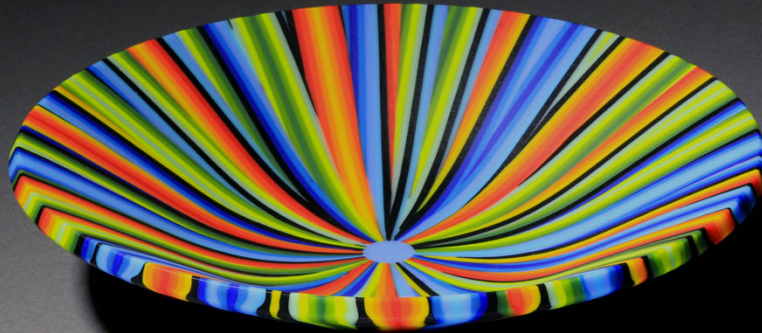


How I Photograph Glass



Bob Heath – 2016

<http://www.candlelightglass.com>

There are many types of glass artwork, from jewelry to public installations, and just as many ways to photograph them. In this presentation, I'll be showing how I photograph my glass artwork. Much of what I'll discuss is simply photography 101 and will be applicable to any type of glass artwork, but the specific techniques I use may or may-not be appropriate for the type of glass artwork you do.



Photo of my glasswork, taken by professional photographer; Paul Foster. In 2014, I hired Paul Foster to photograph some of my glass artwork for use in applying for a juried show. Much of the photo technique that I now use is based on the photos taken by Paul and what I learned from him. Photos used in this presentation were taken by me, Bob Heath, except where noted with a photo credit line.

What we will cover today

- Lighting and background
- Composition
- Camera Settings
- Post Processing
- Resources

These are the basic elements of glass artwork photography. If you get these things right, you'll have good results.

Background

- We want the background to disappear so focus is entirely on the foreground subject.
- Use a paper roll for a seamless background.
- Background color should be neutral, but not completely black so we can see shadows.

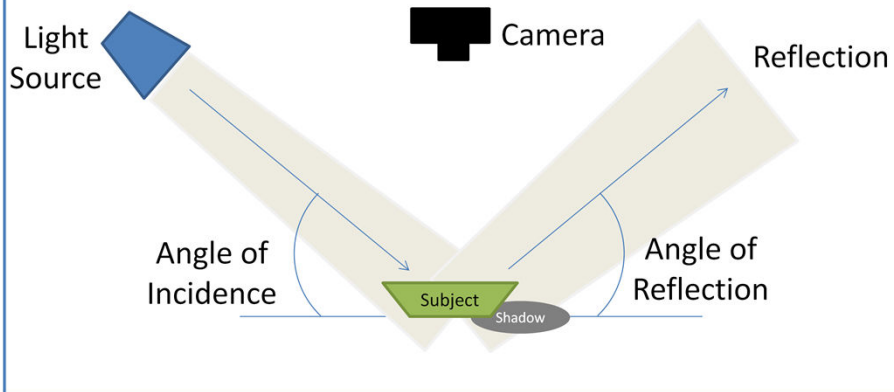
Lighting

- Minimize ambient light so you have more control.
- Use one or two non-diffuse light sources to illuminate the subject and create well defined shadows.
- Use fill light as necessary while being careful not to erase shadows or transmitted light.
- Minimize lighting of background to focus interest on the subject.
- Minimize hot spots by avoiding light reflected directly at camera.

I like to work in a darkened room with only one or two spot lights and sometimes a fill light to illuminate my subject. That gives me that ability to control exactly how much light falls where. Some people prefer to use diffuse light rather than spot lights, but if you do that, you lose most, if not all, of the shadows and transmitted light passing through the glass.

