B&W Landscape Photography meets Astro Photography
And makes a superior B&W digital camera

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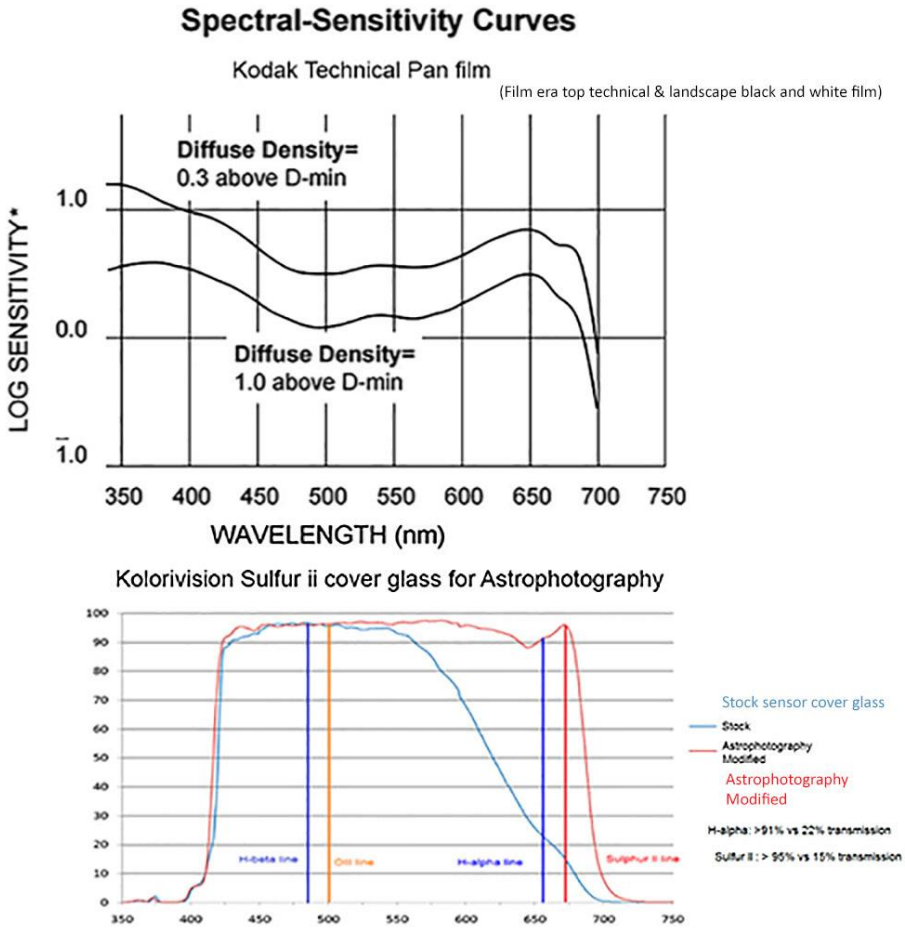
In pre-digital times, I preferred the extended red sensitivity of Technical Pan film.[1] It simply gave me the best B&W image for the landscape and cityscape photography that I do. The skies and clouds, among other subjects, were better separated. The signal to noise ratio (smoothness of the image) was far above equal speed "normal" films, particularly when the scene called for my most commonly used red or orange (#22) filter.

Can this be achieved with digital? It appears it can be for those who are dedicated B&W photographers. This PDF will document my experiences with this approach as I gain experience with the Sony a7r (v.1 & 2) and their "astro" (aka "H-Alpha Filter") cover glasses.

Kolari Vision is a company that has specialized in retro-fitting cameras with sensor cover glasses that filter out differing amounts of the spectrum. One of these conversions is for the same purpose as the extended red sensitivity of Tech Pan. It is the astrophotography filter.[2] See the spectral distribution graphs, below. The astrophotography modified spectral sensitivity (red line, lower graph) is very close to that of Technical Pan film. The "stock" cover glass (green line, lower graph) simply cuts off too much red and, relatively, "starves" the red channel, which is most important in B&W landscape photography.



[1] Others have noticed that extended red sensitivity helps most B&W. At https://luminous-landscape.com/leica-m8-solution/ Michael Reichmann noted, "Because of its high IR sensitivity the [Leica] M8 turns out to be an incredible B&W camera. …"
[2] See https://kolarivision.com/product-category/astro/ and https://kolarivision.com/astrophotography-h-alpha-and-sulfur-ii-conversion/ My first astro glass conversion was the Sony a7r in early 2016. My A7Rii was converted in December 2016.

