Photography Masterclass

EQUIPMENT GUIDE
# Equipment Guide - Table of Contents

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Equipment
What equipment do you need to capture sharp, vibrant, beautiful subject matter? Answering this question is my least favorite part of photography, although it seems to be the most obsessed-over topic for photographers. I believe that the image itself is what matters, not what was used to create it. In any case, equipment is an important topic, so I will cover what is necessary.

Equipment can seem confusing at first, especially when you are just getting started and don’t even know what to look for. After reading this ebook you should have a good big-picture understanding of what equipment is needed and what isn’t.

Let’s dive in.

DSLR Camera Bodies
If you are starting out in photography as a hobby, my advice would be to just get any DSLR and not worry about which specific one to get. Just get something -- anything -- to get your started. Work your way up as time progresses. I’m guessing that when you first got the desire to pursue photography, your first question probably was “Okay, what camera should I get? Which one takes good pictures?”. Let me make a bold statement here... I’ll even type it in bold: All DSLRs take good pictures.

Asking “What camera should I get?” seems like the question to ask at first... heck, I was asking the same exact thing when I started. However, I’ve learned that the camera is not as important as the knowledge used to operate it.

All experienced photographers realize this. The first camera you have just isn’t important. What is important is just to get one, become very familiar with the fundamentals of photography, then discover what you need in your next camera and upgrade to that when you are ready to progress.

Another thing you should know is that, in a big-picture context, all the different camera brands are basically selling the same thing: cameras. Canon, Nikon, Sony, Pentax, Fuji, whatever. No brand has any magical powers when compared to another brand. The brand is unimportant and irrelevant in a big picture context. The photos that you capture are what matters, not what brand was used to capture them.

Once you actually start using a DSLR, you will start learning about photography concepts -- things
like exposure, light, and composition -- and will naturally become more familiar with photography as a whole. After you become more familiar with photography by using a particular camera, you will sooner or later become aware of its limitations and will then realize what camera has the specs and features you want to upgrade to next.

The best way to figure out what camera to get is to just go to a local camera shop and talk to the sales people there. Their job is to help you get a camera that is right for you, even if you don’t know where to start. Because they sell cameras for a living, they are the ones who have all the specs memorized for dozens of cameras (I don’t) and will be able to help you choose a DSLR and lens combo in no time, and in a face-to-face conversation.

If you have lots of money to spend, go ahead and get a super expensive flagship DSLR body. It will give you more options and make your job easier, but also remember that you won’t have more skill and knowledge just by owning a really good camera. A photographer that has an entry level camera but has more knowledge and understanding can easily create a better portfolio than someone who has the best equipment on the planet but hasn’t any knowledge of how to use it. Here is why:

Disregarding camera specs, All DSLRs, no matter how inexpensive or expensive they may be, give you the option to manually adjust the Aperture, Shutter Speed, ISO, White Balance, and Focus; your first priority should be to learn how to appropriately adjust these essential variables so you will know how to take a good picture no matter what camera you are using, no matter what situation you find yourself in.

Nothing else matters before mastering how to manipulate these variables. Knowing how to manipulate composition, light, and subject matter is also very important, but those aren’t necessarily dependant on the camera technology you are using.

Technology is not really much of an issue any more. Basic entry level DSLRS of today are better and even less expensive when compared to the flagship models that were made 10 years prior. Everyone now has access to usable equipment. The barrier to take good photos has never been as low as it is today. The main limiting factor is knowledge and experience, not “the best equipment”.

With all that being said however, if you are just starting out and still would like to at least know a little bit of what to look for when getting a camera, here are some things you can consider:
**Pricing: Consumer vs. Prosumer vs. Flag-Ship DSLR**

Let’s face it, pricing is probably the first thing most people need to take into consideration. If you can’t afford a high-end camera, then there is no sense in even taking them into consideration, so those can be eliminated right off the bat (unless you wanted to get one used, or get an older model - which a lot of people actually do).

If money is a determining factor for choosing what DSLR you get, you have to take a look at your options, pick the best camera available that is right for you, and then slowly upgrade over time, eventually climbing your way up the ladder to the Flagship model (if that is what you see fit for your situation).

Let’s take a look at Nikon’s DSLR line-up as of 2012 (Sorry, Canon users). I’m mainly going to be referring to Nikon products throughout this course because I use their products, but will also try to mention Canon whenever possible.

The chart below -- as well as charts for Canon cameras and other brands -- can be found on Wikipedia. If you want to exclude old cameras and only look at the *current* selection of available cameras today, go to the official [Nikon website](http://www.nikonusa.com), or the official [Canon website](http://www.canon.com).

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If money is the most determining factor for choosing what DSLR you get, you will have to purchase either a brand new entry-level consumer DSLR like the D3200, or any older/used DSLR, preferably one with an auto-focus motor. Entry-level cameras don’t have auto-focus motors in the DSLR body (as indicated by the yellow highlighting), so only lenses that have Auto-Focus motors inside of them can be used with them. Having no Auto-Focus (AF) motor in the camera isn’t that big of a deal if you are first
starting out because you will most likely be using a kit lens that comes with the DSLR body anyway, which is perfectly fine.

If you have a little bit more money to spend ($800-$2000), start out getting any DSLR that is in the gray highlighting. These cameras will either be an advanced consumer camera (they typically call these **prosumer DSLRs**), or better yet, a compact professional camera (ex. D300s, D800, D600). These DSLRs will be able to use almost all lenses available, have cleaner image quality, shoot more frames-per-second, have more auto-focus points, and the physical body will be more robust.

If you have even more money to spend (more than $2000), you can get a **Professional DSLR** that has a full-frame sensor (as indicated by the green highlighting in the chart) and at least one full-frame lens to go along with it. The lenses you put on a full-frame DSLR body need to be high-quality (i.e. expensive) in order to make use of the high quality full-frame sensor.

Lets put things in perspective by contrasting the levels of DSLRs:

An **consumer level** D3100 camera costs ~$450 with an 18-55mm lens included.

A **prosumer level** camera, like a D90 or D7100 will cost around $1000-$2000 for the body, and another $2000 for 1-3 lenses, depending on which lens/lenses you get.

A **professional** DSLR (like a crop-frame D300s, or full-frame D600, D800, or D4) for the body only, will cost ~$2000-$10,000 and $2000 for a standard zoom lens. Most pro full-frame lenses cost ~$2000, so if you wanted to get 2 more zoom lenses, you would be at $6000 for lenses. Prime lenses are cheaper.

These prices are subject to change dramatically due to various factors such as technology getting cheaper, inflation, buying used vs. buying new, buying right after the release date of the DSLR/lens, etc. If you are reading this ebook 10 years from when it was written, these prices will probably be different.

The first DSLR I purchased was an entry-level Nikon D50, which I used from 2006-2009. Once the professional Nikon D300s was released, I purchased that and used it from 2009-2012. From 2012-present, I use a Nikon D800, which is a full-frame DSLR. Do you see how each time I upgraded to a new camera, I was “climbing the ladder” and going up a level? Let me explain:

Whenever you upgrade your camera, always make sure that you are upgrading it to a new level and not just updating it with same one as before. For instance, if you already have a consumer level DSLR, don’t purchase another consumer level model just because it is the updated model (unless you want to, of course) - instead, upgrade to a prosumer or professional model.

Now that we have the big picture out of the way (consumer vs prosumer vs professional), lets discuss the features of the cameras on the next page.
When I bought my first DSLR, the only criteria I had was for it to be able to take long exposures (all DSLRs can do this, but I didn’t know this back then) because all I wanted to do was to be able to take light painting and long exposure shots. I also wanted the camera to be able to accept Nikon lenses, because my father had some old Nikon lenses in his closet that he previously used for his Nikon film camera.

So, how did I figure out what specific camera to get, when there are so many available on the market? Did I spend weeks tediously researching every single camera in existence, only to have Buyer’s Remorse two days later due to too many choices? No. I simply went to a camera shop and asked the sales person what he recommended that would fit my budget. He recommended a Nikon D50 DSLR, so I bought it right then and there, no further questions. Done.

Now, I am not insisting that you don’t put any thought into choosing a camera, but I also wouldn’t stress out over it too much. If you are using the camera for a hobby, the first camera you get is usually just to get the ball rolling so you can figure out what you need in your next camera. You can only really know what you want for your next camera as you gain experience with cameras.

If you don’t have the criteria I had or don’t have any lenses that you could potentially use from friends or family members on your new camera, then just take a look at the DSLRs that fits your budget and get either a Nikon, Canon, or Sony DSLR.

Canon and Nikon are the industry standard and they are the brands that will be referenced throughout this course, but you can use anything you want to. If I was forced to recommend a brand, I would recommend Nikon just so you can follow my tutorials easier.

Okay, lets dive in to and discuss the different camera features you can look out for when purchasing a camera.

**Feel and Navigation**

A big difference between the entry-level models and the advanced models is that the advanced models are larger, heavier, and may have more dedicated buttons on the physical body of the DSLR. Dedicated buttons allow you to quickly and conveniently change camera settings on-the-fly by pushing a physical button on the camera body, instead of going into the menu system to change something. Entry-level models usually have fewer dedicated buttons on the DSLR body, which slows things down.
Auto-Focus Points

Some DSLRs only have 3 auto-focus points, some have 9, some have 51, etc. More AF points will make taking shots more efficient and convenient. I find more AF Points to be especially convenient for sports photography where the subject is moving throughout the frame very quickly, or macro photography, where every little bit of space has been magnified and calls for precision when focusing.

If you don’t know what an Auto-focus point is, take a look at this illustration. This is what it would look like if you were to look through the viewfinder of your camera. The red box represents where your AF point currently is and the gray boxes represent all the possible places you could place the red box. You can move the active AF point around by first pushing half-way on the shutter button to activate it, and then use the thumb pad on the back of your DSLR to move it around.

