

My Approach to Coin Photography

by Mark Goodman

Introduction

Coin photography has come a long way in the last few years since the arrival of digital cameras. Digital cameras allow virtually anyone to take good photographs of the coins in their collection. The available cameras have high resolution, good macro features and can be purchased relatively inexpensively. There is no need for film and you get the instant feedback of having the photo available for immediate viewing.

In the time that I have been photographing coins I have come a long way. I started out like everybody does and have taken some horrible photographs. I have learned from my mistakes and have tried to be scientific in my approach to improvement. How does changing settings, lighting, etc affect the finished product? How do I use this information to improve future photographs?

There is no right way to do things and a technique or a look that I like may not work for you or your equipment. Because of this, I will try to keep the information as general as possible to keep it relevant for all cameras and setups. The goal is to understand the concepts behind the photograph. This will allow adaptation to new coins and situations that you may come across.

Equipment

Camera

The camera is, rightly so, an important part of coin photography. But, it's not as important as many think. Good pictures can be had out of a cheap camera given the right lighting and setup. Conversely, an expensive camera can take bad pictures if the setup is not right.

Most of the available hand-held digital cameras have a setting for macro photography which allows focus at the close range required for good coin photos. When I got my first decent digital camera I went out looking for one that had good resolution and could focus really, really close. I got a Nikon 5400, which turned out to be a good camera, but it does have limitations.

As I have come to learn, focusing down to 1/2 inch is not what you really need. Take a few pictures from that distance, and you'll quickly learn that you just can't get decent lighting with the camera hovering that close to the coin. Another problem is that cameras that focus that close often have a very wide-angle (short focal length) lens which actually forces you to image the coin from closer to get the coin the same size on the picture.

What you really want is a camera that allows you to shoot good macro photographs from a reasonable distance. That can be accomplished by either a longer focal length lens or shorter focal length with some zoom. You just have to make sure that the camera can focus at macro range with zoom. This factor is especially important for small coins, such as Indian cents where the camera's macro capabilities will be strained. The hardest part to all of this is figuring out which cameras have these specific capabilities. That being said, most mid-priced digital cameras will take fine images. I have seen good results with virtually all of the major brands out there.

So what features should your camera have? I think that you should get one with as high resolution as you can afford, preferably 4 Megapixels or higher. The camera should have macro focus capabilities, as stated above. Aperture priority mode is very helpful. It should have some way of adjusting white balance of the image. Exposure compensation and different exposure modes, such as center-weighted metering, are helpful. A self-timer is also very useful. The use of these features will be discussed further in later sections.

The digital SLR (Single Lens Reflex) will almost always have the features recommended above and have the added utility of having interchangeable lenses. The longer focal length lenses that are available allow lighting and setup options that most hand-held cameras can't offer. The problem with these cameras is price. The good news is that the prices are starting to come down. Digital SLR's will cost you more than you might think because you need to buy a body, a macro lens and will generally need to have a sturdier copy stand because of their weight as they are quite large.

The lenses that typically come with SLR packages will only marginally focus at macro distances and will be of limited use for coin photography. A 100 or 105mm macro lens will generally be adequate for photographing most coins. Just make sure that it focuses

down to 1:1 (life size on the film/detector). Virtually all new/modern macro lenses focus down to 1:1.

Lighting

Lighting is as important or even more important to good coin photography as is the camera. There are a multitude of different lights and bulbs. My personal opinion is that the type of bulb doesn't matter that much as long as you are able to get a good white balance setting on your camera. Some people swear by various specialty bulbs, like GE Reveal and Ott lights. I'm not sure that they make any real difference with coin photography. These specialty bulbs are designed to deal with various shortcomings of the human eye and I don't think that cameras have the same problems (my own opinion). I feel that any good light will do.

I personally like halogen lamps. They have a good white light and can be very compact compared to a traditional bulb. My first lights were a set of three gooseneck halogen desk lamps with small heads on them (fig.1). The small heads and goosenecks allow them to be put into tight spots or close to the camera where a traditional bulb and lamp won't fit.