Sony a7r – Kolari Vision Thin Astrophotography Cover Glass

Kolari Vision now has 2 thicknesses of Sony astro cover glasses. Its original astro cover glass was thinner than the Sony cover glass. In October 2016, I asked them to make one that matched the OEM Sony glass. They did, and I am happy to report that it works well with the Sony and Zeiss lenses made specifically for the Sony a7 platform.

It is important to keep in mind that many modern digital optical designs assume specific optical characteristics for the cover glass. The variable that is most important for image sharpness is the optical thickness of the glass.[3] Any time there is glass in the optical path, it will affect the image. If the light goes through the cover glass as an angle, the glass, like a prism, will bend the light and spread a rainbow of colors. The more obtuse the ray angle, and the thicker the glass, the greater the potential problem becomes. Leica's very thin cover glass is its attempt to keep its legacy, film camera Leica M lenses relevant in the digital era. Those old Leica M normal through wide angle lenses do not work well on Sony a7 cameras, which have a thicker (more standard) cover glass.

Sony a7r with then Thin Astrophotography cover glass

My Sony a7r was converted with the thin astro cover glass in early 2016. The result was a camera that did, in my view, make a superior B&W landscape camera, but only for my Leica M lenses from 50mm up, as well as the Tri-Elmar 16-18-21mm ("Wide Angle Tri-Elmar" or "WATE"),[4] which is a retrofocus design, like SLR wide angles. A retrofocus type of design minimizes the ray angles, but it also makes the lenses larger than needed, among other compromises. The thin astro cover glass is better than the OEM Sony cover glass for M lenses, but it is still not as thin as the digital Leica M cover glasses. For the Leica M lenses that worked well on the stock Sony, the image quality increased with the thin astro glass conversion.

For the Sony standard 55mm f/1.8 and 35mm f/2.8 wide angle lenses, as well as the Zeiss Loxia 21mm, the image quality was badly deteriorated by the thinner astro glass conversion. These modern Sony and Zeiss lenses that are made exclusively for the Sony clearly depend heavily on the optical characteristics of the cover glass, and the thin astro glass does not work well with them.

So, for me, the thin astro cover glass made a superior B&W platform for some legacy Leica M lenses, but it will not allow the use of these important Sony and Zeiss lenses, and that was a problem.

The Leica f/4 Tri-Elmar 16-18-21 did an outstanding job for normal daytime landscapes. It is best at f/8. With respect to night sky, wide field, wide open f/4 photography (for example Milky Way and star trails) the WATE did a good job, but more speed and better wide open optical performance would be desirable. I used the A7r with the thin astro filter at this year's Golden Trout Natural History Workshop. Some sample night images are shown on my web pages.[5] As nice as those shots are, if I'd been able to use the Zeiss Loxia 21 at f/2.8, they would be noticeably better in large prints, which is my target output medium.

The Standard Thickness Astro Cover Glass on the Sony a7r2

Kolari Vision's thicker cover glass works very well with the Sony and Zeiss lenses. As such, for me and for those who do not have a collection of Leica M lenses they want to use, this thicker cover glass looks like it will be the better option.

The Sony 55mm f/1.8 and 35mm f/2.8 appear to be as sharp as ever. The Loxia 21mm f/2.8 is the lens that I suspect is the most critical with respect to its need to have a cover glass that matches the OEM optical thickness. The results look very good. There is some very minor red color fringing with the 21mm, but I cannot say this is any different than it was before.[6] In fact, most of the apparent fringing is more a function of getting the Color Temperature and Tint correct than

[3] The index of refraction and how exactly the different colors are spread are the types of things glass and optical companies vary to make good lenses. One can imagine that there is a lot of science that has and will continue to go into making these glasses. For simplicity, I just call this "optical thickness."

[4] $5.9K at B&H.

[5] See http://www.paulroark.com/Golden-Trout-Workshops.html for photos. Only the 2016 photos were with the astro glass.

[6] The extended red is going to show off whatever red fringe the lens has, particularly with a low sun/sunset type of lighting.

