches apart). Later designs would incorporate fast camera shutters controlled by clockwork timing devices.

He would keep innovating until it worked.

Finally in 1877, a single photographic negative captured the precise moment clear enough to be unmistakable. Stanford's race-horse, *Occident,* was fully airborne at the trot.

Jubilation would be short lived however. He had won the bet but there were *so many more* questions this technology could answer. Spurred on by the governor his work continued.

Decades of innovation

Earning the title 'the father of the motion picture', Muybridge's inventions and research into fast camera shutters and sensitive photographic processes allowed moving subjects to be captured and shared in unheard of and almost unimaginable ways.

Fascinated by Muybridge's work and inspired by the power of photography and the study of movement, a host of new visionaries would continue to innovate and expand the field, but it would take another decade before time-lapse photography would enter the minds of the leading practitioners.

WILHELM PFEFFER
1845–1920

Wilhelm Pfeffer (1845-1920)
German botanist

His 1898 work as the director of the Leipzig Botanical Garden resulted in the world's first implementation of time-lapse photography.

THE FIRST TIME-LAPSE

Transport yourself to the year 1898, only a short time until the dawn of the 20th century. You're an intelligent person, interested in the new technology of the day and you're aware of some the latest advances. One sunny and warm day you are ushered into a university classroom to witness the truly incredible.

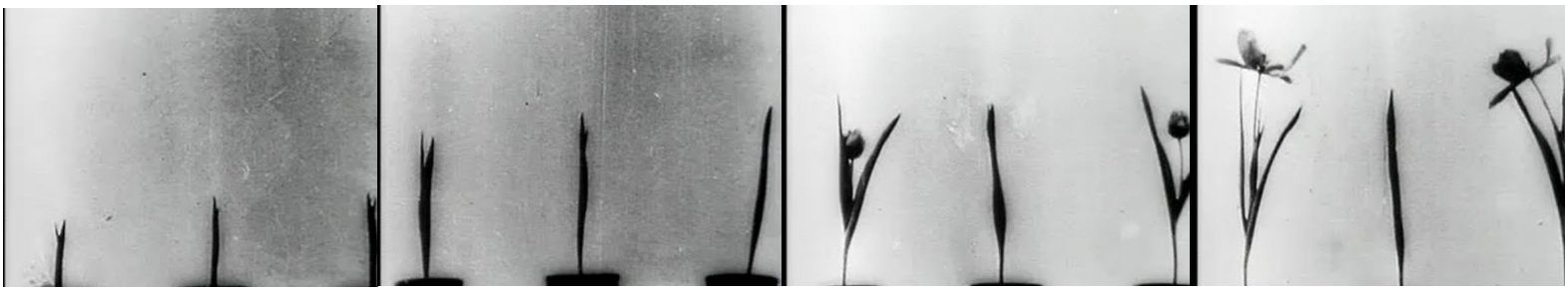
A short film is being shown. It's a film of a tulip plant, but not just any tulip plant, one that appears to be dancing back and forth growing taller and taller before your very eyes.

A bud forms at the center. It shoots up and you see the tulip flower blossom and spread its petals. The film is repeated and you are once again amazed at the images before you. You are seeing something you've *never* seen before.

Sure you knew plants grew, but not like this. Like peering through a microscope for the first time, you are seeing a whole new world and it's life changing.

Utterly amazed you repeat to yourself this same idea again:

"You know things change over time, but to actually see it happen is completely different."



As you walk out into the courtyard you can't help but pause and think about all the things taking place around you, camouflaged and numbed by slowness.

No more.

A blown mind

This technology and concept must have blown people's minds. OK, I probably don't have the strongest of mental constitutions, but seeing the world from such a different time perspective continues to amaze me.

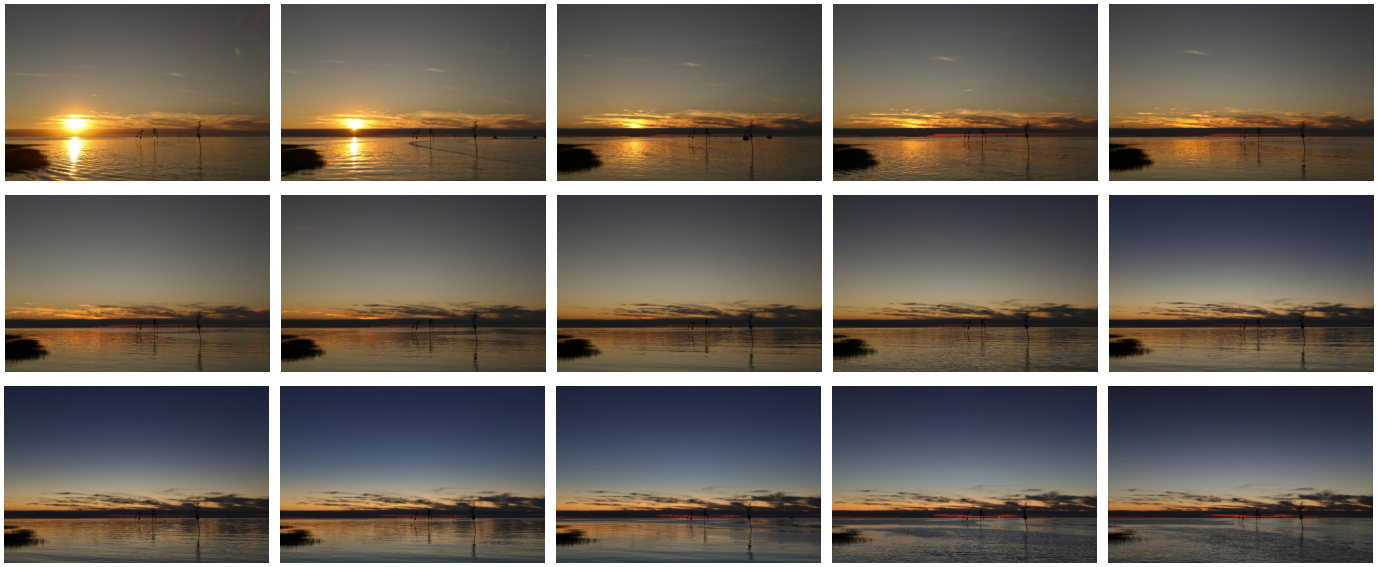
You've probably stumbled upon an incredible work of time-lapse and you just couldn't get the images and feelings out of your head. Possibly you're fascinated by nature and the slow changes that occur over a period of time. A flower blooming, a sunset or a moonrise. Maybe it was a construction project or a cityscape at night, full of activity and production. The capture of change in a way that we can't normally see is what makes time-lapse what it is. But what's really going on in the background?