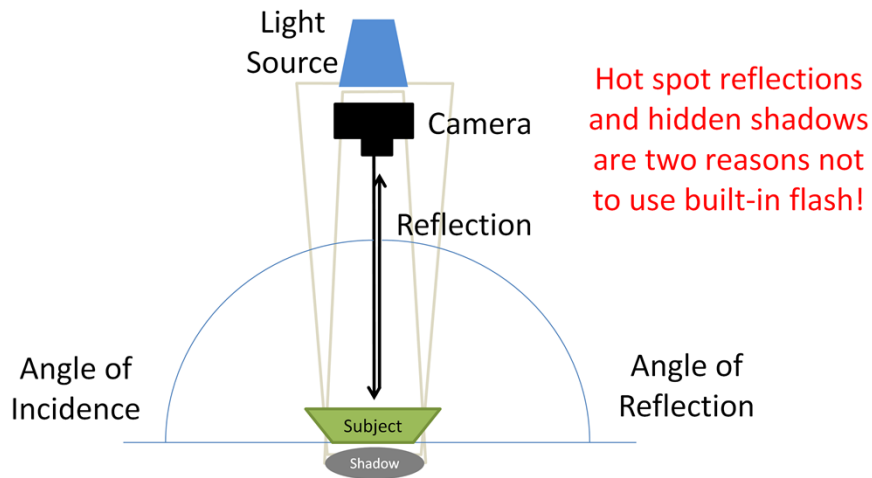
Angle of Incidence = Angle of Reflection

Lighting from the side directs reflections away from the camera and shadows appear where the camera can see them.



Hot spots or glare are a common problem when photographing a shiny surface like that of glass, but can be minimized through proper light positioning. Similarly, shadows and transmitted light can be controlled and used to help describe the shape and characteristics of the glass artwork.

Angle of Incidence = Angle of Reflection



Using the built-in flash of a camera is almost always a bad idea when photographing glass. The bright light of the flash is reflected directly back into camera lens, resulting in hot spot glare. In addition, the shadows and transmitted light fall behind the object where they will not be visible to the camera. The use of a strobe in general makes it almost impossible to compose the placement of shadows and transmitted light, unless you have a strobe with a modeling light.

What we will cover today

- Lighting and background
- **Composition**
- Camera Settings
- Post Processing
- Resources

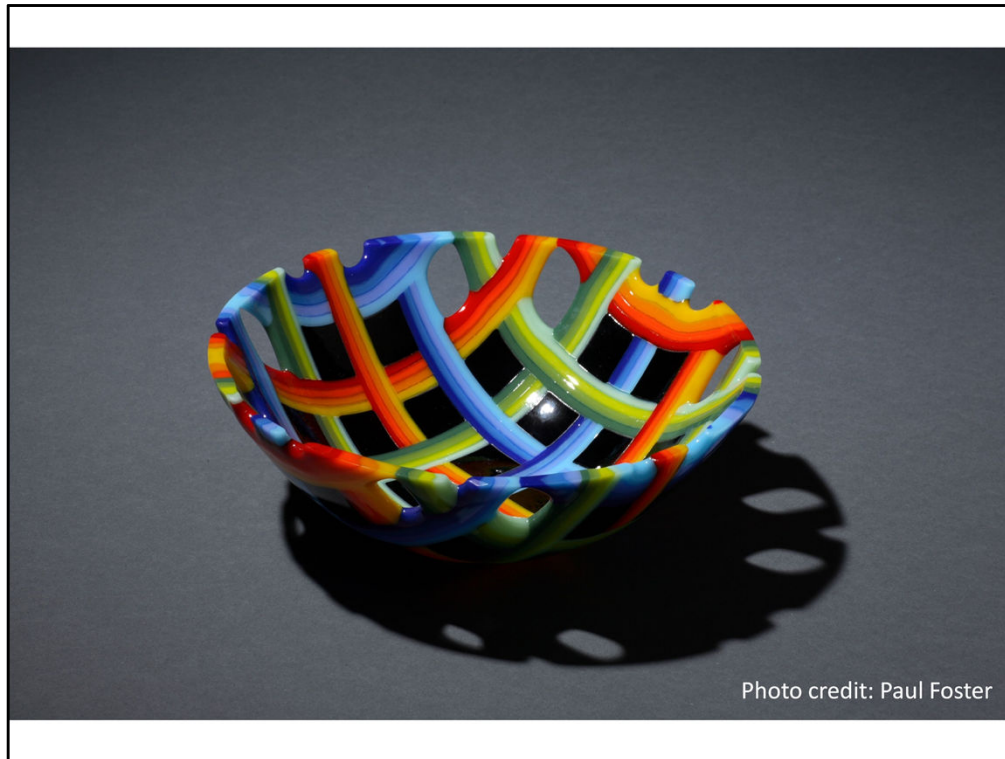
Composition

- The subject and shadows should fill about 75% of the frame and be roughly centered.
- Don't clip or crowd the subject.
- Orient subject to show its shape and features.
 - Use shadows to help.
 - Use a stand if necessary, but don't let it overwhelm the subject, unless it is part of the art.
- Avoid including any distractions in the frame.