Let’s say your camera has 3 auto-focus points: one to the left, one in the middle, and one to the right of the frame. What if the subject you wanted to focus on was in between the right and middle point (as seen above)? How would you be able to auto-focus on that subject? In order to focus on it, you would have to compose your shot so that the subject was inside one of the red boxes at first, hold down your finger half-way on the shutter button to lock the focus in place, recompose the shot to how you actually want it (while keeping your finger pushed half-way down on the button), then finally take a picture by pushing the shutter button all the way down.

Now, let’s take that same situation only using a camera with 51 auto-focus points. With the luxury of 51 points, you don’t usually have to worry about moving your camera around to recompose your shot that much at all. Simply compose your shot the way you want it, move the box over what you want in focus, then push the shutter button all the way down to take a picture.

As you can see, having more auto-focus points is just a luxury feature to save time (a few seconds); it isn’t a necessary feature to have in order to take good shots. As a general rule of thumb, consumer cameras typically have 3-11 AF Points, while prosumer and professional cameras typically have 9-51 and sometimes even more.
Megapixels

More megapixels will allow several things:

- More Megapixels will allow you to significantly crop your image in post-production without having to worry about significant resolution loss.
- More megapixels allows you to create prints at larger sizes without having to artificially up-size the image, which can cause pixelation.
- More megapixels will allow you to downsize your images, which can sometimes come in handy if you need to fake-sharpen them.

More megapixels sounds great, right? Well, keep in mind that in general, there are two distinct benefits to having less megapixels as well: Less megapixels typically means smaller file-size. In addition to smaller file size, a lower amount of megapixels means less sensor heat, which means less noise.

In most cases, you do not need to be taking shots at some insane 60 megapixel resolution, especially if you won’t be printing your images as large posters. File size is not much of an issue if you are shooting very few pictures, but lets say you shoot a wedding and end up with 1000+ RAW images, and all of them are 40 megapixels each. 40 megapixels for each image is a large amount of data that adds up fast. If all of the shots were 12 megapixels instead, you would be able to fit more images onto your memory card, transfer them to your computer faster, edit them faster, upload them to the internet faster, and store them on a hard drive using less hard drive space, memory, and CPU power. Plus -- depending on the camera -- the images wouldn’t have as much noise.

Here are some facts on how megapixels effect size, assuming your images are 300dpi:

1 megapixel will make a 1000x1000 pixel image. That is 1,000,000 pixels total.
8 megapixels will make an image that is 3872 x 2592 pixels, and would produce an 8x10 inch print.
16 megapixels will make an image that is 4920 x 3264 pixels, and would produce a 16x10 inch print.
36 megapixels will make an image that is 6928 x 5200 pixels, and would produce a 23x17 inch print.

These are just examples of how to get a razor sharp image when you are looking at the print from a few inches away. You can still take an 8 megapixel image and upsize it to 16 megapixels and then make a 16x10 print from it, but pixelation might be visible when the print is viewed up close. The average person isn’t going to notice or care at all if the image has some minor pixelation. However, if you are producing extremely high quality work that is going to be sold for hundreds or thousands of dollars inside a high-end art gallery, then I wouldn’t upsize your digital images too much (although, I’ve actually seen people significantly upsize their images in art galleries anyway...).

Believe it or not, at the time of this writing, the newest and most expensive flag-ship DSLR Nikon has on the market (the D4) only has 16 megapixels. The entry level model has 24. Pro photographers un-
understand that megapixels aren’t that important, and that sometimes their life is even easier with fewer megapixels. Fewer megapixels also can enable a faster frame-rate.

My advice: If you are just starting out and buying your first camera, I personally wouldn’t even take megapixels into consideration.

In today’s world, there is way more than enough megapixels. The specs just aren’t that important anymore. Everyday, technology is forever getting better and better. People were taking amazing shots back in 1990 with 35mm film SLRs, they were taking amazing shots with DSLRs back in 2006, and they still are taking amazing shots today. Technology hasn’t changed much at all, it has just improved in that it is less expensive, faster, and easier to obtain for the average person. Don’t even bother thinking about how many megapixels your camera has, especially if you are purchasing a DSLR for the first time. For the vast majority of people, megapixels just isn’t an important variable worth considering.

Maximum Frames Per Second

Some cameras will have more megapixels, but relatively slower FPS (1-6 FPS for example). Other cameras will have fewer megapixels, but relatively faster FPS (7-12 FPS for example).

Having a faster FPS option on your camera can increase the probability of getting a good action shot, but you are usually trading resolution for faster FPS.

The majority of the shots I take are planned shots where I have lots of time to build and craft each individual image (studio work, still portraits, landscape photography, art), so I usually don’t find myself needing fast FPS. However, if you want a camera more suited for live shots of subjects where timing is more important than super high resolution (event, action, sports, wildlife, wedding, concert and live theater photography), then having faster FPS rather than more megapixels would increase the probability of getting a good shot in those situations. And remember, fewer megapixels typically means less noise.

You can still take live shots and studio shots with any camera. For instance, if you wanted to capture a fast action shot of a skateboarder jumping in mid-air but you only had a camera that could only take images at 1 FPS, that just means that you have to be more careful at timing the shot and may need to do several retakes. However, if you had a camera that could take 8 FPS, you could simply hold your finger down on the shutter button to rapidly fire off a ton of shots one after the other (i.e. “spray and pray”) and then select the best shot out of the batch and just delete the undesirable ones.

Having 8 FPS as opposed to 1 FPS will simply increase the probability of you getting a good fast action shot by 8 times. Having a super fast FPS comes at an expensive price and only comes in handy when you are actually in a situations where you need it. If you don’t really need it, you can cross “fast Frames Per Second” off of your criteria list and ignore it completely.
**Internal Sensor Cleaner**

Having an automatic internal cleansing mechanism for the camera’s sensor is not critical, but it is a nice little extra luxurious thing to have because it does a good job of keeping your image sensor clean so that you don’t have to worry as much about little spots showing up on your image. My internal sensor cleaner cleans the sensor automatically whenever it is turned on. The sensor is very delicate and can easily be damaged if you were to try to clean it yourself without knowing what you are doing. If you don’t have an internal cleanser or your sensor is extremely dirty, you can search online for how to clean the sensor yourself, but I would instead recommend taking it into a shop or back to the camera manufacturer and have them do it for you.

**Noise Performance**

Higher-end cameras usually have better noise performance at around ISO 1600 or above when compared to lower end cameras. High ISO numbers make the sensor more sensitive to light (which can free you up to use shorter shutter speeds), but also adds noise to the image, which unfortunately makes the image less clean. New DSLRs that have fewer megapixels usually have better noise performance.

Just to give a little comparison, the D4 (top-of-the-line model as of 2013) is 1.4 stops cleaner than the D3200 (Nikon’s most basic entry level model as of 2013).

The D4 has a maximum ISO of 204,800 with image quality significantly degrading at ISO 2,965 ISO. D3200 has a maximum ISO of 12,800 ISO with image quality significantly degrading at 1,131 ISO.

Both images above shot with Nikon D800.
Sensor Size
There are **crop frame sensors** and **full frame sensors**. The physical size of a crop frame sensor is smaller than a full frame sensor. At the time of this writing, full frame sensors are usually what professionals use, and crop frame sensors are what professionals and hobbyists use alike. Full frame sensors offer cleaner image quality (better noise performance) and often the camera's viewfinder is larger and brighter, but full-frame sensors are more expensive than crop-frame sensors.

There are four main DSLR sensor sizes by Nikon and Canon that can be put into two categories: **full frame sensors** and **crop frame sensors**:

- **1x Full Frame Sensor** - The standard sensor size used in Flagship and Pro DSLRs of all brands. A full frame sensor is roughly 24mm x 36mm, which is the same size as standard 35mm film. Nikon calls their full-frame sensors “FX” sensors.

- **1.3x Crop Frame Sensor** (Canon APS-H) - used in the Canon 1D line-up.

- **1.5x Crop Frame Sensor** (Nikon APS-C) - Nikon calls these sensors “DX” sensors; they are used in entry-level and professional Nikon DSLRs, but not the top-of-the-line flagship models. A DX sensor is half the size of a full frame (FX) sensor.

- **1.6x Crop Frame Sensor** (Canon APS-C) - This is basically the same sensor as the previous one mentioned, but it is a tiny bit smaller and is used in Canon DSLRs, not Nikon.
If you put a 100mm lens on a Nikon DSLR that has a crop-frame sensor, the angle of view of the image will be cropped by 1.5x. This means that if you were to put a 100mm lens on a crop-frame body, it will appear as if you were using a 150mm lens. If you put that same 100mm lens on a full-frame body, it will appear like you are using what is actually labeled on the lens: 100mm.

There is no need to get confused with sensor sizes, just be aware that smaller sensors tend to crop the angle of view of the image and make the lens seem like it is “zoomed in” a little bit more. If you need to “zoom out”, just use a wider lens.

Camera-phones will have very small sensors, point-and-shoot cameras will have larger sensors (like the CX sensor you see in the chart below), basic and mid-range DSLRs will have APS-C sensors, Professional DSLRs will have full-frame sensors, and “Medium Format” sensors currently cost a lot of money. That’s all you need to know about that!
Features

There are a few bells-and-whistles you might want to consider when purchasing a DSLR as well:

- **Cable Release Port** - A cable release is simply a lockable button on the end of a cable that can be attached to the camera. You can push the button from a few feet away to take a shot without applying any pressure to the camera body itself (thus reducing unwanted vibrations), or even lock the button in to take extremely long exposures past 30 seconds. Entry level DSLRs usually do not support external cable releases, but sometimes accept wireless remotes.