Fig. 1 : Gooseneck Lamp

Copy Stand/Tripod

To get really sharp pictures, camera motion must be kept to a minimum. Good shots can be had with a steady hand, but having a copy stand (fig.2) or a small tripod makes things a lot easier. For a small, light camera, an inexpensive copy stand or small tabletop tripod will generally be fine. With digital SLR's, a sturdier stand is necessary because of two factors: 1) SLR's are heavy, and 2) The mirror flipping motion necessary with an SLR's operation causes vibration at the time of shutter release. Make sure that your camera has a tripod mount on the bottom before buying it. Most cameras come with a tripod mount, but it's something to keep an eye out for.



Fig. 2 : Copystand

Photo Editing Software

I won't go too much into this side, but you need some sort of image editor to manipulate the images once you take them. Useful features to have would include: contrast/brightness adjustment, sharpening, and resizing and image compression adjustment. Most

images are improved with a little adjustment. You just need to be careful to use them sparingly. I've seen many pictures ruined by over-zealous use of image editors, including my own. Your goal with an image editor should be to make the image accurate.

Camera Settings

Aperture

Aperture determines two things: the amount of light that gets into the camera and the depth of focus. A low aperture number will allow more light into the camera which allows fast shutter speeds while producing a very narrow depth of field. At low apertures the depth of field can be less than 1 mm. At higher aperture numbers, less light is let into the camera, necessitating longer shutter speeds but giving a better depth of field. There lies an important trade-off to consider when imaging coins. Do you want a fast shutter or good depth of field?

Since the aperture is so important to getting good focus with coins, I prefer to shoot most coins from straight-on at middle apertures so that all of the coin is in good focus. If shooting the coin at any angle other than straight-on, the aperture needs to be about as high as you can set it. Even then you may not be able to get all of the coin in focus.

If your camera has an aperture priority mode, use it. It is commonly marked on the camera dial as "A". This allows you to set the aperture where you want it while the camera decides on the best shutter speed to get the correct exposure.

Shutter

If shooting in "A" mode, the shutter is automatically set by the camera. Otherwise, you want the fastest shutter you can pull off given your lighting. To get really sharp pictures, a fast shutter is helpful. You'll get a faster shutter with low-number apertures and more lighting. Try to keep the shutter speed faster than 1/100 sec. Your pictures will be sharper.

Metering

Many cameras have options as to how the camera decides on the exposure. I prefer to use center-weighted metering. It allows the camera to get the exposure off of the coin rather than the surrounding material. This is useful for slabs where you may have glare or white plastic that will cause the camera to underexpose the picture.

Exposure compensation

Many cameras have a method of over or under-exposing the image depending on the situation. In most situations in macro photography, the camera will tend to underexpose the image somewhat. This adjustment is generally measured in F-stops (aperture settings). I will generally shoot most coins between +0.7 and +1.0, a bit of overexposure.

Focus

Most hand held cameras have pretty good auto focus features. The main problem with shooting through plastic is that sometimes the camera will want to focus on the plastic and not the coin. With an SLR, getting a good focus is easier because of the through-the-lens viewfinder. You see exactly what you are shooting. I prefer to use manual focus with my SLR as it sometimes has trouble with auto focus at close range. Most non-SLR digital cameras have either very limited manual focus ability or none at all.

White Balance

White balance is one of the most important settings to get right. Most lights have a *color* to them. Incandescent bulbs have a yellow tinge to them. Reveal bulbs have a red tinge. White balance corrects for this color and makes whites look white. Colors will look natural in almost any light if you have a good white balance setting. If your camera has a "preset" or "custom" mode, it will allow you to measure the white balance of your current setup. I do this by putting a piece of white paper under the camera with the lights on that you are shooting with and telling the camera to take the measurement. This probably should be done with an 18% gray card to be done properly, but white paper seems to work fine.