Cropping too close to the subject makes the image feel crowded and can give the viewer a sense of unease. However, we don't want to waste the frame either by making the subject area too small. I find that 75% of either the width or height of the frame is a comfortable size.

Try to position the subject so that the viewer can get a feel for the shape. If appropriate, try to show a portion of both the inner and outer surfaces. Let shadows and transmitted light help you to show off the features of the artwork.

By all means, avoid including any distractions in the frame. All we should see is your artwork surrounded by a neutral background that effectively disappears.



Notice how the shadows in this image help to point out that there are void spaces in the bowl. You can see that directly in the back of the bowl, but the contrast in the shadow really makes them jump out.

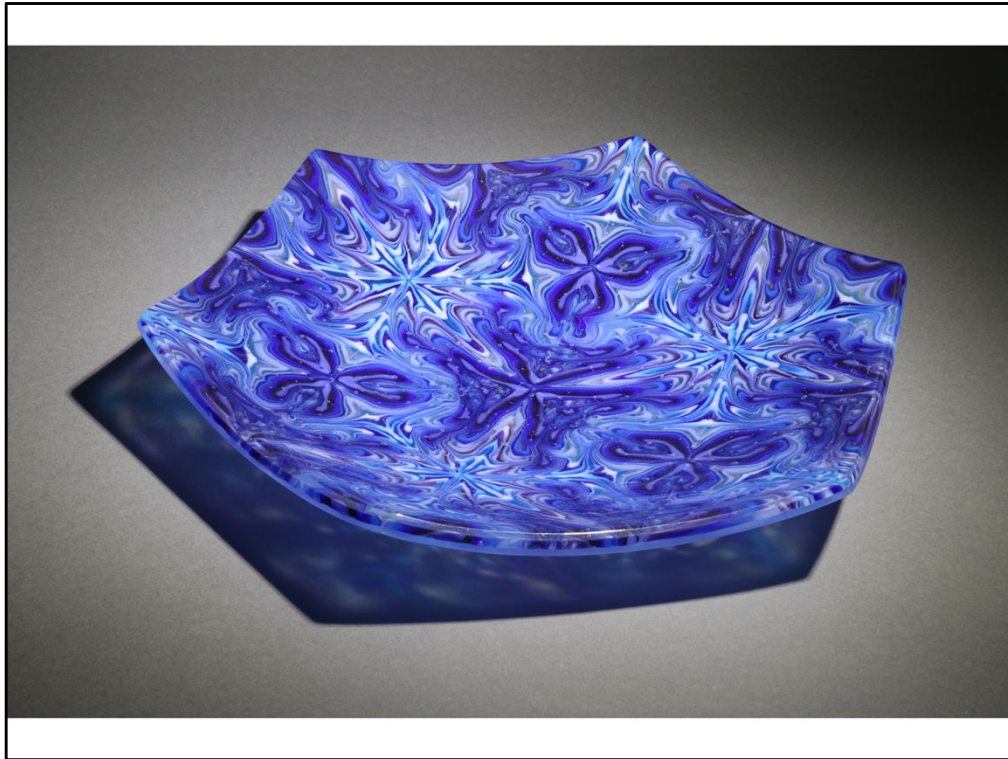
This image could have benefited from some fill light to illuminate the underside of the front of the bowl.



In this image, again, the shadows and transmitted light do the work of showing that the dish contains both clear and opaque areas that form an interesting pattern.



In this image, I made an arrangement of three color related pieces to make the composition more interesting. Once again, the shadows and transmitted light do the job of illustrating that the bowl and vases create a pattern from opal and transparent glass.



One of my favorite pieces, this platter contains intricate patterns of opal glass as seen from above, but also has transparent areas that cast a pretty pattern on the surface as seen in the shadows.