- **PC Port** - A PC port allows you to plug in an external flash to your DSLR via a cable so you can fire the flash without the flash having to be physically mounted to the camera body. I wouldn’t worry about having a PC Port - you can simply use wireless flash triggers instead.

- **Mirror Lock-Up Mode** - Normally when taking pictures, the mirror inside of the camera flops up and starts recording the light hitting the sensor immediately. With Mirror Lock-Up Mode turned on, the mirror flops up, waits 1-3 seconds for minor vibrations from the mirror and from your finger pushing on the shutter button to go away, then begins the exposure. Mirror-Lock Up mode is particularly useful when you want to get the sharpest image possible for slow shutter speed tripod work (landscapes, dim macro still-life, etc.) and potentially works even better when used with a cable release.

- **Glow-in-the-Dark Buttons, Backlit LCD Screens, and Brighter, Higher-Definition Preview Screens, Detailed Image Preview Metadata Information Display** - These are luxury features found in the newer, higher end models. They are not going to make your pictures look better, but they will make taking one slightly more convenient.
Lenses

Believe it or not, lenses are actually more important than the camera body itself because the technology doesn’t get outdated as frequently, they are a bigger factor in determining image sharpness and “shape”, and they can be used with other DSLRs of the same brand.

It is usually more important to invest in a good lens than it is with a good body. You can literally buy almost any Nikon lens right now and be able to use it on almost any Nikon body years from now and it will retain its value very well (as long as you protect it). You will go through more cameras than you will lenses. Lenses last for years and years.

You can’t properly mount a Canon lens on a Nikon body, and you can’t properly mount a Nikon lens on a Canon body. There are adapter rings you can purchase that allow a Nikon lens to be put on a Canon body, but there isn’t much of a point doing that because you lose too much functionality out of the lens.


Nikon DX lenses project the light perfectly onto a 1.5x cropped sensor, FX projects a larger area of light for full-frame sensors. DX lenses and FX lenses alike can be mounted on any Nikon DSLR (FX or DX) because of Nikon’s universal “F-Mount” system.

Canon’s lens system is a little bit more strict in that they have 2 separate types of mounts: the “EF Mount” or “EF-S Mount”. EF lenses can be used with both full-frame bodies and crop-frame bodies. EF-S lenses are to be used with cropped-frame bodies only, because the back end of the lens protrudes into the camera body more. Do not use crop-frame EF-S lenses on a full-frame Canon DSLR because the DSLR mirror will hit the back end of the lens and potentially damage it!

3rd party companies such as Sigma, Tokina, and Tamron manufacture all sorts of lenses that mount on both Nikon and Canon bodies. If you are purchasing a 3rd party lens online, check the title of the online listing for wording that identifies what mount the lens uses, such as Canon EF-S Mount, Canon EF Mount, or Nikon F Mount, etc.

As a general principal, I recommend getting brand-name lenses that match your DSLR if possible (If you use a Nikon DSLR, get Nikkor lenses. If you use a Canon DSLR, get Canon lenses). However, If you are on a budget, then third party lenses are an attractive option. All the Sigma lenses I have used in the past have had excellent image quality.

Just like with the DSLRs, here are the main things to consider when getting a lens: (see next page)
Crop-Frame Lenses or Full-Frame lenses?
Remember how we were talking about sensor sizes a little bit ago, and the difference between a crop-frame and a full-frame sensor? Well, they make lenses to “fit” each of those sensors, let me explain:

A crop frame lens (green) will project light in a smaller area so that it matches the area of a crop-frame sensor (seen left). Crop frame lenses are less expensive because they require less glass to make.

Full-Frame lenses (red) project light in a way that covers the entire area of a full-frame sensor (seen right).

Can a crop-frame lens be mounted on a crop-frame body?
Yes, doing this is totally fine for both Nikon and Canon DSLRs. The only potential disadvantage is that if you ever upgrade to a full-frame body later on, you will want to ditch your old crop-frame lenses and replace them with full-frame lenses in order to actually take advantage of getting the highest image quality out of a full-frame sensor.

Can a full-frame lens be mounted onto a crop-frame body?
Yes, for both Nikon and Canon. The only potential disadvantage to doing this is that purchasing a full-frame zoom lens will cost more than a crop-frame zoom lens.

Can a crop-frame lens be mounted onto a full-frame body?
For Nikon: Yes. Some resolution will be lost because you won’t be taking advantage of the entire area of the sensor. You may have to go into the menu system of your DSLR and tell your camera to only record the light that hits the inner portion of the sensor. The only time you would really want to put a crop-frame lens on a full-frame body is if you had an extra crop-frame lens laying around but couldn’t afford to replace it with a full-frame lens to use with your full-frame camera.

For Canon: No. Remember that the crop frame EF-S lenses protrude deeper into the camera body. Do not use EF-S lenses on a higher end Canon DSLR that only accepts EF lenses.

Can a full-frame lens be mounted onto a full-frame body?
Yes, for both Nikon and Canon. This is the ideal set-up in the long run, but using full-frame lenses and full-frame bodies can get very expensive.
The Maximum Aperture

The aperture is the hole in the lens that allows light to pass through it. The hole is made up of blades that expand to let more light through the lens, but can also contract to let less light through.

The widest possible aperture is usually written on the lens with an f symbol followed by a number. The f number indicates how much light can enter the lens. If the f number is small (f/2.8), more light can enter the lens. If the f number is large (f/11), less light can enter the lens. In most situations, having a lens that has a large opening (aperture) is best because it gives you the option to shoot hand-held pictures in low-light situations. Here are common f numbers you will find marked on lenses:

- **f/1.2, f/1.4, f/1.8 and f/2** - Found on most prime lenses (I'll explain what a prime lens is later). F numbers this low allow for lots of light to enter through the lens opening - this means that you will be able to take higher quality images in low light situations and capture some great images with a shallow depth of field.

- **f/2.8** - This is what I look for in any given zoom lens. Anything that is f/2.8 or wider (like f1.8) usually indicates that the glass is of high quality (which means higher quality images) and can shoot in lower light situations without much of a problem. People call lenses that have a maximum aperture of f/2.8 or lower a “fast lens” because you can let more light into the camera, thus enabling you to use shorter shutter speeds, thus reducing motion blur and unintentional camera-shake when shooting hand-held. f/2.8 is usually found in good zoom lenses.

- **f/4 and f/3.5-5.6** - Anything above f/4 won’t be letting in as much light into the lens. This isn’t a big deal if you are shooting during the day or are just starting out in photography and don’t have the money to spend on a relatively more expensive f/2.8 zoom lens. The first lens I used for years was a standard 18-55mm kit lens that had a maximum aperture of f3.5-5.6.

Note that f3.5-5.6 is a **variable aperture** (not a “fixed” or “constant” aperture). A variable aperture lens means that, when the lens is zoomed out at 18mm, the widest aperture possible is f3.5. If the lens is zoomed in to 55mm, the widest possible aperture is then f5.6. The aperture literally opens and closes as you zoom in and out. f5.6 is really bad for low-light situations and even shooting in the shade at times; I’d much rather use a lens that has an aperture opening of at least f2.8 in situations like that.

I used the 18-55mm f3.5-5.6 kit lens for years and took great pictures with it but don’t use it anymore now that I have a f/2.8 **constant aperture** lens. With a constant aperture lens, the aperture can remain fixed at f/2.8 no matter how much the lens is zoomed in. I can be at 17mm, 50mm, or anything in between, and still have it be at f2.8. Fixed aperture lenses show an indication of a good piece of glass, while variable aperture lenses generally indicate that the lens isn’t as high quality.
The Focal Length

The focal length is that number written on every lens followed by “mm”. In very simplistic terms, the focal length simply tells you how wide or narrow your field of view is (how far you can “zoom in” on a lens).

Wide Angle Lens: Anything between the range of 0mm-35mm
Normal Lens: Anything between the range of 35mm-70mm
Telephoto Lens: Anything that is 70mm or above

Example lenses:
16mm, 35mm, 50mm, 85mm, 18-55mm, 18-200mm, 12-24mm, 24-70mm, 70-200mm, 300mm, etc.

Notice how all of these lenses have different focal length and ranges of focal length.

Also notice the difference between a 50mm and an 18-55mm lens. You can zoom in and out with an 18-55mm lens, but you can’t zoom in or out at all with a 50mm lens. The focal length is stuck at 50mm, so you are forced to physically walk closer or further away from the subject you are photographing if you want your subject to fill the frame appropriately. Any lens that has a fixed focal length (like a 50mm) is called a **prime lens**. Anything that can zoom in and out (like an 18-55mm) is called a **zoom lens**.

So then, why on earth would you want a prime lens when you could just use an 18-200mm lens and cover all bases in one go? The reason is that, in general, the less range a lens has, the better the image quality will be. If you were to take a shot side-by-side using a 50mm lens and an 18-200mm lens zoomed in to 50mm, the 50mm prime lens would produce a sharper, higher quality image.

Prime lenses usually allow for larger maximum apertures, such as f/1.2, f/1.4 or f/1.8. Prime lenses are generally the highest quality of lens possible, are lighter, smaller, are less expensive when compared to pro zoom lenses, and are the superior choice for taking shots in low-light situations or producing shots with shallow depth of field. The downside of prime lenses is that they are not as versatile as zoom lenses. If you only used prime lenses, you would have to constantly be switching lenses on and off the camera body in order to select the desired focal length.

So then, the question is, which focal length do you want your main lens to be? Here is my answer: There is no single lens that is ideal for every situation. Different subject matter calls for different lenses.