If you don't have a preset or custom mode, set the white balance to the setting that matches your lighting, such as "incandescent" for a normal light bulb. If all else fails, the white balance of a picture can be corrected in your photo-editing software to make the color more natural.

ISO

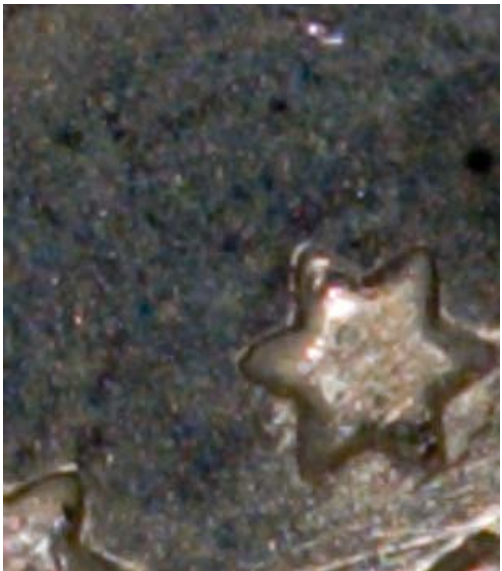
ISO (International Organization for Standardization, the order is correct) is not as big of a deal with digital cameras as with film cameras, but it can be optimized to produce better pictures. ISO settings were more important with film cameras because the ISO

setting of the camera had to be set to the speed of the film being used. Most digital cameras retain this setting. Setting the ISO to the lowest number will help reduce noise in the images, but will necessitate longer exposures. Conversely, a higher ISO setting will allow faster exposures, but will give noisier pictures. I tend to use the lowest ISO setting available as it produces the least noisy pictures.

The figures below show the effect of changing the ISO. Where the ISO 200 and 400 pictures show a fairly homogeneous dark field, the higher ISO pictures, the 800 and 1600, show more mottled color through the field. This is indicative of noise. I think that if you stick with ISO 400 or less you'll be fine. If you use lower wattage lights, you may benefit from bumping the ISO up a notch or two to help keep shutter speeds faster.



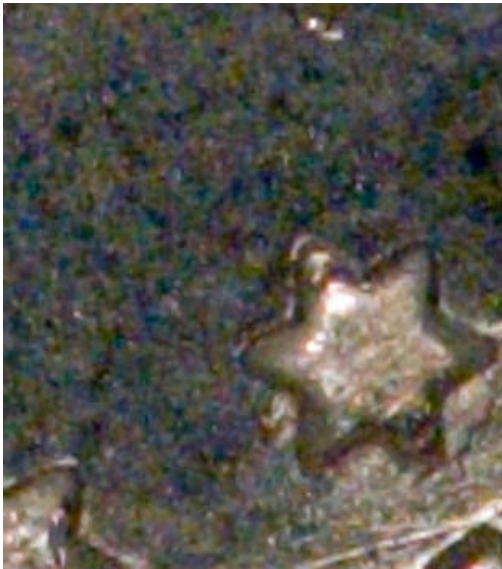
ISO 200



ISO 400



ISO 800



ISO 1600

Image Resolution

I tend to use all of the resolution that the camera provides and shoot at the highest available. I'd rather start out with a really big high-resolution image and then resize it to whatever size that I want to work with. I keep the original images so if I want to go back and redo something or make a bigger or smaller image, I have the original image to work with.

Self-timer

The self-timer is a very useful feature in a digital camera, especially if you use a tripod or copy stand. The action of pushing the button to take the picture can cause motion problems on the images obtained. The self-timer allows you to disconnect the act of pushing the button from the release of the shutter. I use this feature on all coin images I take.

Shooting Pictures

Camera Distance

This is one of the key points that I have figured out over time. Get the camera as far away from the coin as you can. The camera should be as far as you can get it while maintaining good focus and having the coin fill up as much space in the viewfinder as you can. The detector on your camera has a lot of resolution, but if you don't fill the screen with coin, you're not using it.

