

A Few Considerations for Fine Art Copy using the Better Light System

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[This has been expanded a bit so that anyone who is a photographer but NOT a Better Light owner would be able to make some sense out of it, with the exception of one reference to the Zig Align.]

This is based on piece that I presented at our recent Better Light owner's meeting on the topic of fine art reproduction. As I prepared to get up in front of a room full of people smarter than me, I thought I had better limit my talk about the ways we've found to use the Better Light Camera to copy even the most problematic paintings of any size. I'm neither a scientist nor optical designer, but a guy who's made a living off photography for a lot of years and is as excited about it today as I was in college. The Better Light camera system has helped keep my fires going.

Definitions (non-technical and slightly arbitrary):

Glare: scattered light (non-coherent light) reflected by a rough or matte surface.
 Specular reflection: coherent light reflected by a glossy, or mirrored surface.
 Flare: the destructive, ugly halation/lens refraction caused by a specular reflection.
 Highlight: the pleasing halation/lens refraction caused by a specular reflection.
 The difference between a flare and a highlight? In Hollywood, it's \$2500 a day.

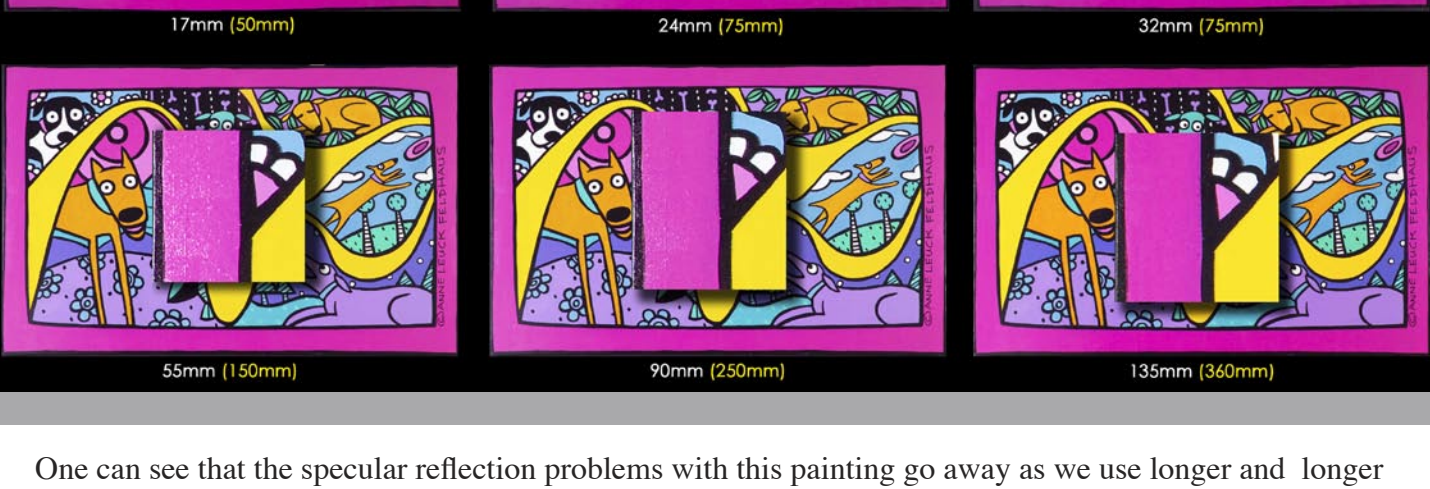
Lighting and the set-up:

For the purposes of discussion, we'll assume that a pair of light banks are placed approximately 45° to the plane of the art and roughly equidistant to it, and that the resultant light is uniform over a 4' x 4' area. We will also assume that the photographer has the skills to align both camera and painting so that the lens is both perpendicular to the painting and the film (sensor) plane of the camera.