For your first lens that you will probably be using in most situations, I would recommend something like an 18-55mm if you are on a crop-frame DSLR, (or 24-70mm if you are on a fullframe DSLR) because you will be able to shoot wide at 18mm, and also zoom in to 35-55mm to capture portraits in well-lit situations. If you will only be shooting portraits, then I would just recommend something like a 50mm (or 85mm if on full-frame) prime lens instead.
Lens Codes
Lenses manufacturers put a variety of little numbers and letters on the lens box and on the lens itself to indicate different features the lens has (we’ve already covered Aperture and Focal Length, which are the most important ones you need to know about). All the different manufactures use different terminology for the more nit-picky technologies. The terminology used by the different manufactures can be briefly reviewed here. If you want longer, more detailed description of a certain term, I would recommend Google searching the term for your specific lens manufacture.

I’ll quickly review what the codes marked on this 70-200mm lens mean, just to give you a general idea.

**AF-S:** Auto Focus - Silent Wave Motor

**NIKKOR:** The name of the brand of lenses produced by Nikon Corporation.

**70-200mm:** Focal Length (the zoom range).

**1:2.8:** More properly written as f/2.8, this indicates the Maximum Aperture of the lens (note how in this example the aperture is fixed because it is saying 1:2.8 and not a variable aperture like 1:3.5-5.6).

To be unnecessarily technical: f represents the focal length. The diameter of the aperture is equal to the focal length divided by 1.8. For example a 50mm f/1.8 lens has a maximum aperture diameter of 50/1.8 mm = 27.8mm. You don’t need to know this math stuff at all to take good pictures though.

**G:** Aperture cannot be physically adjusted on the lens, but instead is controlled 100% by the controls on the camera it is mounted to. All new lenses are G lenses. D lenses are generally older and have adjustable aperture rings on the lens itself that you can physically twist with your fingers to manually adjust the aperture value, but you would only need an analog aperture ring for really old cameras.

**II (and VR):** Also written sometimes as VR II. VR means that there is a Vibration Reduction switch on the lens to reduce unwanted motion blur. The “II” just means that it is the second version of this 70-200mm lens (the technology was improved somehow).

**ED:** Extra-low Dispersion (reduces chromatic aberration, increases sharpness).

**N:** Nano Crystal Coat (reduces lens flare).

As you can see, there are many details. Details like this dive me nuts because there are literally hundreds of technical names that different brands use that are constantly evolving over time. Let me just give you the big picture of lenses that I would recommend getting when starting out: (see next page)
Starter lenses for crop-frame DSLRs

Please note that as a starter kit for your crop frame camera, I would recommend getting one out of the top three lenses listed on this page, in addition to one prime lens (fourth lens listed) if possible. All of these are general purpose lenses.

- **Nikkor DX 18-55mm f/3.5-5.6 / Canon EF-S 18-55mm f/3.5-5.6** - $100-$300 - This lens will be fine to get you going. The image quality is good. The build quality is cheap plastic. These lenses are not ideal for hand-held shots in low-light or shady situations because you are forced to use f/5.6 when at 55mm. I used this lens for years (almost all of the shots in this video were taken with the 18-55). Just remember that the 18-55 isn’t a professional lens because it has a variable aperture and isn’t worth more than $300 at most. Get this lens if you can’t afford the one below.

- **Nikkor DX 17-55mm f/2.8G / Canon EF-S 17-55mm f/2.8** - $1,000-$1,500 - This lens is the professional version of the lens above and would be a better choice if you will be mounting it onto a good crop-frame DSLR body. The optics are better (higher image quality), the build quality is way better (weather-sealed metal as opposed to plastic), the maximum aperture is wider (fixed aperture at f/2.8 as opposed to the variable aperture of f3.5-5.6), and the focal length starts at 17mm as opposed to 18mm, so you get a slightly wider field of view (not that big of a deal). If you have the money to spend, get this lens instead of the one above.

- **Nikkor DX 18-200mm f/3.5-5.6G / Canon EF-S 18-200mm f/3.5-5.6** - $500-$900 - The versatility of this lens is insanely good and makes this the best all-purpose daylight lens without question. You can literally go from wide-angle to telephoto in less than a second, which would normally be impossible if you were to use regular lenses because you would have to be spending time changing lenses. The optics are fine, except you will see a little barrel distortion on the wide-end (this can be corrected in post-production). The biggest disadvantage to this lens is that it doesn’t have a constant f/2.8 aperture.

- **Nikkor DX 50mm f/1.8 / Canon EF 50mm f/1.8 prime** - ~$100-$200 - Prime lenses are light, usually have the best optics, and are especially useful for low-light and shallow depth of field work, but they are not as versatile as the zoom lenses. I think everyone should have at least one prime lens. The 50mm and 35mm are the most popular and least expensive prime lenses available and are quite light and small; the 24mm and 85mm are more expensive. Lenses that have f1.2 or f1.4 will be more expensive when compared to the f1.8 versions.
Professional lenses for full-frame (and crop-frame) DSLRs

Note that the first three lenses are commonly called “Holy Trinity” lenses because all three of them have the constant standard aperture of f2.8, all of them project the light in a large enough area to fit an entire full-frame sensor, and all of them cover the most popularly used focal length range (14-200). All of these lenses can also be used on crop-frame bodies. I’ll list the lenses in order of their general usefulness from top to bottom.

The Default: **Nikkor 24-70mm f/2.8 / Canon EF 24-70mm f/2.8L** - $1,500-$2,000 - Without question, this lens can pretty much be used for anything. If I was forced to pick only one professional lens to use for the rest of my life, this would be it. It is wide enough to capture landscapes and architecture, but also narrow just enough for portraiture. I would make a guess that this lens is the default lens many photographers have on their DSLR 70% of the time.

The Telephoto: **Nikkor 70-200 f/2.8 / Canon EF 70-200mm f/2.8L** - $2,200 - This is better for outdoor portraiture because of the shallow depth of field that can be achieved at 200mm. Sports and wildlife are also popular subjects shot with this lens because of the far reach/zoom. Even products and landscapes can be shot with this lens too, especially if you want a background element to appear larger than it does in reality - see the Lenses video to get comparison and example images.

The Ultra Wide-Angle: **Nikkor 14-24mm f/2.8 / Canon 16-35mm f/2.8L** - $1,500-$2,000 - This lens is generally used for photographing landscapes (especially when you want to put emphasis on the foreground and less emphasis on the background), photographing inside of tight spaces, and photographing architecture. The Nikon lens is fantastic.

Prime Lenses: Since we are going in order of general usefulness, I would have to rate these below a “holy trinity” lens. Again, you would want a prime if you wanted to get the highest image quality possible, get better images in lower light situations, or get extreme shallow depth of field shots. The top 3 prime lenses I recommend getting would be the 50mm, 35mm, and 85mm.

Fisheye: A circular fisheye lens projects the image as a circle onto your sensor; the field of view is literally 180°x180° in all directions. A full-frame fisheye lens is the same thing but it crops the image to fill up the entire sensor, so the field of view is only 180° when measured diagonally from corner-to-corner and not side-to-side like the circular fisheye. My DSLR is 36 megapixels, so I just use a circular fisheye lens and crop the image later if I have to make it look like a full frame fish eye image. See the Lenses video for comparison and example images.

Macro: Macro lenses are capable of focusing very close to subject matter for extreme close-up shots such as insects, flowers, and small products. Macro lenses aren’t just limited to focusing up close, they can also photograph things far away as well. A true macro lens should be able to focus to at least a 1:1 ratio. If you were to take a shot of a coin at a 1:1 ratio, that would mean that the sensor is recording the
light as if you had placed the coin right up to the sensor.

**Super Telephoto:** 300mm+: Mainly used for professional wildlife and portrait work. These lenses are very expensive and very large. They usually range from 300-600mm, but can go higher. The price and size of the lens jump extremely high after 600mm, often costing more than $10,000. You'll also need a large hard carrying case just to safely transport the lens from place to place. I personally would rather just use an extension tube if I really needed to zoom in past 200mm.

**Tilt/Shift Lenses:** A [tilt/shift](https://www.example.com) lens is a unique type of lens that comes with the following two distinct mechanical features:

**Tilting** takes the depth of field plane that would normally be parallel with the camera lens, and tilts it forward or backward at a diagonal angle in order to preserve sharpness across a plane (this comes in handy if you want the sharpest image possible for a landscape shot, of if you were taking a macro photo of a computer chip on a table at an angle, and wanted the entire plane that the chip is resting on to be in focus from front to back). You can also *reverse-tilt* to make the depth of field appear super shallow.

The perspective of the lens can also be **shifted**, which is useful for architecture photography where you want to capture the entire building from top to bottom, but also want to preserve straight vertical lines so they are parallel with the borders of the image. You can also *reverse-shift* the lens to aggrandize non-parallel lines, making everything look skewed. Shift and reverse-shift can be faked in Adobe Photoshop, although resolution will be lost.

**Extension Tubes:** [Nikon AF Extension Tube Set](https://www.example.com) / [Canon AF Extension Tube Set](https://www.example.com)

Extension tubes are hollow metal rings that come in various lengths that fit between your camera and your lens to push the lens a little further away from the camera’s sensor. Extension tubes simply give you the ability to focus closer to your subject. There are no optics in extension tubes, so nothing is magnified - their sole purpose is to get the lens further away from the sensor.

You can attach extension tubes to any regular lens in order to transform that lens into a pseudo-macro lens, or even put extension tubes on a real macro lens to get *super-duper* close. Manual Focus (MF) extension tube sets are less expensive when compared to the Auto-Focus (AF) extension tubes. If you purchase a MF extension tube set just make sure it has plenty of good reviews; some of the MF extension tubes out there are very low quality.