You want the camera to occupy as little of the sky over the coin as is possible. This allows better lighting and helps prevent reflections of your camera from getting into your picture (worst with modern proofs). On preventing reflections: 1) buy a black camera and use a permanent marker to black out the white lettering on the front of the lens, 2) a black sock or black construction paper over the front of the camera can also help. More distance from the coin to the camera allows better lighting, color, and luster.

Many point and shoot cameras have the capability of using add-on macro lenses. These will connect to the filter threads on the end of the lens. These do a good job of pushing the camera farther away from the coin.

I switched to a digital SLR mainly because of the distance factor. An SLR with a 100mm lens allows you to pull the camera back a considerable distance while maintaining the coin at full-screen size. I believe in this concept so much that I have since switched to a 150mm lens to get back even further (almost too far with big coins).

Camera angle

I prefer to shoot almost all coin pictures with the camera pointed straight-on to the coin. Any angle of the coin can cause focus problems because of the extremely narrow depth of focus at macro distances. If you look closely at many slabs, the coin is tilted within the slab. This too can cause problems with focus and sharpness of the resulting picture. If the coin is tilted significantly in the slab, the slab can be tilted to make up for this problem. This does seem a bit picky but it can help if you want extremely sharp pictures.

The time to tilt the camera or the coin is when you want to capture color on proof and proof-like coins. I prefer to tilt the coin so I don't have to mess with the camera in the stand. Getting color out of coins when shooting at an angle can be difficult, especially with a slabbed coin because of glare from the plastic. I'll talk about this technique later.

Lighting Angle

I have found that lighting on coins is best when the lighting is at as high an angle to the coin as is possible. High-angle improves the overall lighting of the coin, helping to prevent dark spots. Color and luster on coins tends to be better with higher angle lighting. Proof-like and proof coins require a completely different technique to show the color on the fields.

The following figures 3-5 show the difference in lighting between high-angle lighting and lower-angle lighting. They show the camera and lighting setup and a photo from each setup. All three images were shot with the same technique and camera settings. The highest angle lighting (fig.3) shows the best overall lighting of the relief and fields. It shows details of the coin better and also shows better luster. Notice the width of the luster cartwheel between the three samples; it gets progressively wider as the light gets higher. Color also improves with the higher angle lighting.