Lighting & Composition Demo

What we will cover today

- Lighting and background
- Composition
- Camera Settings
- Post Processing
- Resources

Camera Settings

- Objectives of camera setup:
 - Accurate color rendition.
 - Subject in focus.
 - Proper exposure of subject.
 - Jitter-free image.
 - Image resolution high enough for intended use.

Camera Settings

Accurate color rendition

- Adjust camera White Balance. This allows the camera to compensate for the color temperature of your lights.
- Digital cameras usually offer at least Automatic White Balance.
- If available, use Custom White Balance with a White Reference Card for best results.

In the early days of film cameras, there were only two kinds of light; Sunlight and Incandescent Light. You would load your camera with film appropriate to the type of light you were using (Daylight or Tungsten) and the film would take care of giving you the correct colors as seen under that type of light. If you should happen to need to shoot in fluorescent light, there wasn't a special film for that, so you would have to put a special color filter on your camera.

Now, there are a multitude of different types of light available, each with its own particular mixture of colors. Fortunately, we now also have digital cameras that know how to measure the color mixture in our lighting and compensate for it. This is called White Balance because the camera is finding the right balance of each of the primary colors as present in our light source, to give us a true white. Most digital cameras have a built-in Automatic White Balance capability that generally works pretty well. For best results though, we want to use a Custom White Balance where we help the camera by showing it an example of what White looks like under our unique lighting.

Different digital cameras do Custom White Balance in different ways, but it usually involves either aiming the camera at a white reference card and telling it to balance on that, or taking a picture of a white reference card and telling the camera to use that picture as an example of what White should look like. Learn how to do this with your own digital camera to achieve accurate colors in pictures of your artwork.

White Balance Adjustment Demo

Camera Settings

Subject in focus

- Maximize Depth-of-Field by minimizing lens aperture. This usually requires selecting Aperture Preferred Mode of camera.
- Use Manual Focus to set focus slightly in front of the center of the subject, to center DOF.
- Use image magnification during focusing if available.

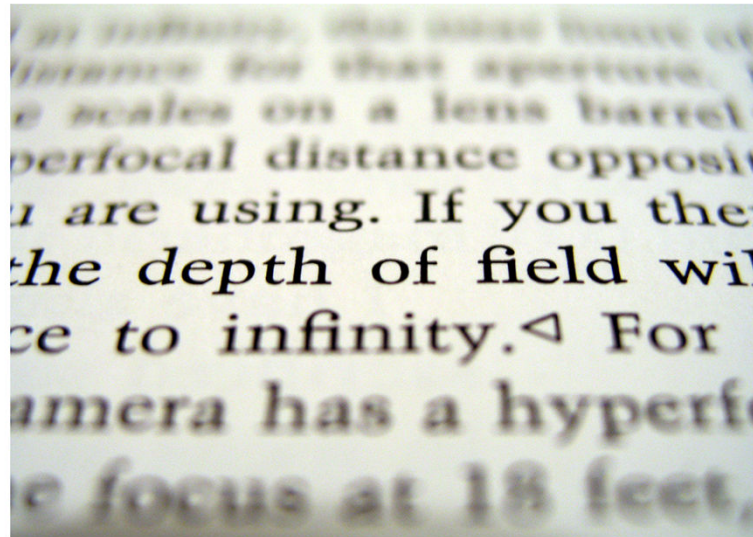
Depth of Field is the distance between the nearest thing that is in focus and the farthest thing that is in focus. We want our artwork to fall entirely within that area so it will all be in focus.

Depth of field is a function of a number of different things including the focal length of the lens in use, the distance between the camera and the subject and the aperture setting of the lens. The shorter the distance between the camera and the subject, the smaller will be the depth of field. Since we are generally pretty close to our subject when photographing artwork, we compensate by adjusting the Aperture. The smaller the Aperture, the greater the depth of field.

Using a small Aperture however, means that we will be significantly restricting the amount of light entering the camera. In Automatic or Point-and-shoot mode, the camera will generally set the Aperture as large as possible to let in the maximum amount of light. That's exactly the opposite of what we want, so we set the camera to Aperture Preferred Mode where we can force it to use a small Aperture.

I prefer to also turn off the Auto Focus function of the camera and use manual focus so I can carefully set the focus in roughly the center of my artwork to take maximum advantage of the depth of field. Many digital cameras will allow you to digitally magnify the image during focusing so you can see exactly what you are doing.