**Teleconverters:** [Nikon Teleconverters](https://www.example.com) / [Canon Teleconverters](https://www.example.com)

A Teleconverter is an adapter you put between your camera body and your camera lens which magnifies the image according to the length of the converter. There are three converters available that magnifies the image 1.4 times, 1.7 times, or 2 times. If you were to use a 2x teleconverter on a 200mm lens, it would inexpensively transform that lens into a pseudo 400mm lens (with some drawbacks).
The drawbacks of using a teleconverter on a 70-200mm lens instead of using a real 400mm lens are the following:

- You will lose some light when using a teleconverter. For example, if the maximum aperture of your lens is f2.8, the new maximum aperture when using a 2x teleconverter becomes f5.6, or f4.8 if using a 1.7x teleconverter).
- The image will not be as sharp and free of chromatic aberration as it could be if you were to use an actual high quality 400mm lens. Teleconverters magnify *everything*, including optical imperfections of the lens it is attached to, so be sure to only use teleconverters on high quality lenses like the 70-200mm f/2.8. The less magnification a teleconverter has, the more sharp the image will be (ie a 1.4x teleconverter will be sharper than a 2x teleconverter).

Teleconverters will only mount on certain lenses, so be sure to check the [Nikon teleconverter compatibility chart](https://www.nikon.com/en_us/products/teleconverters), or the [Canon teleconverter compatibility chart](https://www.canon.com/en/camera/teleconverters).

**Reverser Adapter Ring**

The cheapest way to get pseudo-macro capability would be to mount your lens backwards onto your camera using a lens reverser adapter ring. Reverse rings are inexpensive but can be very difficult to work with and get good images because of the following problems:

- The focusing ring of the lens will be disabled. The only way to focus on your subject is to physically move your entire camera body closer or further away from your subject. This is very tedious because you have to be pretty precise.
- If the lens you are using does not have an adjustable aperture ring on it (ex. Nikon G lenses) then you will need to manually open the aperture on the lens by pushing the little aperture lever on the backside of the lens with your finger. This is also tedious.
- The image can be very dark when looking through the viewfinder or live-view mode and the depth of field can be ridiculously shallow, making it difficult to get good shots.

**Comparing Camera and Lens Specifications**

If you really need to get more details of which camera has what and what lens has which, you can use websites such as [DXO Mark](https://www.dxomark.com) and [Snapsort](https://www.snapsort.com) to compare camera and lens specs and their prices, side-by-side.
Filters
For the sake of proper terminology, it is important to note that a filter is not a lens. Many people get the two terms mixed up.

*Lenses* are mounted onto camera bodies.
*Filters* are placed in front of lenses in order to add an optical effect.

The most commonly used filters today are UV filters, circular polarizing filters, neutral density filters, and graduated neutral density filters.

You can get a filter that has coatings on the glass to protect it from sunlight flaring, scratches, water, dust, etc., or you can get a regular glass filter that has no coating on it for about half the cost. The coating will make it easier to use the filter while shooting into the sun. If you ask me, the coating makes a big difference.

I get filters made by B+W with the Multi-Resistant Coating (MRC) coating. The MRC coating makes the filter resistant to flare, scratches, dirt, and water, and also reduces any flares.
Filter Sizes for Round Screw-On Filters

You need to know what size of filter your lens accepts in order to fit the filter on the lens. The backside of almost any lens can be mounted on any DSLR of the same brand (especially if it is Nikon), but the front element varies in size from lens to lens. The filter size is the diameter of the front threaded ring around the glass. You can find out the filter size of your lens by looking at the backside of your lens cap or by reading the text around the front ring of your lens.

Some lenses, like the Nikon 18-55mm DX kit lens, will have a filter size of Ø52mm. Other lenses, like the Nikon FX 24-70mm will require larger filters such as a Ø77mm filter because the front glass element is larger. You can’t usefully use a small Ø52mm filter on a lens that has a Ø77mm filter thread, but you can use a large Ø77mm filter on a lens that has a Ø52mm filter size if you place a “step-up” adapter ring between the filter and the lens.

The vast majority of all lenses will never exceed 77mm in filter size, so if you only purchase 77mm filters, you will be able to use them on almost any lens available, provided you use lenses that have smaller filter sizes with a step-up ring adapter kit for multiple sizes or just a single step-up ring (more useful for wide angle lenses).

Don’t confuse the focal length mm number with the filter size mm number. They are distinct.
UV Blocking Filters

A UV blocking filter (commonly called “UV Filter”) is a clear filter that blocks invisible UV light that is apparent in distant high altitudes (in the mountains) and by the sea and in regions with very clean air that can potentially cause your image to have a slight tinted haze. More importantly though, because the UV filters are clear, they are commonly used to simply protect the front lens element from any potential damage.

People constantly debate as to whether or not you should put a UV filter on your lens. Protective UV filters are like condoms: it is better with it off, but safer with it on.

If you have an expensive $2000 lens and shoot with it on a beach or desert on an extremely windy day where sand and salt water is everywhere in the air, would you want all the grime to build up on the front of the lens element, potentially scraping and deteriorating the expensive glass? I wouldn’t, so I screw a protective UV filter on the front of the lens (when I remember or if it is convenient) so that the lens can retain its value and I can resell it if I ever want to.

Dust builds up everywhere in your house, dirt flies around in the air, food and liquid splashes uncontrollably, drunk people throw things, little kids smudge things with peanut butter on their fingers, and photographers drop their camera and bump it into things. A UV filter can protect your lens from all of that stuff (as can a lens hood!).

It is important to note that if you do decide to get a UV filter, that you get the highest quality one that you can afford. Getting a cheap uncoated glass filter that costs $20 just won’t cut it. Putting a cheap filter on an expensive lens defeats the purpose of having an expensive lens because the low-quality filter will make your image look hazy, add flare, lower the sharpness, lower the contrast, and shift the color. Higher quality filters will still do that, but just barely. The effect just isn’t humanly noticeable unless you are comparing the shots side-by-side with a magnifying glass, and even then, it is a minor difference.

A “UV Filter” is sort of a catch-all phrase for a modern protective filter. It is technically better to use a 100% “Clear” filter with digital cameras to get the maximum amount of light transmission because there is already a UV Blocking filter in front of the image sensor which is located inside the camera. The reason why people still call protective filters “UV filters” is because film was sensitive to UV light, so the term has just stuck around over the years. If you are shooting exclusively with film for some reason, a UV Filter would be a better choice than a Clear Filter.

So then, what specific filter should you get? If you ask me, I recommend filters made by B+W because of their quality.
If you want a protective filter, I would recommend getting this one, specifically: **B+W Clear Filter**.

Do some test shots in different lighting conditions with the filter on and off and compare the shots side-by-side in order to come to your own conclusion if you want the filter on your lens at all times or only in potentially rough environments. Using UV filters just comes down to personal preference and isn’t as big of a deal as the salesmen make it out to be.

I have one clear filter on my 70-200mm lens and just use lens caps, lens hoods, and care to protect the rest of my lenses, not protective filters. If I was shooting in a really rough environment (like mounting a camera onto a car while driving down a desert road filled with insects splattering on the car and lens), I would definitely try to make use of a protective filter if I could. But other than that, a lens hood does an extremely good job of protecting the lens from all sorts of things (including flare!), so I just don’t bother putting UV filters on any of my lenses.
Circular Polarizing Filters

Polarizing filters generally make bright blue skies a darker blue, as well as reduce glare and reflections, thus making your photograph look colorful and professional. Say goodbye to annoying highlights and reflections on glass, foliage, water, and other surfaces!

Polarizing filters come in two flavors: Circular polarizing filters and linear polarizing filters. Get a circular polarizing filter, as these are better for Digital SLRs. If you get a linear polarizing filter, you may run into problems with metering and auto-focus.

The specific filter I recommend is the B+W Kaesemann Circular Polarizer with Multi-Resistant Coating. When you put a polarizing filter on your lens, you will lose roughly 2 stops of light.

Polarizing filters generally work best when the main light source (ie. the sun) is at a 90 degree angle to the side of the camera with a lens longer than 24mm. Using ultra-wide-angle lenses with polarizers will only make half of the sky look darker, which usually is not a desired effect.

Reflected highlights on foliage can be removed by using a circular polarizing filter. Because of this, the color of the image will be more true, rich, and saturated. Mmmm.
Ugly bright highlight glare seen on the grass, road, and stream have removed by using a polarizing filter, and even the grass seems to be brighter!
Neutral Density (ND) Filters

An [ND filter](#) is simply a gray filter that limits the light passing through it. That’s all it does. This filter will give you the freedom to widen the aperture in order to get shallow depth of field shots in daylight and take long exposures during daylight and blur any subject that moves (waterfalls are a prime example). ND filters come in different darkness levels. A filter that is labeled “ND400” will be much darker than a filter that says “ND4”. Click the link above and scroll down to see a chart of the specifics.

This is just an example of what you can do with an ND400 filter. The shutter speed for this shot was around 10-30 seconds in pure daylight.

Some people in the shot look normal and not that blurry, this is because their bodies remained still during the entire exposure.

Some people look slightly blurred, because they were weren’t remaining very still.

Some people can only barely be seen, or cannot even be seen at all (they are literally rendered invisible) because they were moving significantly throughout the entire exposure, so the camera’s sensor never got a chance to pick them up. The people who are rendered invisible are the people who were walking across the beach and never stopped long enough for the camera to render them as significant.
Graduated Neutral Density (GND) Filters

A GND filter is dark on the top and clear on the bottom. The darkened part of the filter is most popularly reduced by about 2 stops (ND0.6), but you can have it reasonably reduced by any number of stops. They can come in different colors as well, but neutral gray is by far the most commonly used.