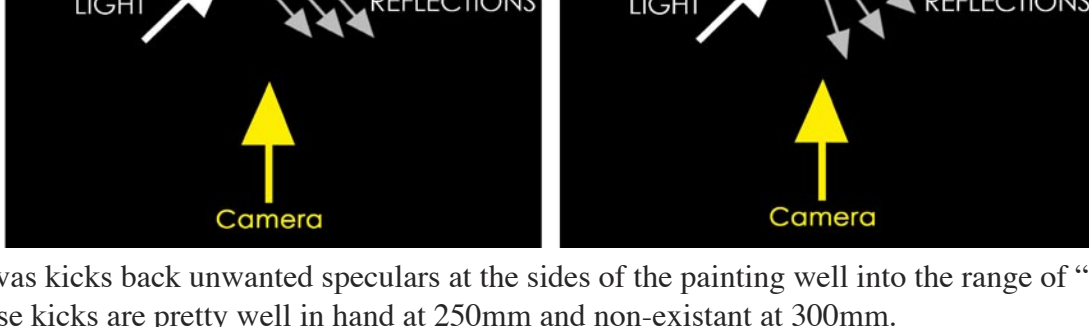
Lens Choice and Specular Reflections: Longer is Better

While good for most art copy, this kind of lighting set-up referred to above can produce specular "fireworks" at the sides of glossy, paintings, particularly those with highly dimensional brush strokes, as impasto or palette knife. Many people, particularly those with vertical copy stands, partially beat this by using "cross-polarization" (polarizing acetate on the lights and a polarizer on the lens). This technique, in my opinion, is undesirable for several reasons. 1) It can affect the color of the painting, 2) it cuts down on the light available to the sensor by a huge amount (80% by my measurements), resulting in much lengthier scan times and even worse (according to Mike Collette), a noisier image, and 3) it greatly increases the amount of time a fragile work of art is exposed to the destructive effects of UV light. And then of course, there are those recalcitrant kicks that even cross-polarization can't kill.

A simpler approach, workspace allowing, can be achieved by using a longer focal length lens. Consider the typical "problem" painting below. This canvas acrylic paint is smooth, but is covered with a glossy varnish. (The square in the center is a blow-up of a section of the side of the painting). I shot this (with a full-frame SLR) without varying anything but the focal length of the lens. The approximate focal length equivalent of a 4/5 lens is in yellow.



One can see that the specular reflection problems with this painting go away as we use longer and longer lenses. Why is this? Because the angle of incidence equals the angle of reflection. With a totally smooth surface, like a glossy photograph, the reflection of the lights are reflected harmlessly away from the lens, unless it's a very wide lens like the first two above, which would actually see the light unit itself. Canvas, however, is not flat but bumpy, and if the canvas has been painted with a glossy material, specular reflections occur in constantly varying angles as below:



Glossy canvas kicks back unwanted speculars at the sides of the painting well into the range of "normal" lenses. These kicks are pretty well in hand at 250mm and non-existent at 300mm.

One might ask if such a long lens would have even less depth of field that requires a higher f-stop to guarantee good focus, right? In a word, no, since you are taking a photo of a flat object. A regular spherical lens used for 3-D photography achieves its most critical focus at a given object size (like a person) in an arc from the nodal point of the lens (picture a semi-circle of people). The wider the lens, the more severe the arc, the longer the lens, the flatter the arc, therefore the less "safety" stopping-down is required to achieve good focus across the entire field. Furthermore, if the lens has been specifically designed for copying flat artwork, the focus issue is even more moot, as these lenses have been ground to achieve the same focus at the corners of the field as in the center. These "flat field" lenses were used throughout "process" photography before intermediate color separations and half-tones were done in a computer. Fortunately, they still make them for art copy work, which is what we are concerned with.

A note here on the nature of photographic lenses: other things being equal, the longer a focal length, the greater the circle of coverage. In any given lens "family" this increases proportionately to the focal length of the lens. For the Rodenstock APO Sironar N's for example, at infinity, the 100mm lens has a circle of 150mm, the 210mm has a 315mm, the 300mm has a 450mm circle. Since the Better Light diagonal is only about 125mm, what is the benefit? For one thing, a larger lens circle offers an extended "sweet spot", a non-technical term for that ultra-sharp section of the lens with minimal chromatic & spherical aberration and transmission fall-off. These evils occur more dramatically at the edges of the circle, especially in a wide-angle lens where the lens circle usually barely covers the format for which it's marketed.