Depth of Field



Depth of Field is the distance between the nearest thing that is in focus and the farthest thing that is in focus

Camera Settings

Proper Exposure of Subject

- Using a small Aperture means we'll have relatively little light entering camera.
- Disable the built-in camera flash.
- Use Manual ISO setting instead of Auto to prevent camera from setting too high.
- Use exposure bracketing with 1/3 or 2/3 stop adjustment for best results.
- Use camera metering to select exposure time. Don't be surprised if it is many seconds long.

Since we are using a small Aperture and the camera is receiving relatively little light, the camera will want to compensate for that in order to achieve a good exposure. There are several ways in can do that. The camera may try to use its built-in flash to throw more light on the subject, but for reasons we discussed before, we don't want that, so we need to take away that option by telling the camera not to use the flash.

Unlike film cameras, digital cameras have the ability to automatically adjust the ISO of their image sensor. The ISO number is a measure of how sensitive the film or image sensor is to light. The larger the ISO number, the more sensitive it is and therefore the less light it needs. Once we've taken away the flash option, the camera will set the ISO of its image sensor very high. Unfortunately, that can degrade the image quality, so we want to tell the camera not to do that either. We do that by manually setting the ISO to a modest number such as 100.

Now that we've taken away the flash and ISO adjustment options, the camera will resort to its only remaining trick, and will use a long exposure, leaving the shutter open for a long time to let in more light. Using simple desk light type lighting like I do often results in exposures that are many seconds long.

Use the built-in camera light metering to let it determine how long it needs to leave the shutter open of proper exposure, but also use exposure bracketing to make sure you get the best exposure possible.

Camera Settings

Jitter-free Image

- Using a small Aperture and long Exposure means we need to use a Tripod to avoid jitter.
- Enable camera stabilization if available.
- Use a stable Tripod with adjustable height and tilt for ease of composition.
- Use a remote shutter release or camera's built-in self-timer to avoid vibration from touching camera to press shutter button.

The rule of thumb for film cameras with a normal length lens is that any exposure longer than 1/60 of a second is too slow to shoot hand-held and a tripod should be used. If you're using any sort of telephoto lens, the cutoff shutter speed for hand held images is even faster.

Many digital cameras have automatic image stabilization to help compensate for hand-held jitter. These generally work quite well and can extend the shutter speed for hand-held images down to 1/30 or 1/15 second. I recommend enabling that feature if your camera has it available, but it does have its limits.

I generally use a zoom lens set to slightly longer than "normal" length when shooting glass artwork, and as explained earlier, I'm certainly using exposure times that are slower than 1/60 or even 1/15 of a second, so I definitely need to be using a sturdy tripod.

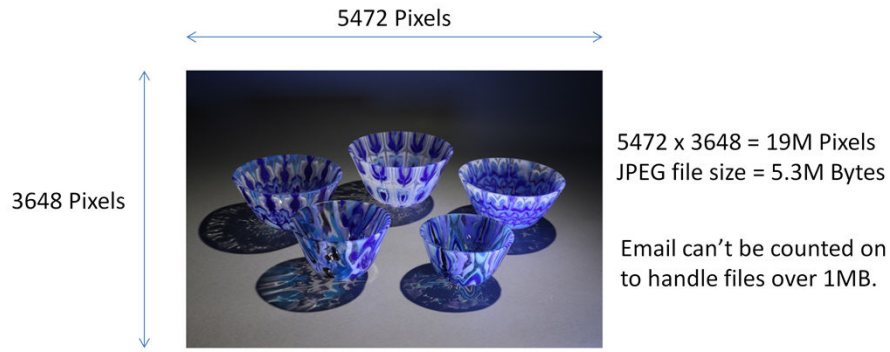
Even with a good solid tripod, its easy to jiggle the camera when pressing the shutter release. For that reason, I like to use a remote shutter release that is connected to the camera by a cable. Some cameras even have wireless shutter releases that you can control from a smart phone. If you don't have either of those options available though, a good work-around is to use the self-timer built into most cameras. That will give you a 2 second to 10 second delay between pressing the shutter release and opening of the shutter and that gives the camera time to stop shaking.