WHAT IS TIME-LAPSE PHOTOGRAPHY?

Time-lapse photography is a cinematography technique whereby the frequency at which film frames are captured (aka the frame rate) is much lower than that which will be used to play the sequence back.

Put simply: We are manipulating time.

Objects and events that would normally take several minutes, days, or even months can be viewed to completion in seconds having been sped up by factors of tens to millions.



A century of real world science

The atmosphere, geology, astronomy, botany and microbiology. Rotting fruit, cell division, glaciers moving, cakes baking, construction and demolition. Thousands of subjects in hundreds of fields; dancing tulips were merely the start. Greater than a century of instructional and educational time-lapse aided research was about to begin.

More than science, understanding

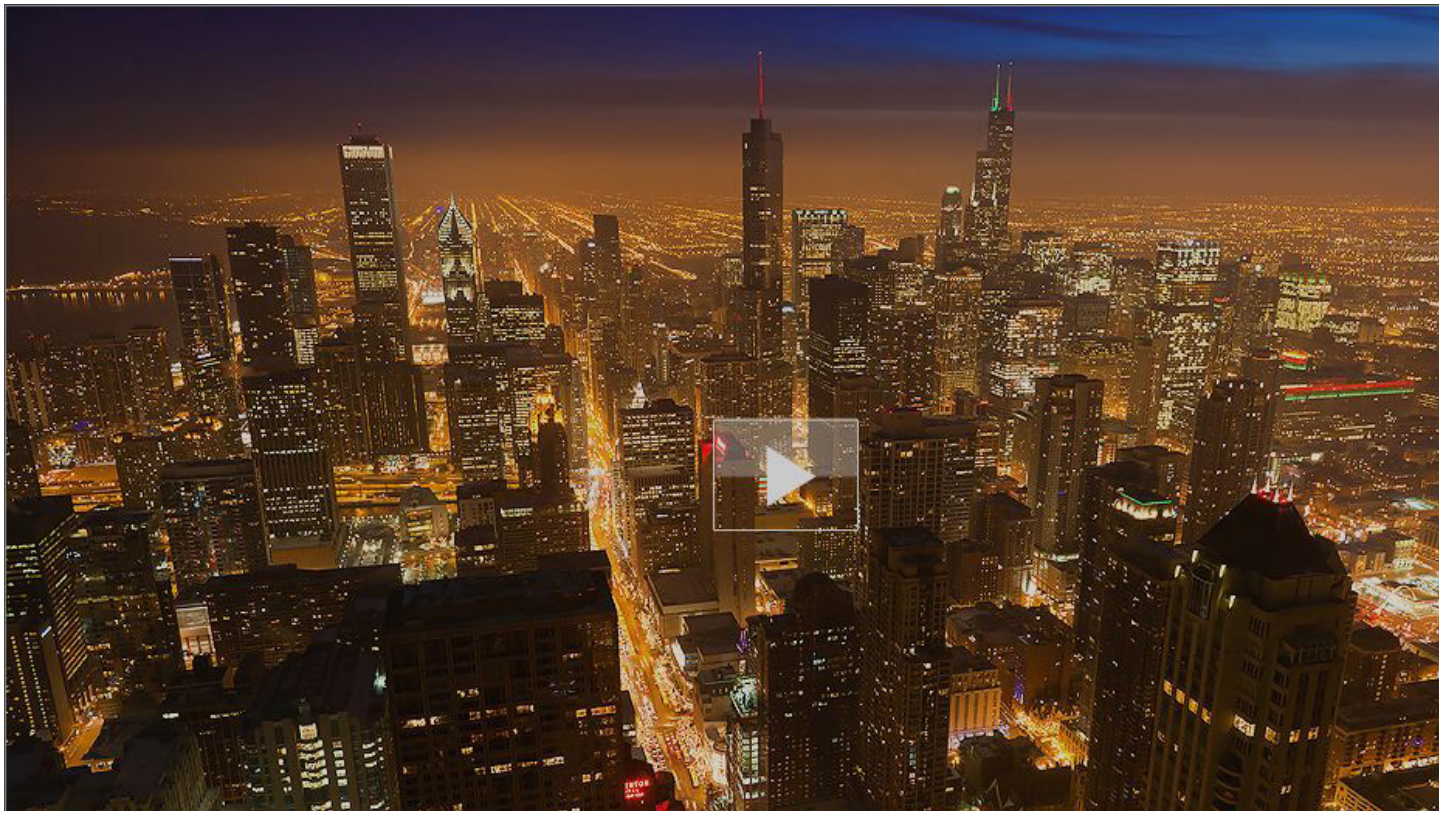
The best way to get a greater feel for the power of time-lapse outside of the educational realm is to watch a few. Now I know you have seen some before, (especially if you watch reality TV) but I'm not really talking about those short clips between tribal counsel elimination decisions, it can go a little deeper if we let it.