GND filters are useful when photographing a scene that is bright in one half of the frame, and relatively dark on the other (a sun setting on a simple horizon line, for example). If you were to not use the filter and expose for the foreground, the foreground would be exposed correctly, but because the sky is brighter than the foreground, the sky would be too bright and has loose detail. If then, you were to expose for the sky, the foreground would then be too dark. With a GND, you can darken the sky and leave the foreground as it is, so you can get a properly exposed, evenly lit scene with more detail distributed across the entire frame as a whole. A GND filter allows you to capture more information onto your sensor that would otherwise be blown out.

You can purchase a GND with a “hard edge”, which is good for simplistic straight-lined horizons, or a “soft edge”, which can be a little more useful for complex compositions where having an abrupt transition would be too dramatic. I typically find hard gradients to be more practical than soft gradients.

GND filters are usually sold as a rectangular piece of resin. The resin filter slides in a filter holder which is screwed on the front of the lens. The reason why a rectangular filter is used for GNDs and not a circular screw-on filter is because a circular screw-on filter wouldn’t allow you to adjust how high or low the gradient lies in the composition, the gradient would just be stuck in the middle. With the rectangular holder, the filter can be shifted up and down while it is in the filter holder to adjust the position of the gradient.
There are different filter (and filter holder) sizes:
A series goes up to 67mm
P series goes up to 82mm
Z-pro series goes up to 96mm
X-pro series goes up to 118mm

Even though most lenses do not have a filter size larger than 77mm, there are two distinct benefits to using Z-Pro filters over P filters:

- Larger filters ensure that vignetting is minimized on any given lens.
- Larger Hard GND filters can be used as regular ND filters when you slide the filter all the way down the filter holder - the tinted portion of the filter pretty much acts as a 4x4 filter which will cover the entire portion of the front element using any given lens.

It is for these two reasons I recommend the Z-Pro series over the P-Series. If you can’t afford going with the Z series, get the P-series, or don’t use filters at all but instead photograph a bracketed set of images([-2EV, 0EV, +2EV], for example) and then manually tone-map the image using layer masks in Adobe Photoshop, or use HDR software to tonemap the image for you at a pixel-by-pixel level.

There will be three individual parts you will need to purchase in order to have a complete, fully functional filter system:

1. **Filter** - I use the Z-Pro Hard Grad Filter Set and the Soft Set.
2. **Filter holder** - I use Cokin Z-Pro Filter Holder.
3. **Adapter Ring** - The adapter ring is used so that the filter holder can be screwed onto the front of your lens where a screw-on filter would normally go. Because I use Z filters and most of my lenses have a filter thread size of Ø77mm, I use a Ø77mm Z ring. If, for example, your lenses are Ø55mm and you are using P filters, then you'll need a Ø55mm P adapter ring instead.
4. **Case (Optional)** - I recommend the Lowepro S&F Filter Pouch 100 to hold everything together.

The filter holder, adapter ring, and case aren’t necessarily required to make use of the filter... After all, you could just hold the filter up to your lens using your fingers... However, the filter holder can definitely come in handy (especially for video work!). I find myself using it all the time - it makes things much more convenient.
If you are in high-contrast situations and want to increase the dynamic range of the image, there are basically four ways you can do it (you don’t have to be limited to just using GND filters):

- **Shoot one RAW image and under/over expose certain parts of the image in Adobe Camera RAW or Lightroom by using a gradient** - This method can artificially increase the dynamic range a little bit, but if the scene you are trying to capture contains an enormous amount of dynamic range, you just won’t be able to restore it all. The sensor can only record so much information until the black points and white points get maxed out. Using this method is better than nothing, but if you have the time to do either of the methods below, you should be able to obtain better results.

- **Take one shot and use a GND filter on the front of the camera lens** - This method will capture an image that has more information contained in it when compared to the method described above. The only potential downside to this method is that hard grads may not work the best when you are trying to photograph a scene that is more complex than a simplistic horizon line. After shooting your image with a GND filter, you can always further under/over exposure certain parts of the image using Adobe Camera RAW, Adobe Lightroom, or Adobe Photoshop.

- **Bracket multiple shots, (such as a [-2, 0, +2 EV] set), then post-process it as an HDR image** - This method also works, but isn’t ideal if there is motion present in your scene such as trees moving around in wind, moving ocean waves, or any sort of moving objects such as people or cars.

- **My favorite way is what I consider to be the most powerful technique of all of them**, and that is to combine using a GND filter when bracketing a set of images; doing so will create the highest quality image in the long run, plus gives you the most amount of options during post-processing. You may or may not find yourself wanting to create an HDR image from the bracketed shots, and if that is the case, just delete the extra bracketed shots you don’t need and only use the shot you took at 0 EV.
Lighting
If you want to take a good photograph, the lighting is much more important to consider than camera bodies and the lenses. You can use the worst camera body and worst lens ever created, but if you take a shot with it in good light, you will end up with a more aesthetically pleasing image than if you were using the best equipment in crappy light or even sub-par light.

I talk about how to use light in the videos, but for now lets stay on topic and just review the physical photographic equipment.

Monolights
Because studio strobes plug into an electrical outlet or portable power pack, they are brighter when compared to portable speedlight flashes and also recharge consistently faster when compared to portable flashes.

Strobes usually come with two light sources on the front of the unit: a modeling lamp (which is simply a regular bulb that is always continuously ON to act as a real-time visual aid so you can prepare your shot by seeing how the light is forming around your subject) and also the strobe itself, which is the super-short, super-bright light that flashes in a fraction of a second when you actually take the photograph.

The upside of monolights when compared to portable speedlight flashes is:
• The strobe is a fully omnidirectional bare bulb, making the light appear slightly softer and more suitable for larger softboxes and other light modifiers
• Greater amount of light output can easily overpower the sun, even at a distance.
• The recharge rate is consistently faster compared to portable flashes
• The constant light of the modeling lamp can come in handy - you can “preview” the light.
• Color temperature and power output is 100% consistent with strobes, but starts to vary when using portable flashes when the battery power is low.

The downside of monolights when compared to speedlights is:
• Larger and heavier when compared to portable external flash speed lights units.
• Needs to be plugged into an electrical outlet or a clunky power pack (again, not as portable).
• Flash duration is longer (speedlight flashes have a flash duration of ~1/10,000 of a second at 1/16th power, and that number gets even shorter when the power is lowered. This is why they are called “speed lights”.)

I’d only recommend studio strobes to someone early on if they were going to be doing studio work for the majority of their time. Otherwise, speed lights will be good enough. I personally use both.
TTL Speedlights
Nikon and Canon flashes have a feature called Through The Lens metering, or “TTL” for short. TTL metering simply means that the camera communicates with the flash and automatically adjusts the flash power based upon what is seen through the view finder of your camera.

For example, if you are looking through your viewfinder and you are photographing a person 15 feet away with your lens zoomed in to 100mm and a flash is attached to the hot shoe of your camera, the flash will automatically raise the flash power to travel that distance and zoom in the flash head in to 100mm. If you are photographing a person that is 5 feet away from the camera and you are zoomed out at 24mm on your lens, the flash power will detect that distance from the subject and lower the flash power accordingly to make sure it doesn’t blast your subject with too much light, as well as zoom out the flash head to 24mm so the light has more spread.

TTL flashes are good for shooting events and weddings when the flash is mounted onto the camera body.

Because flashes are battery-powered light sources, they can be placed anywhere in your scene (off camera) and then triggered wirelessly whenever you push the shutter button on your camera to take a photo. As of right now, I prefer small flashes over big studio strobes because they are small, light, battery powered, versatile, and portable.

Nikon calls their flashes “speedlights” and Canon calls theirs “Speedlites”. Click those links to take a look at their current line of flashes. I only recommend flashes that have a rotating and pivoting head.

The disadvantage of using speedlights is that you cannot plug them into an electrical outlet in order to get a faster recharge rate, they are not as bright as studio strobes (they cannot overpower the sun when outside on a bright day like a monolight can), and their power is solely dependant on AA batteries, so the power output will start to vary between shots when running low on power.

By the way, most photographers tend to go with Sony Enelope rechargeable batteries for everything inside their photography bags in order to make everything standardized.
Manual, Non-TTL Speedlights

These are the cheaper alternative to TTL flashes. I like manual flashes; they are simple and inexpensive compared to the brand name TTL flashes. The down side to manual flashes is that they can’t automatically adjust the power output when in different lighting conditions. Another disadvantage is that, if you have several flashes set up on light stands around your camera when photographing a subject, you will have to physically walk over to each individual flash to change the power output of that flash.

In my opinion, the best manual powered flash to get is the LumenPro LP180 flash. The light output from the LP180 is equivalent to that of a $500 top-of-the-line Nikon SB-900 flash but only costs $200! The reason why the price is so low is because it is a 3rd party flash with only a few buttons to adjust the power on it. Basic power and zoom control is all you really need in a flash; everything else is more-or-less useless bells and whistles and can actually make things more complicated.

Manually adjusting the power usually doesn’t bother me at all when using flashes on light stands, detached from the camera.

The only time I really need TTL in a flash is when I am capturing photos when the flash is mounted on the camera and am capturing things “in the moment” such as events, weddings, non-studio photography, etc.

I would recommend getting one flag-ship, brand-name flash if you can afford it, and then after you have that one flag-ship TTL flash that you can use for everything (including events), just add a few more LP180 flashes and you will be all set for using multiple flashes off-camera. You could just get all TTL flashes if you wanted, but it will cost you more.
Wireless Flash Triggers
Using a flash on-camera is all fine and dandy, but what you really should be aiming for is to get all of your lighting off-camera. Once the flash is disconnected from your camera, you can then use wireless flash triggers so the camera can communicate with the flash wirelessly. If you have an external flash, you really need to get some sort of wireless triggering system for it.