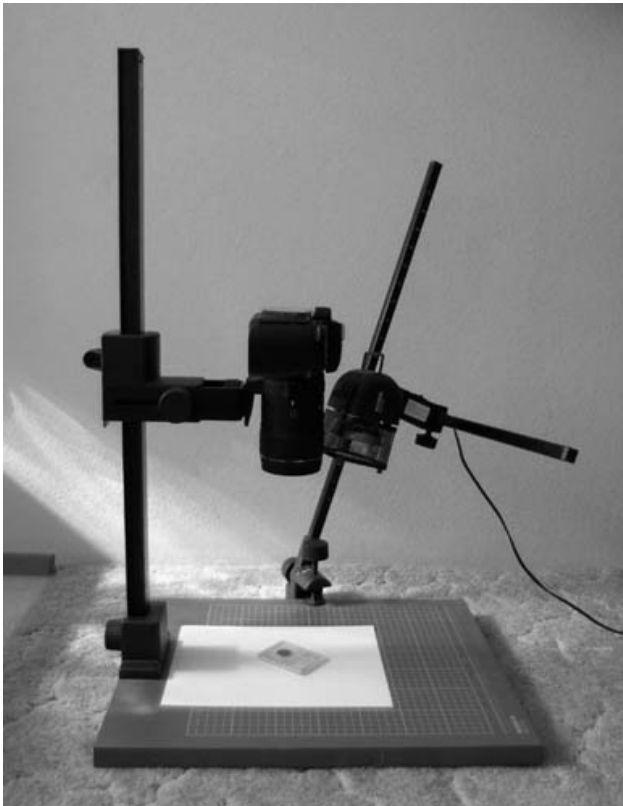


Fig. 3: High angle lighting

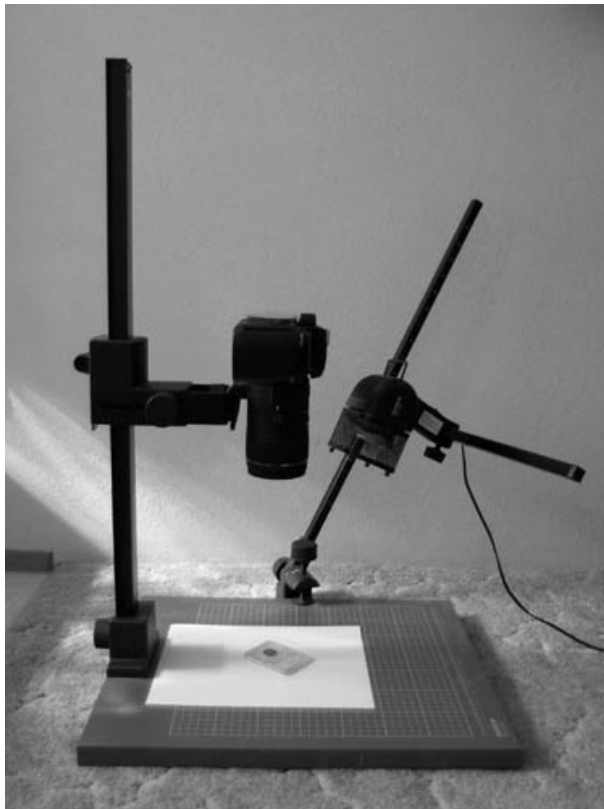


Fig. 4: Medium angle lighting

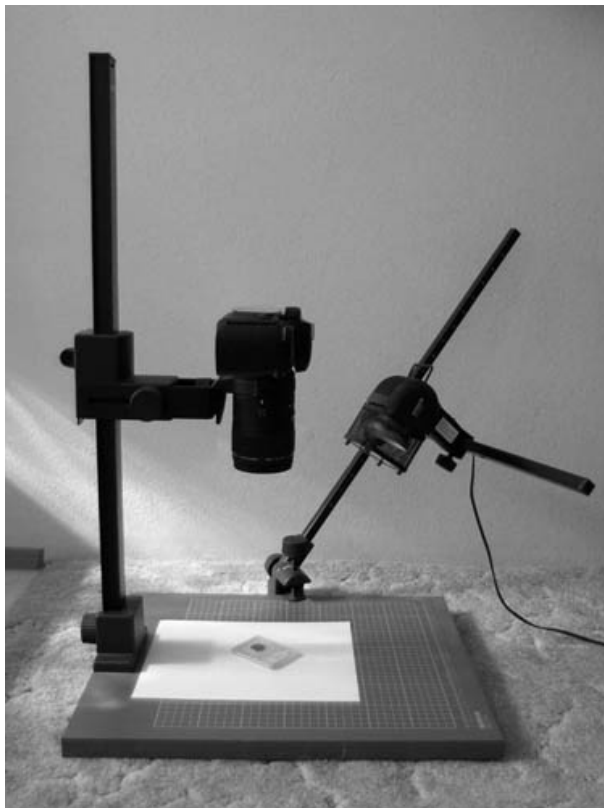


Fig. 5: Low angle lighting

To get lighting at the highest angle, put your lights as close to the camera lens as is possible. When shooting through plastic, you want the reflection of the light just off of the edge of the coin, close to the coin but not causing glare. The angle of lighting you can get is directly related to several factors.

The physical size of the light may prevent you from getting the light near the camera. This is why I use lights that have a small footprint. The size of the camera may also inhibit getting the light close to the lens. One way to help with this situation is to put the light on the side of the camera where the lens is closest to the edge (fig.6). Just turn the coin if you don't want to light it from that side. The last factor is the camera's distance from the coin. The farther the camera is away from the coin, the narrower the angle will be between the lamp, the camera and the coin if the camera and lights are close together.