What I am talking about are the compilations that really grab your attention and make you think about the world around you. The ones that give you a better understanding about how nature changes and cities work.

AN UNFAIR EXAMPLE

I know. It's certainly unfair to recommend any one time-lapse clip in particular as there are so many great works by amazing photographers, but there's one that just poked my brain and refuses to withdraw its finger. The brief clip is called "The City Limits" by Dominic Boudreault and I encourage you to watch it.

His work was filmed in Canadian and American cities and shows the duality between these places and our natural world. Take a look and see if you can resist being inspired. It's just one of many ways that time-lapse photography is so much more than a gee whiz editing effect. It can be used to tell a story.



"The City Limits" by Dominic Boudreault. See more of his work at his website: Dominicboudreault.com

We've come a long way

A lot has changed since Occident's hooves' left the ground. From feature length collections of time-lapse compilations, IMAX films and medical imaging, to one-a-day photos of your face or your growing pregnancy on YouTube. It's both an art and science that fosters understanding and connection to the world around us.

Time-lapse requires patience, dedication, and some special tools and know-how in order to get the scenes we design in our minds to show up on screen, but it's certainly not hard. We'll walk through the process step by step, but it all starts with gear.

Who doesn't love gear?

“NEVER FORGET THAT ALL THE GREAT PHOTOGRAPHS IN HISTORY WERE MADE WITH MORE PRIMITIVE CAMERA EQUIPMENT THAN YOU CURRENTLY OWN.”

-BROOKS JENSEN

TIME-LAPSE GEAR FROM BASIC TO ADVANCED

1 TIME-LAPSE GEAR

Chances are if you currently take photos with a DSLR camera you probably have just about everything you need.

Phew!

No doubt that first time you said "*hey, wouldn't it be fun to dabble in DSLR photography? You know, just as a hobby.*" Our financial counselors, or our spouses for that matter, broke out in budget busting hives. There probably isn't a more gear obsessed group of enthusiasts out there, but don't worry, great time-lapse photography doesn't require that much gear to begin.

And what about all that advanced stuff you ask? Well, as always the sky is the limit and rainbows can be chased, but I can firmly say as a Dave Ramsey devotee that with some savings and a few Craigslisted garage items, creativity and drive will be your only limits.

Throughout this book I'll highlight what I currently use, free stuff and where to find it, as well as how to duck tape and hack your current gear into submission whenever possible (more found online).

This chapter begins with a minimum gear checklist to get you up and out the door as fast as possible. We'll then wet the appetite with a quick introduction to advanced gear (we cover this in more detail in the challenges section), then take a deeper look into the basic time-lapse necessities with some tips and thoughts for finding the right new or used gear that's best for you.

BASIC TIME-LAPSE GEAR

There are only four basics when it comes to time-lapse hardware:

1 TRIPOD

A rock solid shooting platform that you are comfortable using is almost more important than the camera itself. The good news is that big, old, and heavy metal beasts usually make for great time-lapse tripods and in the world of photography *old* and *heavy* usually means *used* and *cheap*. The bad news is that sometimes your shot is more than a quick walk from the car and suddenly big and heavy doesn't sound so hot. We'll talk about what to look for in a good portable time-lapse tripod and a few things you can do to any tripod to make it as stable as possible.

2 INTERVALOMETER

An intervalometer is an automated camera trigger, a programmable device that is used to snap hundreds of photos at precise intervals. In other words it's the heart of time-lapse photography. There are many different devices that we can use, some internal via camera firmware, some external like the one pictured at left. Some are cheap and some are not so cheap. Having some sort of automated control is required and we'll talk about several different ways to achieve it.

3 CAMERA

Is there such a thing as a good camera for time-lapse photography? Well, yes. I think it's a DSLR. We'll touch on other ways to capture time-lapse images but this book is manly devoted to time-lapse photography using digital SLR (Single-Lens Reflex) cameras. Why? Results. Unless you are shooting for the big screen (or really big screen, IMAX) I don't think you can find a more affordable package offering outstanding control, quality and ease of use. DSLR's get my vote.

4 ND FILTERS (SORTA OPTIONAL)

Like sunglasses for your camera, neutral density or ND filters reduce the intensity of light without altering its color. Less light intensity allows us to use slower shutter speeds in bright environments. Slow shutter speeds in turn allow us to capture motion blur on the moving objects in our time-lapse sequence. Wait a second? Blur!? Isn't that a bad thing? Well, no not really. Not in time-lapse photography. We'll talk all about it in later sections.

ADVANCED TIME-LAPSE GEAR

When it comes to advanced gear the sky is the limit... or is it? Maybe not. I think you could argue that the art of time perception cinematography and the associated technology is evolving so quickly that much has yet to be thought up, let alone designed and offered in the marketplace. Unlike other fields, money might not be the only limiting factor to our time-lapse imagination.