I use a 360 Rodenstock APO RONAR, process lens which I find ideal. It is flat-field corrected, apochromatic, and optimized for flat art copy at large magnifications. It generates a very large circle (320mm at 1:11, more on the advantages of this in a moment) and there are no measurable transmission or color aberration issues across the entire field. The only downside with this lens is that the camera has to be approx. 20' away to capture a 4' tall image. Fortunately, there are 3 other focal lengths of APO RONARS still in production: 240mm, 300mm, and a 400mm. All of these lenses have been multi-coated for many years and are very usable for field and studio work. And any of them, in my view, would be good for use with the Better Light system in fine art copy work. If you were to "Google" these oft-overlooked lenses, you would find praises sung to them around the world.



One minor word of caution: on a lens of this length, even a relatively small change in magnification (i.e. field size) requires a new exposure calculation because of the greater bellows factor of a long lens.

Capturing in Tiles: Usually a Good Idea.

"Tiling", or shooting an artwork in sections, obviously offers a way to generate a file of larger size than shooting it's entirety in a single shot. Just as importantly, this technique allows the photographer flexibility in capturing a "troublesome" painting WITHOUT having to resort to using cross-polarization. As I demonstrated in the lens comparison, specular kicks and light flare are more of a problem toward the sides of a painting as the reflective angle to the light source(s) becomes more critical. By using a precise rolling easel, this section of the painting can be repositioned to where the troublesome reflections disappear. And because the easel moves from left to right, the BL back is always used in the vertical orientation, and the painting is positioned in a "landscape" orientation, regardless of the artist's intention. The important concept here is that this kind of tiling maintains perfect alignment and uniformity of light between the "tiles" regardless of where it is placed.

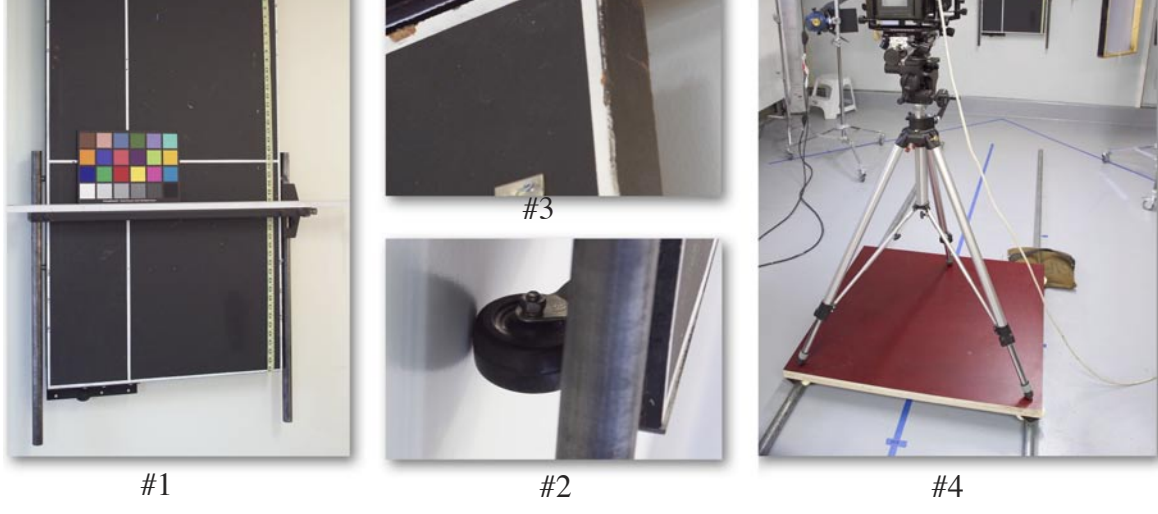
Assembling the tiles in Photoshop takes no time at all (so long as the painting's sections were uniformly lit and properly aligned). The example shown is a painting shot in two vertical tiles (#1):



For assembly, the remaining steps are: #2) increase the canvas size of one of the two shots by doubling it, then control-shift dragging the other tile onto that canvas. 3) the second tile's layer opacity is lowered so the two pieces can be precisely aligned. 4) a layer mask is used to create a feathered transition between the tiles. 5) the layer's opacity is restored to 100% and the file can be flattened and cropped.