Fig. 6: Lighting from short side of camera

Lighting Amount:

Good lighting is as important if not more important than the camera for taking good pictures. Get as much lighting as you can. More watts translate into faster shutter speed which makes for sharper pictures. More wattage does have a drawback - more heat. Things tend to melt if left around or under high-wattage lamps for too long. Leave your lamps on only when shooting.

Number of Lights

The number of lights plays a strong factor in how well the coin is lit. Not all coins require the same number of lights. Commonly, I will use between one and three lights depending upon the coin and what I want to see. More lights mean more wattage, which means faster shutter speed and sharper pictures. There is a trade-off in that more lights means less contrast in your images.

This concept can be understood by thinking of the shadow cast by a tree in the sun. With one sun you'll have a strong shadow on the opposite side (high-contrast). If you had another sun on the other side of the sky, you would light the tree from both sides and the shadow would be diminished (lower contrast). So you have to tailor the number of lights to the amount of contrast needed in your photos.

Figures 7 and 8 show the effects of one or more lights on the contrast of the image. With one lamp (fig.7), the whites and blacks are more pronounced, the luster is stronger. With two lamps (fig.8), the lighting is more even and diffuse. The shadows are softer with two lamps. That being said, one lamp isn't always better. They both work well in various situations which will be discussed later.



Fig. 7: One light



Fig. 8: Two lights

Light Position

I tend to put lights somewhere in the 10 to 2 o'clock positions. The exact position you choose may vary according to taste. I just prefer lighting from the top whether using one, two or three lights. If you want luster cartwheels from the lights to be evenly spaced, put two lights about 90 degrees from each other, or three lights about 60 degrees apart.

Slab Preparation

Slab preparation is often overlooked. A scratched up slab will produce scratched up pictures. Most scratches can be rubbed off of a slab with a little work. I use PlastX (available at most auto supply stores). It's a nice fine polishing agent intended to take hairlines off of plastic on cars. I have found that it will take off scratches on plastic slabs pretty well too. The shinier the slab, the less glare you'll get on your images.

When polishing slabs you need to be careful of the direction in which you polish. Polishes will leave very fine hairlines on the plastic that will not normally be visible when shooting images except when your light is at 90 degrees to the hairlines. I alleviate this problem by polishing in one direction. If I want to light a coin from 10 and 2 o'clock, I will polish the slab from 6 to 12 o'clock (fig.9). Always polish toward the anticipated light source.

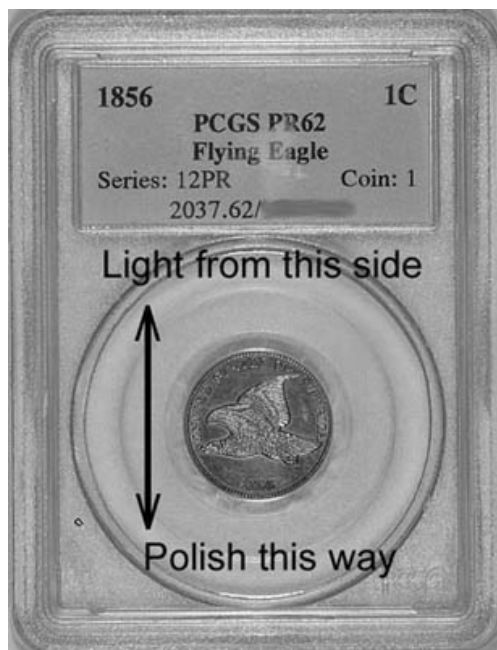


Fig. 9: Polishing direction

Determinants of Sharpness

Sharp, highly detailed pictures are what you're after with coin photography. I'll take pictures over and over until I get the sharpness I want. I want my pictures to show every little detail on the coin. Several factors work together to make images sharp or fuzzy.

Focus is important to obtaining sharp pictures. You want the plane of focus right at the coin. This is why I like to make sure the coin is square to the camera. Any tilt of the coin or camera will put areas of the coin farther away from the focus plane and those areas will be less sharp.