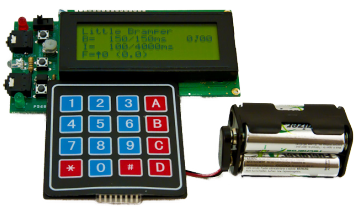
Don't get me wrong there are certainly some incredible devices on the market and we don't have to go too far to find big price tags. But not only are these new designs eliminating mechanical and processing road-blocks, they are allowing us to program camera movement and control in new and amazing ways adding many multiples of interest to our shots. We'll start with the two main areas of time-lapse innovation: motion and exposure control.

Motion control

We are all familiar with regular movie camera movement: panning (left and right), tilting (up and down), and dolly movements (smooth mounted movement along a track) but achieving those movements inside a time-lapse at precise programed intervals over potentially very long periods of time requires a whole new book of thought. I am fortunate to have one area of advanced time-lapse movement covered (dolly movement) with the purchase of a 6 foot Stage Zero Dolly by Dynamic Perception. We'll introduce more movement solutions later on in the challenges section.

Exposure control

Some of the best time-lapse sequences capture the extremes of light and dark in our environment, shots that are really dynamic in nature. Time-lapse images that begin in deep night using very long exposures and then continue into full daylight requiring short exposures and often camera filters, need more than a simple timer to execute correctly. Advanced exposure control devices, both in camera hardware/firmware and post production software, help us plan and alter the cameras settings gradually as the conditions dramatically change in our scene. We'll talk more about these and the time-lapse Holy Grail in later chapters.



A FEW GOOD TRIPODS...

As a heavy feeling of disappointment sweeps over me, I realize all is lost. A windy shooting day led to a shaky time-lapse, which led to frustrated tinkering at home trying to correct it (failed), which led to 650 pretty photos of an awesome landscape but no usable time-lapse sequence. Bummer. While it's possible to correct tiny bits of movement and maybe even save a few scenes with post processing software, it's not fun.

Rock solid stability (or precise controlled movement) will be your most important and most essential component for good time-lapse photography. Unless you do a lot of hiking or travel (we'll talk about this on the next page) the bigger and heavier the tripod the better. Believe it or not, older models in the used marketplace are great for what we need. Do some digging and see what you can find.

A few things to look for:

- Seek big, heavy, and solid models
- Consider all materials not just the latest
- Consider both still and video tripods

A few places to look:

- KEH, B&H Photo, (both sites offer used)
- Call local studios (they cycle gear frequently)
- Craigslist, eBay, Amazon (read reviews)

I was lucky to find this old Bogen 3036 tripod legs and three-way head on Craigslist for $70, which is a great deal. They don't sell this model new anymore but its clone/predecessor the Manfrotto 475B goes for $310 at B&H (and that's for the legs only!). It's heavy clocking in at 9.5 pounds for the legs and another 5 for the head. A beastly monster from what I was used to before time-lapse. Perfect, for most situations that is...

Does it have to be heavy?

These big cosmodome like tripods work great but what if you do a lot of hiking to that secret epic overlook and it isn't exactly close to the trail head? I've included a few thoughts on what to look for in standard more portable tripods as well as a few things you can do to any tripod to make it more stable.

TIPS FOR PORTABILITY

Keep in mind a good tripod that meets your needs will outlast several cameras so consider budgeting a little more time and possibly cash to this category.

- Consider the materials used: weight and strength
- Check the load weight avoid sagging and flexing
- Height: eye level without using middle column
- The right head for your work: ball heads vs pan/tilt

HOW TO MAKE ANY TRIPOD MORE STABLE

Add more weight
Weight can also be added to the top of the camera. Think bean bags, granule bags etc. (Stay away from dusty sand though)

Remove neck strap
You don't want it to turn into a giant sail in the wind do you?

Turn off lens IS
Image Stabilization (and vibration reduction) lenses look for vibrations in your camera in order to reduce it – however if they don't find any (like when you are using a tripod) they actually can cause it. Unless your lens auto detects tripods turn it off.

Never extend center column.
You lose lots of stability. It's best to keep it down all the way and locked.

Batten down the hatches
Coil lose wires and attach extras like the remote timer to the tripod using Velcro straps or rubber bands. Blowing swinging things are very bad.

Use center column hook
Most tripods have a hook below the center column. Add weight by attaching heavy stuff to the center (backpack, water jug, a short uncle, etc.)

Tighten and lock
Make sure all clamps, knobs, and fasteners are clamped, knobbed (*wait that's not right*) and fastened.

Spikes or rubber
On soft ground? Extend the metal spikes. On concrete or your dining room hardwood floor? Use the rubber feet.

Biggest legs first
Avoid extending the smallest thinnest legs whenever possible. Keep the tripod as low to the ground as you can and raise with thicker legs first.

Tripod Heads: What else do you like to shoot?

A lot of photographers own several head types and leg setups and swap them out based on where they are going and what they plan on shooting. If you do shoot a lot of video with your DSLR the ability to pan and tilt smoothly is sometimes very important. Some three-way heads are also specified as fluid heads and as the name implies sealed liquid is used to create a mini hydraulic system which enables steady silky motion. If you find that you do a lot of wildlife photography the speed of a ball head might also be a good choice.

Not sure what to get? Consider renting

The best and truly only way to know if gear is right for you is to use it in the field. Renting camera equipment and accessories has become incredibly easy and very affordable and this is one of many times you'll hear the suggestion. For a very small fraction of the retail price you can use top-of-the-line equipment on your next vacation, assignment, or to try out over a long weekend. There are many great companies out there but my favorites are Borrowlenses and Lensprotogo.