Assembling The Equipment You'll Need for Accurate Tiling

Obviously, not every painting needs to be shot in tiles, but if you're going to do it part of the time, your art copy set-up should always be set up to accommodate it. This will also allow for more efficient workflow copying of multiple paintings. But because everyone's needs are so different, you may end up building such a set-up yourself. Fortunately, there's not much too it.

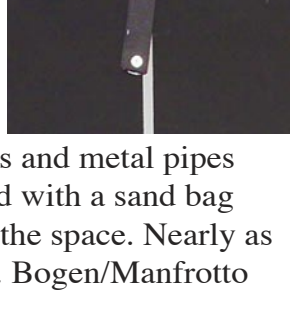


One of the keys to efficient art copy (unless you want to use a ZigAlign on every shot) is to have a rig that will keep x/y/z perpendiculars true while allowing for accurate tiling. With an expensive vertical stand, this is a given. But the limited travel of the vertical stands require wide (er) lenses, and offer limited field size. Horizontal copy is superior, but your own you're own when it comes to the equivalent of a copy stand. First off, you need a space with a flat (preferably horizontal) floor with a wall (preferably plumb) at one end and twenty feet plus of clear space for positioning the camera. The first step is to make a rolling easel on the wall.

First, you'll need an overhead track and wheels to roll the easel on. A variety of heavy-duty door tracks are available for reasonable cost, some with ball bearing wheels. This track needs to be attached to some metal or heavy wood (i.e. 2" angle iron or a 4" x 4") that must be very straight. This is then either cantilevered off the wall or suspended from the ceiling, keeping in mind that it will need many points of attachment so it doesn't bend over time. Care must be taken to make the track horizontal. For the easel itself, I use a cut-down fire-code wooden door, as it has a lot of mass and can be drilled and screwed as needed. For centering the art, I added an adjustable shelf repurposed from a table saw.

Once the easel is tracking horizontally and the face is plumb, it's necessary to make a couple of lines on the face of the easel, one horizontal and one vertical, for framing the camera, centering the art, etc. The intersection of these lines will also be the axis for the lens to start in most cases, so make it a convenient working height, like 60". Next, some calibrations are necessary for the horizontal and vertical. Note we "temporarily" (i.e. 4 years ago!) stapeled up two of my wife's sewing tapes. We need to choose a point in the easel's left-right travel to make our "home" for the easel to live, i.e. the place we align the camera on, and use for lighting. Note our slick position is at 23" which is marked in red. This is our home.

From this "home" position, we drop a plumb line (or use a long level) to locate this same position on the floor. Using a secret carefully guarded by the Masons for centuries (a triangle with sides 3 x 4 x 5 units always produces one right angle), we can make an accurate reference line (the blue tape) for the camera's lens to travel on, exactly square to the easel's path. While it is not essential, we use a simple track dolly for the camera to facilitate changing image size.



This particular dolly is based on skateboard wheels and metal pipes. The pipes are held together by a "tie" at the far end with a sand bag on top. It can be quickly picked up when we need the space. Nearly as efficient are a wheel accessory kit for your tripod. Bogen/Manfrotto makes a nice one, but it tends to jostle the camera.

Anyways, with the lens fixed at 60" and directly over the reference line, we should be able to put the cross-hairs of the camera on the intersection of the lines on the easel, and track in and out without loss (too much) alignment. It is at this point that a Zig Align check should be used to dial things in for good. Or at least until the next time.