Most cameras take the sharpest pictures with the aperture somewhere in the middle settings. Pictures tend to be a bit less sharp at the extremes of aperture settings, high and low. This is a relatively subtle effect and probably applies more to SLR's than the hand held cameras because the SLR's tend to have a larger range of aperture settings.

The aperture can be used to increase the depth of focus by turning it to higher numbers. This won't solve all focus problems but can help tremendously if you need to shoot at an angle. The drawback of a high aperture is longer shutter speeds.

Shutter speed is very important to getting sharp pictures. A fast shutter will help negate motion and vibration in the camera during shooting. In general, if you can get the shutter speed faster than 1/100 sec, the sharpness will improve. Faster shutter speed can be achieved by getting more light onto the coin. Turning the aperture to a lower number will let more light into the camera and will improve shutter speed. But, as we discussed earlier, turning the aperture to a lower number will narrow the depth of focus. This makes focus and shooting from straight-on all the more important.

Motion can be reduced by using a copy stand or a tripod. Shooting coins handheld will invariably produce fuzzier images. The heavier the camera, the sturdier the copy stand needs to be to stabilize it.

Contrast Management

Lighting for coin photography is all about contrast management. The following is a theory that I came up with a while back. It makes sense to me at least. I think that the eye and the brain like a certain amount of contrast within any image. If the contrast is too high or too low, the image won't look right. It will appear either harshly lit or washed out. Therefore I try to get my images to have that happy amount of contrast that my eyes like. I stole the following concepts from the physics that I learned during my radiology residency. There are two determinants of image contrast: lighting contrast and subject contrast.

Subject contrast is how much contrast is on the surface of the coin you are shooting. How much relief? How much luster? How glossy is the coin? How dark is the coin? I tend to break things down into three categories: Low, medium and high contrast coins.

Low Contrast:

- Circulated coins with little or no luster
- Dark copper (not glossy)

Medium Contrast:

- Glossy copper
- Most RD and RB copper
- Most MS silver and gold
- Lustrous AU silver and gold

High Contrast:

- Glossy MS clad/silver
- Brilliant proofs
- Most modern proofs

Lighting contrast needs to be tailored to the coin being shot. Lighting contrast is controlled by various factors, the number of lights being the most important. As discussed above, the contrast of the lighting is inversely proportional to the number of lights. More lights = less contrast and vice versa.

The angle of the lights also has a say in the resulting contrast. The higher the angle of the lighting, the less contrast it has (but better lit in general). The positives of high-angle lighting far outweigh the negatives, so I use it almost exclusively. I only use lower angle lighting to increase the contrast in the case of circulated coins and worn copper to get the color more natural.

Contrast can also be controlled by using diffusion on the lights. Diffusing the lights lowers the contrast. Diffusion can be achieved by placing a piece of paper or similar translucent material between the light and the coin. Commercially available "light domes" and "light tents" are sometimes useful for shooting coins. The main application of these in my view is shooting modern proofs.

We have already decided that the eyes and brain like a medium amount of contrast in a picture. So therefore, a low contrast coin needs high contrast lighting to bring out what little contrast is present on that coin. A high contrast coin needs lower contrast lighting so it doesn't look so harsh. Medium contrast coins like medium contrast lighting. I'll give specific examples to follow.

Color and Luster

Color and luster go hand in hand in coin images. The color on an MS coin will show up best where the luster is brightest. Getting a colorful coin to show that color on an image can be tricky. Color and luster will improve with higher angle lighting. This concept also applies to frost on proofs which acts much like luster in the way it responds to lighting changes.

Color and luster will be more intense with higher contrast lighting, such as using a single light. The problem with using a single light with a colorful coin is the loss of color coverage. You will only get one band of luster with a single light and will only get good color in that band. The rest of the coin will not show the color well. This can be remedied by using more lights. The intensity of the color will be a little less, but the coverage will be better.