Camera Setup Demo

Camera Settings

Image Resolution High Enough for Intended Use

- Image Resolution is measured in Pixels.



If printed at 300 DPI, the image would be 18" wide and 12" high.

If displayed actual size on a 1920 x 1080 monitor, you would see only about 1/10 of the image.

Image Resolution is often a source of confusion. Digital images are actually an array of small dots where each dot is called a pixel. This is true both for the image sensor in your camera which is the digital camera equivalent of film, and the image display on your computer or television.

Generally speaking, the more pixels you have in your image sensor or viewing screen, the better quality will be the image. When there aren't enough pixels, the image will become blocky or "pixelated". The point at which that happens varies according to the application and the viewing distance.

Another term that you will often hear with respect to digital image resolution is DPI or dots-per-inch. The dots in this case, are the same as pixels, but now we've added in the idea of size. For example, a typical computer monitor that has 1920 pixels from its left side to its right side and is about 20 inches wide, has about 100 DPI. A big screen TV may also have 1920 pixels across its width, but it is two or three times as wide, so it has a much lower DPI. That works because we view the TV from a greater distance, so those 1920 pixels take up about the same amount of our viewing angle as those on the computer monitor.

For print images which are typically viewed much closer, a higher DPI is required. The number of pixels that we capture in our digital camera image ultimately determines how that image can be displayed or printed.

Camera Settings

Image Resolution High Enough for Intended Use

- Generally speaking, bigger is better, but how big is big enough?
 - For viewing on a web browser on an average monitor; 1920 x 1080 is full screen.
 - For emailing to a friend; 1024 x 768 is plenty.
 - For printing an 8" x 10" image at 300 DPI, you would need 3000 x 2400 pixels.
 - Fine art magazines may print at 600 DPI.

When submitting your artwork photos to a jury, there will generally be minimum requirements for the size of the image in pixels. Failing to provide images with high enough resolution (pixel count) is a sure way to get eliminated by the jury.

Costco Recommended Print Resolutions

Print Size	Minimum resolution pixel dimensions (115dpi)	Optimum resolution pixel dimensions (300dpi)	
Wallets	230x345	600x900	
4x6	460x685	1200x1788	
5x5	575x575	1500x1500	
5x7	575x805	1500x2100	
8x8	920x920	2400x2400	
8x10	920x1150	2400x3000	
8x12	920x1380	2400x3600	
11x14	1265x1610	3300x4200	
12x18	1380x2070	3600x5400	
Print Size	Minimum resolution pixel dimensions (115dpi)	Optimum resolution pixel dimensions (150dpi)	
16x20	1840x2300	2400x3000	
20x30	2300x3450	3000x4500	
Poster Board Size	Minimum resolution pixel dimensions (115dpi)	Optimum resolution pixel dimensions (150dpi)	
11x14 (½ border on all sides)	1150x1495	1500x1950	
16x20 (½ border on all sides)	1725x2185	2250x2850	
20x30 (½ border on all sides)	2185x3335	2850x4350	

When I need printed pictures of my artwork, I like to order them from Costco. I find that it's easy to upload them to their website, tell them what I want printed then pick them up at a nearby store within just a few hours. I find the quality to be quite good and the price very reasonable.

This table shows the pixel size requirements that Costco recommends for pictures of various sizes. If you try to use a picture that has too low a resolution for the image size you want printed, their website will warn you.

The key information in this table is the DPI requirements shown at the top of each column. Everything below that is just a matter of doing the math to determine how many pixels are required to achieve that DPI for a given size image.

You can use this DPI information when considering other print applications as well. For example, if your picture is going to be printed in a magazine, as a 4" wide image, you can compute that at 300 DPI, you will need an image that is at least 1200 pixels wide. The magazine art director will probably tell you what resolution image you need to submit, but at least this way, you have some idea. Fine art magazines printed on high gloss paper may print images at 600 DPI and will therefore require higher resolution images.