Starting point portable recommendations

A few good introductory models ($100-$200) might be the Manfrotto 190 Series, Benbo Classic or the Vanguard Alta series. I've used both and can say that they get the job done. I can't stress enough to look for used though, you can really find some great deals out there with a little patience. The next step up ($300-$400) might be the Manfrotto 055CX series which catapults us into the range of carbon fiber tubes. Beyond this the Gitzo Mountaineer series and other advanced models start to blur the boundary between practicality and an all out spend fest. Hey we can dream right?

INTERVALOMETERS

Intervalometers, remote triggers, remote timers, basically the physical devices or software applications that allow us to program a precise number of photo actuations at precise intervals. It's the heart of time-lapse photography. If you don't already have one, you need one and this section is for you.

DSLR Intervalometers come mainly in 3 forms:

1. A special shooting mode that comes pre-built in some DSLRs (or tweaked with new firmware)
2. A dedicated external timer remote that plugs into your camera's side input port
3. A connection to an external computer/smartphone running time-lapse/automated image capture software

1 PREBUILT: DOES YOUR CAMERA ALREADY HAVE ONE?

Take a look through your camera's manual or do a search through the features section of your camera model's website. See an interval shooting mode that is part of your camera's functionality? If it's there you should be all set. Almost all digital cameras have the basic capability for interval shooting, mainly knowing current and elapsed time, but in the end it's up the manufacturer to implement it as a menu feature. The Nikon D2 series does have built-ins, older Nikons and most Canons for example need an external device.

2 DEDICATED EXTERNAL DEVICES:

Don't worry if nary a timer function is found, my search came up blank too. I'll go out on a limb here and say that most DSLRs do not include one.

MAGIC LANTERN

Have Canon, will Hack... enter Magic Lantern. I'll quote right from their Wiki: "Magic Lantern is an enhancement atop of Canon's firmware that frees your Canon DSLR, allowing you to use many useful features [including built-in intervalometer!!].... it now has functionality for both photo and video enthusiasts, including manual audio, zebras, focus assist tools, bracketing, motion detection and much more." see magiclantern.wikia.com [See also nikonhacker.com, gh1-hack.info, or pentax-hack.info]

I have broken the external intervalometer world into 4 segments:

1. 3rd party manufacturers/aftermarket (some are perfectly good and cheap)
2. Name brands (good, but expensive)
3. Advanced (sometimes expensive but offer more features
4. Home-built and DIY (Some are hard to make and lack features and field reliability, but hey, downright cool)

We'll go through each of these four segments and point out some things you should consider before you buy.

3rd party and aftermarket manufacturers
Several 3rd party manufactures produce great DSLR compatible intervalometers (some even having the same form factor as the name brands) and sell at a fraction of the cost. This is very good news. Here are a few that I might recommend:

The most important thing is to make sure the product is compatible with your specific camera model.

- **Linkdelight ~$25 (linkdelight.com)**
  Linkdelight is a photographic and small electronics aftermarket company which sells an inexpensive and perfectly functional time-lapse timer remote for most DSLR models. It does what we need it to do and is of good quality for most situations. Their brand now usually ships from US warehouses and has received good reviews and recommendations by other photographers. You just can't beat the price. Note: You *can* take unlimited shots with this model, just set the FRAMES mode to 0 (zero). Beware of the special batteries though.

- **Satechi ~$50 (Satechi.net or Amazon)**
  This is what I currently use and I am happy with the quality and functionality with no problems to report. It has the same features as the Linkdelight model plus the added ability to set shots between 1-399 and infinity (instead of 1-99 and infinity). AAA batteries are easy to find and replace.

There are many others out there and I encourage you to look around. Take your time and again make sure the specific camera model is listed as compatible and look for some good reviews before you buy.

Name brand intervalometers
I love name brand equipment, but the price…. ouch! With something relatively basic like an intervalometer you may want to save up any buy an advanced one with extra features or buy 4 or 5 aftermarket models to have as backups: put one in the glove box, put one in your other camera bag and stick one in your back pocket. I jest, but my cat already chewed the wire and claimed my first Satechi (oops!). As far as build quality and very long-term reliability is concerned, these models do score a little higher.

- **Canon Timer Remote Controller TC-80N3**
  Cost: ~ $210 from Canon
  ~ $142 from Amazon

- **Nikon MC-36 Multi-Function Timer Remote**
  Cost: ~ $180 from Nikon
  ~ $125 from Amazon

Advanced Intervalometers

Time-lapse photography is benefiting from a dramatic flow of innovation into the world of camera movement and shutter control. Some devices are made commercially available almost immediately while others are crowd-sourced strictly for sharing and experimentation. Here are just a few implementations you might want to learn more about:

- **The Little Bramper ~$95 (thewippersnapper.com) (Canon only) - Tough to get ahold of**
  The Little Bramper introduces a whole new level of exposure control in time-lapse photography. Up until this point intervalometers only fired the camera shutter according to a set interval. With the Little Bramper we can now ramp or change our time-lapse interval and exposure variables smoothly over time.

By subtly varying the exposure at a level much more precise than your camera alone provides, flicker free time-lapse footage of light varying scenes can be achieved.

Largely a community driven development, this controller is a little hard to get ahold of but hopefully will come back on the market soon.