There are essentially two parts to a wireless flash trigger system: The transmitter and receiver. The transmitter attaches to your camera’s hot-shoe, and the receiver attaches to the foot of the speedlight. Once you click the shutter button on your camera to take a picture, the flash signal transmits itself to the receiver that is attached to the foot of the flash and the flash is fired at just the right moment.

Many systems are now transceiver systems, meaning each unit can act as both a transmitter and receiver in order to make everything easy - one less thing to think about and keep track of!

Here are two wireless systems I recommend: The inexpensive solution and the expensive solution.

The inexpensive solution: RF-603
I have three of these (I actually use the old RF-602’s) and they work without fail. Very inexpensive, and, with my experience, very reliable. I’m not complaining at all here. The RF-603 must be purchased for your specific camera model - Amazon.com will list compatible cameras in the listing title. Simply mount one RF-603 transceiver unit on the hotshoe of your camera, and the other one on the foot of your flash, and now whenever you take a picture, the flash will fire. The disadvantage with these is that they are not a TTL system, meaning you will have to use manual power on your flashes, and physically walk over to your flash to adjust the power output (this is fine, because when flashes are off camera, they are usually set to manual mode anyway).

The expensive solution: Pocket Wizards
Pocket Wizards are said to be the most solid, reliable wireless flash trigger system available, but they come with an expensive price tag. Pocket Wizards are mainly used by high-end portrait and studio photographers. The advantage with the FlexTT5 + AC3 ZoneController PocketWizard System is that it has a Hypersync capability (meaning you can use the flash at shutter speeds faster than 1/250th of a second) and it is a TTL system. You can adjust the power output of your flashes conveniently from your camera using the AC3 ZoneController, without having to physically walk over to the flash to adjust the power output.
**Light Stands**
Once you get your flash, you now need something to mount it in place. Most people usually will use regular light stands to have their flash in a place where they want it, but you can also simply have someone hold the flash for you, put it on a table, shelf, etc, or even mount the flash onto a regular tripod.

Light stands have a footprint that expands and contracts only near the bottom of the stand, and a very long center rod that is quick and easy to lengthen or shorten without effecting the footprint size. The top end of the light stand usually has a 3/8” stud and then a 1/4” threaded screw at the tip of the stud. Adjustable brackets and studio lights attach to the 3/8” stud.

Using light stands for lighting equipment is recommended as opposed to using tripods, but if you are in some sort of emergency situation, you can screw a 3/8” stud on your tripod in order to mount an adjustable flash bracket or a studio light to it, or even just screw to a cold shoe alone onto your tripod if you only want to attach a flash with no umbrella.

All light stands fulfill the same purpose, so I can’t recommend a specific one that “blows all others out of the water”. Get the first stand listed below if you are on a budget, get the second one if you are not. Both are air cushioned, and both will last a long time.

**Ravelli 10’ Stand** ($25) - Tall. Heavy duty. High quality. You may find yourself wanting a light stand carrying bag that is 46” in length if you are hauling several of these around on location. I personally use the Kata LS-46 bag to throw a tripod, a variety of light stands, umbrellas, and other clunky accessories in. Works great!

**Manfrotto 12’ Stand** ($113) - The main advantage of the Manfrotto stands is that they are slightly lighter, take up less space when stored, and are a little higher quality and smooth all around. Manfrotto is well known for some of the best tripods and stands. With the Manfrotto Quick Stack System, the stands lie down flat so that other stands of the same kind lock onto them; this means you can group up several stands when they are closed and carry all of them around as one unit. If you order them as a set of 3, you can save a few dollars. The 12’ stands are heavy duty and will easily hold any studio strobe.

**1x Manfrotto 9’ Stand** ($106), **3x Manfrotto 9’ Stand** ($282.85) - Same thing as the 12’ stand above, but more compact, lighter, faster, and cheaper. Lighter stands can occasionally blow around in the wind a little easier than the heavy ones.

You will **need** to mount a **bracket** on the top of a light stand if using speedlights. The bracket simply gives you the ability to attach a speedlight to it, tilt it up and down, and attach umbrellas to the bracket.

If you are not on a budget, get the **Manfrotto bracket** ($35) along with a **Coldshoe Mount** ($8). If you are on a super slim budget, get the **CowboyStudio bracket** ($12) with a **mini ballhead** ($13).
Some of the cheaper brackets (like the Cowboy Studio one above) are configured in a way where the flash beam does not hit the center of the umbrella. If you would like to lower your flash so that the beam of light actually hits directly to the center of the umbrella, you will need to attach a Mini Ballhead on the top of your flash bracket. There is no need for the ballhead if you go with the Manfrotto bracket.

Once you have a light stand with bracket on the top of it, you can then attach an umbrella to the bracket if you would like to diffuse the light.

Attaching a Super Clamp to your light stand, and then attaching a U Hook to the super clamp will allow you to hang objects on the hook; this adds weight to the light stand so that there is less chance of it falling over due to wind. If I am using my light stands outside on a moderately windy day with an umbrella attached, I will usually try to hang my camera bag over the hook for a little bit more protection.

This is what a full, decked out light stand would look like (see right). Each individual part has been color coated so you can easily identify them. The mini ballhead would be eliminated if we were using the better Manfrotto bracket.
Reflectors and Light Modifiers
A light modifier is simply something that alters the light to reshape it or spread it out, etc. Examples of light modifiers include:

Reflectors
Reflectors can take advantage of available light and bounce it back at your subject. Reflectors are not electronic, so they aren’t expensive. Once unfolded, the edges expand, pop-out, and become rigid for use. After using it, you can then twist it up and fold it back into its compact storage position.

The good reflectors will come with a reversible fabric that zips up around a diffusion disc (also called a scrim).

If you simply take the fabric completely off the scrim and place the scrim between your subject and the light source (the sun, for example), the scrim will diffuse the light, reducing harsh shadows and hotspots.

The zipping reversible material usually will have reflective silver on one side, reflective gold on another side, white on another side, and black on another side. Silver is more punchy, bright, and contrasty; gold gives a pleasing warm glow; white is more diffused and not as punchy (it is usually positioned fairly close to the subject); black removes light instead of adding it, especially when placed very close to reflective subjects. Black also can make a good background.

Keep in mind that even a gray or white wall or ground can act like a reflector. Imagine placing a model close to a white wall with them standing on white concrete - the light from the sun will hit those surfaces and bounce back onto the model when positioned correctly.

Foam Core Board
Foam board is the same thing as a regular reflector, except it is a smooth surface (not wrinkled) and can’t fold up. White foam board can also be used to add highlights onto shiny reflective surfaces (like a wine glass), and black foam board will absorb light and add more shadow if placed very closely to your subject. Because of the smooth surface, foam core also works very well as backdrops for small objects.
Umbrella

An umbrella simply spreads out and diffuses the light coming from a flash or strobe to soften the light and reduce harsh shadows - it makes a smaller light source larger.

Umbrellas can be used as shoot-through umbrellas where the umbrella is translucent and is simply used as diffusion material between your subject and flash, or as a bounce umbrella where the flash is pointed at reflective material on the interior of the dome and then bounces back to hit your subject.

A shoot-through umbrella tends to spill the light everywhere in all directions, while the bounce umbrella tends to be more a little brighter and directional in nature, and has a little more “kick” and contrast.

When would you want to use a shoot-through umbrella and when would you want to use a bounce umbrella?

I will typically place a shoot-through umbrella very close to a subject (especially if it is just one model) in order to get a large apparent light source, and will use a bounce umbrella if the umbrella needs to be located further away from the subject, because the bounce umbrella is a little more efficient in terms of brightness.

If you are shooting in public, a bounce umbrella won’t attract as much attention as a shoot through, because light isn’t being emitted in all directions. Brolly boxes are also more “contained” and help reduce unwanted lens flare that you can get with regular umbrellas.

You can sometimes see the spokes of the umbrella when photographing reflective surfaces, and will sometimes see the light stand and flash itself if using a bounce umbrella. The complex edges of the umbrella usually doesn’t appear to be the most pleasant on reflective surfaces when compared to the more minimalist look of a softbox or beauty dish, but you may find this to be an insignificant detail.
Softbox
A softbox diffuses the light just like an umbrella does, but because the box has well defined edges, the light can be feathered off and can be controlled into a defined area. With an umbrella, the light spills in every direction. The downside to softboxes is that they are usually not as easily portable as an umbrella because it takes more time to fold them up. Softboxes create rectangular highlights on reflective surfaces, including eyes. Neither a softbox or umbrella is good or bad. They are simply a little different.

I use Paul C Buff softboxes with my Paul C Buff strobes. Paul C Buff softboxes can’t be used with speedlights, unfortunately, because there is nowhere to mount the speedlight onto the softbox. If you want to use a softbox with a speedlight or strobe outdoors (I’d recommend doing this if it is very windy outside, as umbrellas get caught in the wind and fly away or break), I’d recommend this one.

Beauty Dish
A beauty dish is simply a metal dish that nicely wraps the light around your subject and creates a perfectly round catch light in the eyes. The quality of light is that between a bare flash (very contrasty and harsh) and a softbox (very soft and diffused), and doesn’t make hotspots. Grids are commonly used with beauty dishes. Beauty dishes don’t blow around in the wind as much as umbrellas do.

Beauty Dishes work particularly well with young female beauty shots because it accentuates facial features. I try to have the beauty dish as close to the subject as possible, anywhere from 0-1.5 meters.