Image requirements for Café and Zapp

- **Café** (*used by Bullseye Emerge & Portland Open Studios*)
 - **File format:** JPEG only
 - **File dimensions:** No smaller than 1920 pixels on the longest side
 - **File resolution:** 72 ppi/dpi (standard web resolution)
 - **File size:** 5 MB maximum
- **Zapp**
 - **Recommended Dimensions:** 1920 pixels on the longest side.
Note: To assist artists who do not have images that are 1920 pixels or larger, the system will also accept images that are at least 1400 pixels on the longest side.
 - **File Format:** Save all images as Baseline Standard JPEG. **Do not save as a Progressive JPEG.**
 - **File Size:** JPEGs should be under 5 MB in size.
 - **Recommended Resolution:** between 72 and 300 ppi
Note: You may need to lower your resolution if the file size is larger than 5 MB.
 - **Color space:** Save images in RGB color space, preferably sRGB.

Café and Zapp are two common services that are used by many shows to collect artist images for jurying. Each has its own specifications for the type of images they will accept. Individual shows may impose even stricter requirements, so be sure to carefully read the rules for whatever show you are applying to and be sure to adhere.

Camera Settings

Image Resolution High Enough for Intended Use

- What camera image size setting should I select?
 - As large as possible, but at least 1920 x 1080. Any modern digital camera should be able to do this.
 - In general, use highest resolution, highest quality setting available, other than RAW.
 - Image resolution/quality can always be reduced later if necessary. It can't be increased.
 - Almost no penalty for using maximum resolution/quality images.

There is very little reason not to use the highest resolution available in your camera when taking pictures of your artwork. Later, if you decide that you need a lower resolution image for some reason, it is easy to reduce the resolution with a photo editor. You can never increase it though. In any case, always keep your original, high resolution image available for when you might need it and make a copy to reduce in resolution for applications such as display on a website or sending through email.

Digital cameras will also often let you choose different quality settings for your images. Cameras typically store the images on a memory card in jpeg format. The jpeg format is a compressed file which means that it has analyzed the original image and figured out how to discard some of the individual pixel information in order to make the file smaller. The Jpeg compression algorithm is "lossy" which means that it loses information that can't be restored. Just how much information is lost and how much compression is achieved is adjustable. When you choose the lower quality setting on your camera, you are telling it to increase the compression and give up more of the original information in the image. The only reason why you might want to do that would be if you had a small memory card and needed to make the individual image files smaller so you could fit more of them onto it. That is very rarely a problem, especially when shooting in a studio where you can readily offload the pictures from the camera, so I recommend always using the highest quality setting available.

What we will cover today

- Lighting and background
- Composition
- Camera Settings
- **Post Processing**
- Resources

Post Processing

- Common Post Processing activities:
 - Cropping images to improve composition or to select picture detail.
 - Resizing large images for email or website.
 - Contrast or Saturation Enhancement. Use sparingly and with caution.
 - Touch-up to remove flaws such as hot spots or dust specs.
 - Change file format; e.g. convert .jpg to .png

Often you will find that the images taken straight from your camera aren't quite perfect. Perhaps you'll want to adjust the composition a bit by cropping the photo, or you'll want to reduce the file size (and resolution) for applications such as display on a website or sending through email.

You may find that you want to adjust the contrast or color saturation to really make your photo pop. If you do, do so in moderation. You don't want to make your photo look artificial or unrealistic. Also keep in mind that how the photo looks on your monitor is not necessarily the same as it will look on someone else's monitor. Finally, if you are going to be submitting the photo to a jury, make sure that their rules allow editing.

I'm always careful to clean off finger prints and remove dust from my glass artwork before photographing it, but often I find that dust particles magically appear in the photo. When that happens, I use a photo editor with a cloning tool to remove the worst offenders. The same tool can also be used to remove hot spots of reflected light. Removing fingerprints is more difficult and I find that it's better to just reshoot the image.

If you need to submit a photo in a different file format than what your camera produces, you can use a photo editor to open the file in one format and save it in another.

Post Processing Demo

What we will cover today

- Lighting and background
- Composition
- Camera Settings
- Post Processing
- Resources

Resources

Background support system



- **Interfit Large Background Support System with Telescopic Cross Bar** (H102", W124") \$109.16 (also available in smaller size and similar units available from other makers such as LimoStudio for much lower price)
http://www.amazon.com/Interfit-Background-Support-System-Telescopic/dp/B002X73IJl/ref=sr_1_1?s=photo&ie=UTF8&qid=1441984824&sr=1-1&keywords=interfit+cor761

This is the stand that I use to hold my seamless background paper. You could also do this with a length of doweling and a couple of bookshelves or hat racks.