- **Promote Control ~$300 (promotesystems.com)**
  The Promote Control is marketed towards serious amateurs and pros (and for $300 that's probably about right). Offering advanced HDR (High Dynamic Range) photographic options and time-lapse functionality including Mirror-Up delay (an automatic wait for added photo sharpness) and HDR time-lapse multiple exposure support. We'll also see how this device and an added accessory can be used to vary our exposure settings gradually and become another way we can achieve those day to night continuous shots.

- **Time-lapse+ ~$99 (timelapseplus.com)**
  Time-lapse+ is a universal intervalometer for Canon, Nikon, Olympus, Sony, Pentax and Minolta SLR cameras (basically as long as they have a connection for a cable release).

Currently in the final development stages (launched on Kickstarter) time-lapse+ is scheduled to include support for an unlimited number of photos, BULB ramping (shift exposure smoothly during the time-lapse), Auto BULB ramping based on the light meter, and more. Holy Grail here we come.

If you haven't checked out Kickstarter.com yet, please do so. The site and community of creators and backers is incredible. Time-lapse is alive on Kickstarter.

Homemade and DIY Intervalometers

Ever since the first time-lapse was filmed people have been hacking and programming their own destructions (I mean constructions) pushing the edge of what seems possible and sometimes practical. Feeling ambitious? Ready for a challenge? Tinker with a few of these designs or search for your own. Don't say I didn't warn you, it's addictive.

- Intervalometer using a 555 timer IC (search instructables.com)
- TI graphing calculator based time-lapse intervalometer (also @ instructables.com)
- Hacking a wireless remote for your camera (search for Luke Hill DIY time-lapse)
- Using a Nintendo DS, phenomenal idea (hdrlabs.com/occ)

And many, many more….

3 TETHERED COMPUTER/SMARTPHONE CONTROL

If you have a smartphone and don't mind dedicating its use for time-lapse every once and a while, or if you've got a laptop and don't mind schlepping it out into the field, tethered camera control might be a solution.

Computer Tether

One of the main benefits of tethered shooting with a laptop is the giant immediate feedback on your computer screen. Advanced time-lapse control applications also exist that really push the envelope of how you can control your camera's exposure over long sequences. Most applications also allow you to save the images directly to your computer, usually solving any kind memory card limitations you might have. Be sure to dive deep into the functionality as there are so many options. Here are just a few to investigate:

Freeware

- DiyPhotoBits (diyphotobits.com)
- gPhoto2 (gphoto.org)
- Sofortbild (sofortbildapp.com)
- And more...

Commercial

- GBTimelapse (granitebaysoftware.com)
- DSLR remote pro (breezesys.com)
- DSLR Assistant (dslrassistant.com)
- Nikon Control Pro 2 (Nikonusa.com)

Smart phone control

More and more smartphone DSLR camera control apps are hitting the marketplace. If you already have a smartphone why not download one and experiment? You'll probably need a special connection wire depending on which phone you have but many apps are coming out with advanced features only found on specialized dedicated devices or full fledged computers. I'm just beginning to experiment with these now and so far I'm having a lot of fun. It's worth it for the small cost to download and pick yourself up a wire.

Android OS (Android market)

- DSLR Controller
- DSLR Remote
- And more...

iOS (App store)

- DSLR.Bot
- Remote DSLR Camera Control
- And more..

A GOOD TIME-LAPSE CAMERA?

Unless you are shooting for the big screen I don't think you can beat DSLRs for an affordable package offering outstanding control, quality, and ease of use.

In the market for a new camera? Time-lapse is obviously on your list, but it's probably not the only thing you want to record. It's important to plan ahead and think about your photographic interests, aspirations, and what you want to shoot, or film for that matter. While I can't say which camera is right for you, I can help you ask the right questions.

Here are few things to consider:

- What do you want to do with your camera? Try to think long term.
- Where do you want to take yourself with photography?
- What is your budget?
- Are there particular features that are important to you?

Where do you want to take yourself?

Weekend warrior, full-time professional, enthusiast, hobbyist or fill_in_the_blank? One is not necessarily better or worse than the other, but having a clear idea of what you want to become is most helpful in setting your camera and photography budget. Are you planning on producing income with your photography?

What is your budget?

The dreaded "B" word.
We talked about this before so I'll just add:
1. Answer honestly
2. Stick to your plan

Budget vs. Passion

Since a camera is probably the most expensive piece of time-lapse gear you'll buy I'll highlight a line that I'm sure you've heard many times: *"The single most important component of a camera is the twelve inches behind it." —Ansel Adams*

Give Ansel Adams a coffee can, some electrical tape, a pin, and some film and he could make a great photo. At the same time give him quality equipment and he could blow us away with amazement. Quality gear matters but not as much as what you do with it. Balance the two and all will be right with the world.

My camera is a Canon 7D

I use a Canon 7D (~$1,200) for my photography, time-lapse, and HD video work. I am by no means immune to the twinges of more advanced models, but I've found a great mix of features, customization and image quality at a mid-range price point that was right for me.

A thought on time-lapse shutter wear: Your camera's shutter mechanism *does* have a lifespan (my 7D advertises ~150k actuations) and while some people easily exceed that mark you *will* wear things out faster by taking lots of time-lapse photos. Personally I think it's more than worth it but it's something you might want to factor into your decision making process.

FEATURES AND RESEARCH

Here are a few considerations that might be helpful as you evaluate your camera options:

Is a built in intervalometer important?