Specific Coin Examples

High-grade, lustrous glossy silver: These can be a bear to get really good pictures of. You tend to get harsh reflections off of the relief and dark areas in the fields with normal lighting. These need low-contrast lighting: high angle, two or three lights, sometimes some diffusion to soften it up a bit more. This same kind of lighting is useful for photographing toned silver also. Copper generally doesn't need lighting like this.

Red and Red-Brown copper: These photograph well with medium contrast lighting - two lights at a high angle will generally work fine. This technique will also apply well to Red and Red-Brown proof copper and most toned MS copper.

Brown copper: Will generally photograph well with a single light at a high angle to bring out what contrast is there. Most brown proof copper will fall into this category also. A single light is also really good at bringing out the surface texture of a frosty proof or matte finish proof.

Glossy brown copper: The gloss will tend to create harsh reflections off of the relief when only using one light. Adding a second light will commonly help soften that up.

Toned proofs or MS proof-like coins: To show the color on most proofs or proof-like coins, the coin needs to be tilted. The light needs to be bounced off of the mirrors and into the camera lens (fig. 10). The problem with doing this with a slabbed coin is that the slab will also reflect light into the lens.

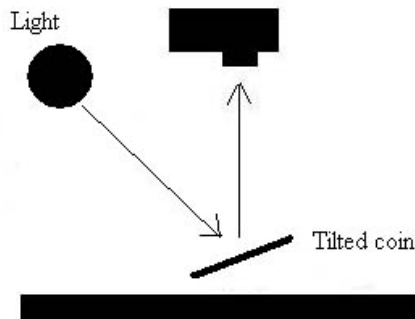


Fig. 10: Tilted coin

This extra light from the slab will drastically reduce the contrast of the image. But, all is not lost. If the extra glare off of the slab is homogeneous, this glare can be reduced by bumping the contrast or adjusting the "levels" in a photo editor (fig. 12). To do this you need extremely diffuse light so you don't get light and dark spots on the image. Remember to use a high number aperture so that the depth of focus is better able to handle the tilted coin. This high aperture will make shutter speed slower, so the camera needs to be extra steady. It's also commonly useful to back off a bit on the exposure compensation when doing this technique.

Similar results can be had by shooting from straight-on with a piece of angled glass between the camera and the coin, called "axial lighting" (fig. 11). A light from the side will reflect off of the glass and onto the coin. As above, the light needs to be very diffuse. This takes a bit of practice but can produce good results. It helps to have the camera a good distance away from the coin when doing this technique so you have room for the angled piece of glass. This technique still has trouble with slab glare. The advantage of this technique is that the coin is straight-on to the camera and you can use a lower aperture and get sharper images. You'll get best results with this technique if you place something dark on the opposite side of the glass from the light because light from that side will also be reflected into the lens.

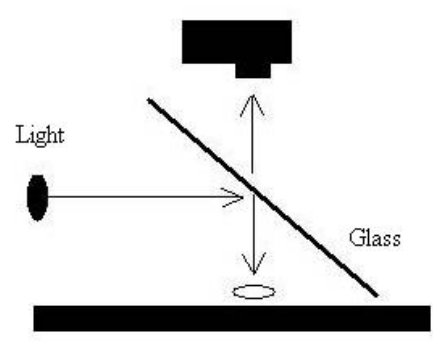


Fig. 11: Axial lighting





Fig. 12: Before and after contrast/levels adjustment

Summary

I hope that this article has achieved what I set out to do with it: help you take better pictures of your coins. I have tried to stick to concepts so that the information can be applied to any setup. Hopefully the framework that I have provided will allow you to improve the quality of your imaging without too much trial and error.

The one thing that I have learned during the time that I have been imaging coins is that you need to take a lot of pictures and experiment with the techniques to really figure out what works for you and your coins. During that time I have discovered that I use the same high-angle technique plus or minus a light or two for virtually all coins. It's really not all that difficult to take good coin pictures once you've got the techniques down. Now go out there and take some pictures, I want to see what you've got.