Resources

Seamless Paper Background

- **Superior Seamless Paper #04 Neutral Grey**, Core 53" X 36' \$35.95
http://www.amazon.com/Superior-Seamless-Paper-Neutral-Gray/dp/B006WNWJLM/ref=sr_1_2?s=photo&ie=UTF8&qid=1441985461&sr=1-2&keywords=superior+seamless+Neutral+Grey
- Seamless Paper and stand are also available from Pro Photo Supply in Portland
1112 NW 19th Ave. 503-241-1112
<http://www.prophotosupply.com>

Seamless background paper is available in a variety of widths and colors. This is the one that I use, but you may want a different size or color depending on the type of artwork you are photographing.

Resources

Point source and Fill lighting



- Similar to **IKEA UPPBO Work lamp** \$34.99, uses GU10 LED bulb \$7.99
<http://www.ikea.com/us/en/catalog/products/20231349/>



- **NEEWER® 160 LED CN-160 Dimmable Light** \$29.99
http://www.amazon.com/gp/product/B004TJ6JH6?psc=1&redirect=true&ref=oh_aui_detailpage_o07_s00

I use a couple of simple desk lamps from IKEA for spot lighting, and a NEEWER LED array for fill lighting. The key thing about the spot lights is that they have a single bulb, providing a single point source of light, so the shadow that is cast is relatively well defined and crisp. A more diffuse light source will not create a clean shadow. An even better light source would be one with a Fresnel lens that focusing the light into a beam, but those are generally much more expensive.

Resources

Post Processing Software

- **IrfanView** – Free photo processing software, good for format conversion, resizing, cropping, rotating, creating thumbnails (batch mode), slide shows and some limited touch-up, like color balance and contrast, but not for removing dust spots.
<http://www.irfanview.com/>
- **Paint Shop Pro** – My version is very old. Current version is available here for \$79.99:
http://www.paintshoppro.com/en/?utm_source=jasc&utm_medium=redirect&utm_term=/&utm_campaign=jasc
Use cloning tool for spot touch-up such as dust spec removal. Pretty much any commercial photo editor should be able to do this.

For the types of photo editing that I do (e.g. cropping, resizing, contrast, saturation and touchup with a cloning tool), most any photo editor should work. My go-to editor is a copy of JASC's Paint Shop Pro that is over 20 years old, but it does everything that I need.

Another editor that I like a lot is IrfanView. This is available as a free download on the web and continues to evolve and add new features. It supports more file formats than any other editor I've ever used, and it's free. It also includes a batch mode function that can be useful for creating resized versions of a whole bunch of images at one time. The one feature it lacks is a cloning tool, or I would use it for everything.

Resources

Features to look for in a Digital Camera

- Resolution of at least 1920 x 1080
- Ability to set custom white balance adjustment
- Optical Zoom
- Manual Focus capability
- Ability to do Aperture Preferred exposure
- Ability to set a specific ISO
- Long exposure capability with automatic exposure
- Tripod mount
- Remote or delayed shutter release capability
- Automatic exposure bracketing capability

Digital cameras have advanced rapidly and now even the most inexpensive cameras have pretty impressive specifications. While preparing this presentation, I looked at a popular electronics store website and saw that they offered a digital camera for kids that cost \$15, but even that one had 1920 x 1080 resolution.

The features listed on this slide are those that will enable you to use the techniques I've described in this presentation.

Summary

- Proper lighting and a neutral background focus attention on your artwork.
- Shadows are an important part of your image composition.
- Use spot lighting to highlight artwork and create shadows while minimizing reflections and background illumination.

Summary

- Move beyond point-and-shoot. Learn to use your camera's settings to enhance your photography.
 - White Balance for accurate colors.
 - Accurate focus with large depth-of-field.
 - Use camera light meter and exposure bracketing.
 - Use Tripod and hands-off shutter release.
 - Use highest resolution/quality setting available.

Summary

- Proper equipment for lighting and background will give you more control over your photo environment and doesn't have to be expensive.
- Enhance your images with judicious use of post-processing software.
- Read, understand and follow image submission requirements when applying to shows.