No, not really. All DSLRs have the capability to record time-lapse compilations but some have interval shooting functionality built right into their menu system. Look in the camera's feature listing for something called *interval timer shooting mode*. If it's listed then you've got it. If it doesn't have it, like in the case of my camera, then you will need to either tweak its firmware (Advanced: not possible for all cameras) or connect an external device like an intervalometer, a smartphone or a computer.

So you want to photograph star trails or star lapses?

If you think astrophotography and star trails or star-lapses might be in your future (and it's still in the budget), you may want to consider a full frame DSLR. Full frame cameras have a larger image sensor (roughly 24mm x 36mm) which is bigger than their smaller *crop sensor* cousins. Bigger sensors allow for better low light shooting options. I get pretty good night sky shots with my 7D (crop senor, 1.6x magnification) but it lacks that extra bang for wide angle shooting and true astrophotography. I encourage you to do more research and see if a crop or a full frame DSLR is right for you?

Use OPR (Other People's Reviews)

I spend way too much time at B&H Photo and Amazon thumbing through reviews but I've learned a lot about what gear works, doesn't work, and is completely irrelevant to me and not worth the extra cost. I've also learned how other photographers use certain features in ways the manufacturer probably never intended. Here are a few good resources, blogs and forums to check out if you are looking to buy a DSLR.

General camera tests, reviews and forums

- Digital Photography Review (dpreview.com)
- Imaging Resource (imaging-resource.com)
- Camera Labs (cameralabs.com)
- Planet 5D (blog.planet5d.com)

Reviews and new/used stores

- KEH used gear (keh.com)
- B&H Photo (bhphotovideo.com)
- Adorama (adorama.com)
- Amazon (amazon.com)

Rent and test first

I talked about renting before but I really can't stress enough how cool it is to take one of these models into the field and try it out for a few days before buying. Absolutly amazing.

- Borrow Lenses (borrowlenses.com)
- Lens Pro To Go (lensprotogo.com)

I spent a lot of time learning about features, reviewing different camera models, studying image tests etc. I found a few camera models I liked. I tried them out. I shopped around. I pulled the trigger and haven't looked back. Okay, maybe just a little.

Don't look back *(at least not for a while).*

It is a big purchase, but you did your homework so stop reading reviews and shoot more photos!

ALL ABOUT ND FILTERS

Like sunglasses for your camera, neutral density or ND filters reduce the intensity of all colors of light passing through your lens equally, leaving you with less light without changing the hue or color rendition. It's really all about choices, and ND filters give us more.

Think about it this way: to achieve a "correct" exposure there are many different shutter speeds and aperture combinations that we could use to get a good result (called reciprocity). If we attach an ND filter, the exposure value is reduced because there is less light entering the lens. With less light we now have the flexibility to lower our shutter speed while keeping the same aperture and still get the exposure we want. Same image brightness, lower shutter speed. Nice!

ND Filters help by:

1. Allowing for wider apertures, assuming a fixed shutter speed
   For example: a shallower depth of field in bright conditions
2. Allow for slower shutter speeds, assuming a fixed aperture
   For example: motion blur in bright conditions

Dragging your shutter

This is why us timelapsers really love ND filters. In still photography a fast shutter speed and minimal (or no) image blur is usually the goal but in time-lapse photography, because we string so many still frames together to create a moving sequence, we actually want a little motion blur in each image to create the illusion of smoother moving objects. This intentional blurring is called "dragging your shutter".

We'll talk more about motion blur when we set up our first shot in the next section but for now just think of the blur as "extra information" about how the scene is changing. This extra motion, when strung together with all the other motion blurred images, adds fluidity to the scene and makes it feel more realistic.

DE-MYSTIFYING FILTER SELECTION

ND filters are sold based on "gradings" depending on how much light they reduce. A higher grading signifies a filter that blocks more light. Two different types of notations are commonly used to tell them apart:

1. Filter factor (listed as: ND2 or ND4 etc.)
2. Filter density (listed as: 0.3 ND or 0.6, etc.)

The *filter factor* simply tells us how much additional light will be required with the filter mounted in place. For example a factor of 4 (ND4) means we need 4 times as much light to equal the same exposure. Since each one "stop" of light reduction corresponds to a halving of light, the ND4 filter results in 2 f-stops of reduction. We can now shoot at f/4 instead of f/8 and get a more selective depth of field, or we could shoot at 1/15th of a second instead of 1/60th to get some nice motion blur.

Filter density is also another common notation used. For each *filter density* change of 0.3, the camera's f-stop is reduced by 1 and the darker the filter will appear. The chart on the next page helps put this in perspective.

ND filters can be stacked... but it's better to use fewer
F-stop reduction using ND filters can be increased by stacking 2 or 3 filters end to end for an additive effect. Just be careful, too many and you might begin to see a barrel effect or narrowing around the lens edges. Reflections might also be a problem so keep your filters to a minimum.

If possible, stick to the name brands
There are a lot of cheap off-brand alternatives out there, especially on eBay, and while some may be okay, time and time again I hear of complaints. Hoya, B+W, Lee and Tiffen are good names to stick to. My B+W ND8 and ND16 work well.

Amount of Light Reduction		Common Manufacturers	
f-stops	Fraction	Hoya, B+W	Lee, Tiffen
1	1/2	ND2, ND2X	0.3 ND
2	1/4	ND4, ND4X	0.6 ND
3	1/8	ND8, ND8X	0.9 ND
4	1/16	ND16, ND16X	1.2 ND
5	1/32	ND32, ND32X	1.5 ND
6	1/64	ND64, ND64X	1.8 ND

I recommend at least a 3 stop reduction filter or higher.
Anything lower and you just wouldn't have the reduction effect you need for most daylight shooting situations.