Softboxes and umbrellas would be better for photographing older people with wrinkles because the light is softer and therefore does not create as much contrasty shadow. Also remember that side-lighting will skim across the surface of the skin (or any texture you are photographing) and create shadows when hitting skin imperfections. In order to avoid having attention being brought to skin imperfections, place the main light next to, or behind and above your camera when photographing a model who’s skin you want smooth - this will make it so the light is right in front of your subject and their imperfections won’t cast as much of a shadow across their face (Loop Lighting or Butterfly Lighting).
Snoot
A snoot is a long tunnel (usually in the shape of a cone) that typically attaches to studio strobe as a modifier, but they make “snoots” for speedlights as well. The snoot creates a narrow circular beam of light on your subject where the light is evenly distributed from the center to the edge. You could make one out of cardboard, tinfoil, and/or tape, if you wanted to.

Grid
A grid is literally a black grid that rests in front of a light source to help direct the light and confine it to a smaller area so it doesn’t spill in unwanted areas. You can place fabric grids in front of softboxes, or little plastic ones in front of bare flashes to create a narrow round “pool of light” effect.

A long grid, such as 16 degrees, will narrow the beam of light to 16 degrees. A grid with less depth, such as a 45 degree grid, will widen the beam to 45 degrees.

A grid is similar to a snoot, however with a grid, the light falls off very quickly from the center to the edges of the beam to create a softer pool with a more dynamic, soft edge gradient. You could make a speedlight grid out of a bunch of black drinking straws if you wanted to.

Gels
You can place colored gels in front of your flash or light source to modify the color of light. This is useful for balancing the light of the flash with ambient light in order to obtain a consistent white balance across multiple light sources with different color temperatures. Gels can also be used for more dramatic special color effects. Here is a set for speedlights, and here is a set for strobes.

Speedlight Diffuser
A speedlight diffuser is simply a frosted plastic cap you can place over your flash. This will simply diffuse the light a little bit and make it more omnidirectional. Try experimenting using these with an umbrella for even more diffusion, but remember that you will lose a little bit of light pass-through with the diffuser on. I’ve found that most flashes will come with a diffuser in the packaging, ready to go.
Software
Adobe is the industry standard, so I am only going to be talking about Adobe software. You can get free trials of all adobe software on their website. I would recommend installing one trial at a time, so you can use their software for a longer period of time (ie get the Photoshop Elements trial first, and then install the Adobe Photoshop CC trial after the Elements trial expires). As of right now, you must subscribe to the Adobe Creative Cloud and pay a monthly fee if you want the latest, most up-to-date Adobe software. Here is Adobe’s detailed comparison guide regarding the differences between Lightroom, Elements, and Photoshop; I also give a video comparison in the beginning of module 4 of the videos.

Adobe Photoshop Lightroom Software
This software is the industry standard for making overall changes to your photograph and can be purchased independently from Creative Cloud. They call it Lightroom because it is similar to being in a darkroom back in the film days - you can adjust and correct exposure, contrast, white balance, color, sharpness, noise and grain, hue and saturation, and darks and lights to your image, as well as apply straightening, cropping, lens distortion and chromatic aberration correction.

Lightroom doesn’t technically edit or modify any pixels of the actual file, it only gives you the option to create certain “recipes” or “instructions” to interpret the image on your computer differently, it doesn’t actually apply the recipe to the original image, but it can export edited copies of the original. This means that you can edit and save your files as many times as you want, and make as many versions and copies of a file as much as you want, and will never have to worry about damaging the original file.

Plus, whenever you adjust a slider, you will be able to preview the adjustment in real time, as you are adjusting it. Regular photographers who edit many photos at once (ie event photographers, portrait photographers, sports photographers, wedding photographers, etc.) use this program all the time in their work, because they have a large volume of images they need to edit in a short period of time.

Adobe Photoshop CS5, CS6, or CC Software
This software can do everything that Adobe Lightroom can do (except it might lack some of the file organization features that Lightroom has), but you can also selectively edit certain areas of your photo on the pixel level.

You can make complex selections and apply effects to only certain areas of the image, easily add and remove objects from a photo, create photo colleges using several different images, and most importantly, take advantage of layers and layer masks.

Up to this point, I’ve used Photoshop for all of my work and have never touched Lightroom. However, I now see the use of Lightroom and will be using it from now on for cataloging purposes, as well as making tonal adjustments to large batches of photos; Lightroom is just more efficient than Photoshop in that regard.
Regarding which version to get: As of this writing, the current version is Adobe Photoshop CC, which you pay on a subscription bases - you can’t get it unless you subscribe to Creative Cloud. With previous versions, you paid once and got to keep the program forever. Previous versions were CS6, CS5, CS4, CS3, CS2, and Version 7. Anything at or above CS5 will work great. Older versions are getting more and more outdated, although they still can be used.

Adobe Photoshop Elements Software
This costs much less than Adobe Photoshop CC, but you get the main features that are included in Adobe Photoshop CC. If you only can get one program, get Adobe Photoshop Lightroom if you can’t afford Adobe Photoshop CC, and if you can’t afford Lightroom or just really want to use layers and layer masks (something Lightroom does not have) but can’t afford the full version of Photoshop CC or CS6, then get Adobe Photoshop Elements (preferably the latest version, but anything above version 10 should do fine).

Adobe Bridge Software
This software is useful for previewing images (RAW and JPEG), tagging and organizing all of your media files (whether it be an image, audio file, video file, etc), as well as editing metadata of that file (title, keywords, location taken, etc.). Adobe Bridge was shipped with previous versions of Adobe Photoshop (CS6, CS5, etc.), and is also inside of the Adobe Creative Cloud.
**Accessories**

**Tripods**

Tripods are very important when it comes to capturing sharp photos, especially in low-light situations where you need to have a long shutter-speed in order to get a correct exposure. Using a tripod will reduce any unintentional camera shake.

I use Manfrotto tripods. They are designed so you first get the legs, and then you get a *head* which you put on top of the legs. Once you have both the legs and head, you have a fully functional tripod system.

*"High-End": Manfrotto 055CXPRO3 with 322RC2 Joystick Head*

If you have the money to spend, I would go with this set up. The tripod is made from carbon fiber, which is the ideal tripod material because it is very strong and very lightweight. I find the joystick head to be the most convenient, fast, and efficient.

*"Middle-Ground": 055XP0B with 496RC2 Ball Head*

This tripod is made from aluminum, so it is heavier than the one above. The upside is that it is less expensive. The 496RC2 ball head is also a less expensive solution for a head. In either case, the ball head or joystick head can be used on either tripod.

**Budget Tripod**: If you want a tripod but don’t want to spend a large sum of money on a brand new one, consider picking one up at a thrift store or on Craigslist.org. You can usually pick one up for around $10-$60. I always recommend getting metal tripods and not plastic ones. Many tripods I find at thrift stores have the head and legs permanently attached together to make a single tripod unit.

If you are ever at the beach and you get sand and/or salt water caught up in the legs of the tripod, just be sure to wash them off with clean water using a hose when you get home, and the legs will be fine. If you don’t wash them after being at the beach, the legs may clunk up and will no longer be usable.
Bags
We shouldn’t spend a whole lot of time talking about **bags**, but I do have a few recommendations just in case you wanted them.

**Small:** Lowepro Nova 160 AW
I used this bag for years. It can basically hold 1 DSLR (without a battery grip) with a medium sized lens attached to it, and 1 extra lens and/or charger. For a slightly larger version, check out the Lowepro Nova 190 AW. The upside to these bags is that you can wear a regular backpack on your back filled with personal items, and have the camera bag beside it, on your shoulder.

**Medium:** AmazonBasics SLR Backpack
I have not personally used this bag, but this thing seems like it would be the perfect size for most people reading this ebook. If you will be traveling and want to carry a little bit more than just a DSLR and one additional lens, this is perfect as a backpack that won’t get too heavy. I could see myself riding a bicycle with it on my back.

**Large:** Calumet BP1500
This is the bag I currently use. It has a large carrying volume and can get very heavy when lots of stuff is in it, but is still possible to wear on my back. It is intended for multimedia artists and people who need to carry lots of equipment. The interior can be rearranged and customized with the velcro tabs. The bag has a laptop compartment and exterior tripod pouch.

With the backpack still on your back, you can get someone else to unzip the backpack half-way and take your camera out for you without having anything fall out even when standing in the upright position, and without having to take the bag off your back and take your camera out yourself. I’ve flown with it on two airplane flights and was able to stow it in the overhead luggage area (without a tripod attached to the front). The only thing I wish it had was waterproof fabric.

**Additional Storage:** Pelican Case + Optional Lid Organizer
This case is a tank. It is a hard carrying case a little smaller than the Calumet bag and is crush proof, dust proof, and water proof. I use this case in addition to the Calumet bag, but only occasionally bring it with me if I go somewhere on location because it normally only houses my non-essential equipment. I find back-packs to be more convenient than rollers. This particular 1510 case can be stowed in airplane storage areas. Pelican makes many different sized cases, and all of them are waterproof/crush-proof. You can order them with peel-n-pluck foam inside, dividers (seen above), or order them as empty, case-only.
Miscellaneous Accessories

**Giottos Large Rocket Air Blaster** - Best air blaster to clean lenses (and other equipment) of dust.

**Black Rapid** - Most efficient, professional camera strap system. I use the RS-Sport Slim.

**Eneloop Rechargeable Batteries** - These are great rechargeable batteries for your external flashes, wireless flash triggers, DSLR battery pack, etc. I also recommend having a portable 4X battery charger in your bag, along with a 16x charger for home, and some battery cases to have some extra batteries safely stored away your bag.

**Cleaning Kit** - Probably the best cleaning kit around. It comes with the Air Blaster noted above, a Lens Pen (used for removing smudges) as well as microfiber lens cloths - pretty much everything you would need to clean any type of smudge or dust/grime.

**Memory Card** - You will need a memory card to put into your DSLR in order for your pictures to be saved. To find out which memory card to get, I would recommend just typing in the model of your camera and then “memory card” as a search phrase into google.
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