But what about the odd painting that demands both vertical AND horizontal tiles, something in the 6' x 6' range? They are in the door (then there's the 8' x 10' guy we'll get to in a minute). There are 2 obvious choices: 1) reposition the artwork vertically, or 2. Move the camera vertically.

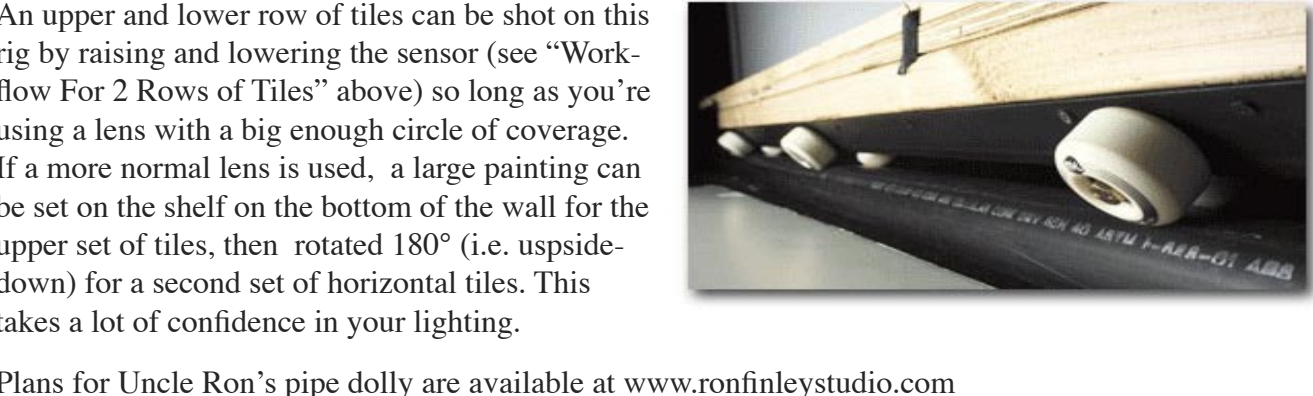
On the face of it, these both seem like bad ideas. Our easel, while fairly precise in horizontal movement, would be a bit crude if we relied on our horizontal shelf to repo the painting on two levels, as it just isn't that accurate. Even a quarter of a degree difference in horizontal would cause some headaches (and fudging) when assembling the final file. Is moving the camera the answer then? Without some seriously engineered equipment, moving the camera 36" while maintaining alignment would be even more difficult. But wait! There is a third way. Since our 360mm APO RONAR has such a huge circle of coverage that we can crank the rear standard up and down with room to spare always staying in the sweet spot of the lens with no vignetting.

WORKFLOW FOR 2 ROWS OF TILES:

After shooting the camera/tripod on hard: 1) Set the front standard in the middle of its rise. 2) Set the rear standard in "portrait" mode. 3) Determine a top and bottom position for the sensor, so the "tiles", will have adequate top and bottom overlap, say 15% of the picture. 4) Determine the horizontal stop positions for the horizontal tiles with similar overlap area. 5) Shoot the upper position tiles 6) Carefully move the rear standard to the lower position, and 7) Shoot the lower position tiles. With our super 6K, this works great on paintings up to 7' in height, by ANY reasonable width, say 10'. Works great!

Shooting Larger Paintings:

Some art is too big to travel. Some other pieces can't get out the door. All of the above principles can be used on location to shoot these very large paintings, with a variation on our portable 8' x 12' rolling wall easel set. This beast rolls on 2" disposable PVC pipe with skateboard wheels and is quite true and precise, and can be assembled in a half hour on location.



An upper and lower row of tiles can be shot on this rig by raising and lowering the sensor (see "Workflow For 2 Rows of Tiles" above) so long as you're using a lens with a big enough circle of coverage. If a more normal lens is used, a large painting can be set on the shelf on the bottom of the wall for the upper set of tiles, then rotated 180° (i.e. upside-down) for a second set of horizontal tiles. This takes a lot of confidence in your lighting.

Plans for Uncle Ron's pipe dolly are available at www.ronfinleystudio.com