You may want a GND filter
A Graduated Neutral Density (GND) filter restricts light across an image in a smooth pattern. Especially helpful for landscape scenes, ones where there's often a horizon line separating lighter and darker areas, the built in transition helps to properly expose for such drastic contrast.

There are many filters out there
Next time you're online take a look at some of the amazing effects photographers can achieve with filters, of particular delight is the famous "Black Glass" or 10 f-stop reduction ND filter. Incredible.


Filters can slide up and down within the holder... and rotate

You also might want to look into the LEE filter system which allows for quick change filter plates and unique mounting configurations.

The resources section near the end contains several links to helpful filter explanations and examples.

SOME THOUGHTS ON TIME-LAPSE LENSES

What makes a good time-lapse lens? We'll, it depends on what you are going to shoot, but for time-lapse we usually want to capture as much dramatic change as we can in our scenes and that means a wide field of view. Let's discuss a few ideas on lens selection.

Lens field of view

Basically all that "stuff" you can see when you look in a particular direction. A lens' field of view is determined by its focal length which is the measure in millimeters from the center of the lens to the principle point of focus for the lens. Don't worry too much about the definition, we really just care about what happens when we change it.

A normal lens is said to have about the same field of view as the human eye. A telephoto lens has a longer focal length and its field of view gets narrower as its magnification increases. A wide angle lens on the other hand has a shorter than normal focal length which results in a wider field of view.

A wide-angle lens is a time-lapes' best friend

In most cases time-lapse photographers are trying to capture as much as they can and that usually means big scenes and wide fields of view. My Canon EF-S Wide-angle 10-22 mm F/3.5-4.5 lens was a great moderately priced choice for most of the scenes I record.

Consider your cameras sensor size

The same focal length lens will deliver a different field of view depending on the size of your image sensor. For example my Canon 7D in considered a crop sensor, that means it's APS-C format sensor size results in 1.6x crop factor to my field of view. Great when I want telephoto reach, not so great if I want to get really wide. Luckily camera manufacturers produce special lenses designed to help compensate for some DSLRs sensor crop factors. My EF-S ("S" stands for "short back focus") sits closer to the image sensor, which allows for wider angles, a larger aperture, and overall less cost. Look into specialized lenses if you have a crop camera.

How does the lens aperture (f-number) affect my choice?

Lenses list the maximum and usually minimum available apertures as part of their printed specifications. The larger the range the greater the artistic flexibly. Lenses with larger maximum apertures (smaller f-numbers) are significantly better for night and low light photography. These "fast lenses" capture much more light in much shorter times but usually cost significantly more. If you are really serious about astrophotography and star-lapses get the largest max aperture you can afford.

HELPFUL TIME-LAPSE EXTRAS

Here are a few extras that I've found to be extremely helpful for time-lapse photography.

Battery Grip

Most DSLR's have an accessory available that allows you to extend the size of the camera's battery compartment and house two batteries instead of one. I'll be honest and say that most time-lapse sequences (with the exception of astrolapses) can get by on one fully charged battery, but the piece of mind of knowing I can shoot a sequence, pick up the camera shoot stills, shoot some video, then setup for a second sequence is well worth the extra $75 (Amazon). I highly recommend a battery grip.

Extra Batteries

Yes. No more need to be said.

Change batteries mid sequence with the battery grip trick

A Google search and Melanderci at the timescapes forum came up with a great little trick to extend your shots as long as you have enough fresh spare batteries. Here's how to change batteries mid time-lapse: Open the door of the battery grip, find the little button that gets pressed when the door is closed (upper left), now wedge something there to keep it down (pen cap, some toothpicks taped together) then turn the camera on.

You are now able to swap out the battery one at a time without disrupting the time-lapse, just be as careful as you can not to move the camera (maybe try to time moves between shots). It's also suggested to write "DO NOT CLOSE DOOR" or else old habits are sure to jump up on you.

Card Reader

If you don't already have one I highly recommend this too. Since we'll be transferring large numbers of photos there no sense in using camera battery power while we wait for images to transfer. You might want to spend just a few more dollars and invest in a name brand unit. Memory cards are very expensive so protect them.

Extra Memory

Good to have.

Save some serious juice by turning image review off. Once you are confident in your exposure and composition there is no need for the screen to fire up and show you each time-lapse image.

“WITH MANY TIME-LAPSE IMAGES COMES GREAT RESPONSIBILITY.”

- SPIDER PIG

SIZE, QUALITY, SPACE AND SPEED.

2 BALANCING TIME-LAPSE IMAGE SETTINGS

Size, quality, space and speed; It's nothing new if you've worked with digital images before but with time-lapse sequences poor planning can quickly cut a scene too short or leave you with a blinking "Card Full" message just as the sun peaks out over the mountains.

OK, I'll admit it. For the first few months after purchasing my DSLR I only shot in the highest resolution RAW format possible. Bigger file sizes must produce better quality images right? Here I was with an 18.0 Megapixel digital camera, why wouldn't I want to shoot at it's fullest potential?

Potential, yes. Practical, not always. I almost had it right back then but my understanding of what makes a good image was a little hazy. I failed to think about the end destination.

Now I still do most of my shooting in full RAW, but only when I know I have the memory capacity to allow for it, and more importantly, have a need for the added flexibility it provides. In other words I plan for it. It's deliberate.

This chapter is about 3 things:

- Image resolution
- Image file types
- And how to fit them all on your memory card