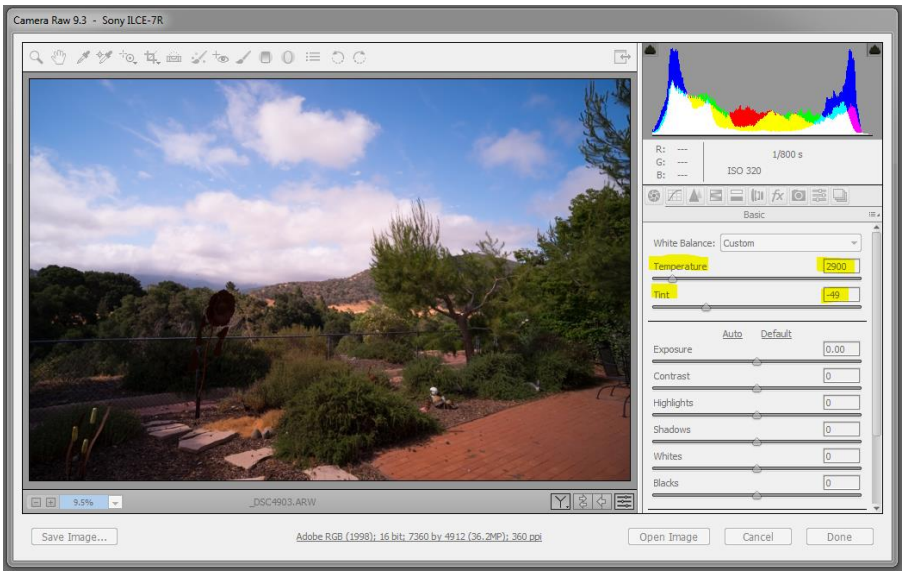
an optical aberration. The Sony 55mm and 35mm show no CA issues. For the Loxia, the ACR conversion tools or the remove the any residual fringe when needed, which may be seldom. The Loxia at f/2.8, overall, at the edge, is better than the WATE at f/4 with the thin cover glass. I call that success. There is probably nothing at 21mm and f/2.8 that can match this performance.

Note that the WATE at 16mm is likely still the best super-wide of that focal length for the Sony. At f/8 it is outstanding.

Shooting Daytime Photos with the Astro glass filter

If one wants true colors, then stay with the standard glass. The extended red sensitivity rendering, however, is not necessarily bad if true color is not a concern. With the extended red, one has to set the camera white balance to a very warm color temperature. This can also be done in the raw processing. See the comparison, below, of a standard rendering (the top un-converted Sony a7r2 image) to the same shot with the astro converted Sony a7r.

The top image was processed at the usual Adobe Camera Raw defaults with "Daylight" color balance. The bottom image has its "White Balance" Temperature and Tint adjustments, in Photoshop/ACR, shown below. The Color Temperature is set to 2900 and the Tint to -49.



Cameras have white balance controls that can do at least some of this for the viewfinder. The ACR "as shot" default image will also then look more normal. If the camera white balance is not adjusted to 2900, the viewfinder and preview will look too red. The exact setting that looks best will vary with the light source.

For true color with the astro conversion cover glass, a "Hot Mirror" filter can be added to the lens. Kolari Vision sells these also.

Frankly, when I asked my family which of the above shots they like best in color, they pick the astro glass version. It is a warmer rendering. Some have mentioned the old Agfachrome look. I used to prefer that rendering myself. That said, for color photographers, I do not recommend this conversion. This is for B&W photographers (and astrophotographers, of course).

Exposure Compensation

The astro cover glass lets through more red light and appears to have about a ¼ stop speed advantage over the stock setup in most cases. Nevertheless, the Sony a7r exposure system seems to work best with the thin astro conversion when the exposure compensation dial is set on +2/3 or +1. The thicker astro cover glass on the Sony a7r2 does not appear to need exposure compensation as often. I assume this has more to do with the camera differences than the glass differences. In all cases some exposure compensation may help, so keeping an eye on the histogram is always advisable.

Auto Focusing

In general, this works as usual. The AF with the 35mm f/2.8, from f/8 down, is slow and not particularly reliable. I cannot say whether the cover glass made is worse than it already was. I found that with the Sony stock cover glass, the original 35mm worked best at f/2.8. At f/8 I always used MF. The 55mm works fine even at f/8; it does not show the same small aperture AF issues as the older 35mm.

Black and White Conversion

One would expect that having an original color image that had more dramatic skies would result in a higher quality B&W print with dramatic skies. My testing suggests this is true.

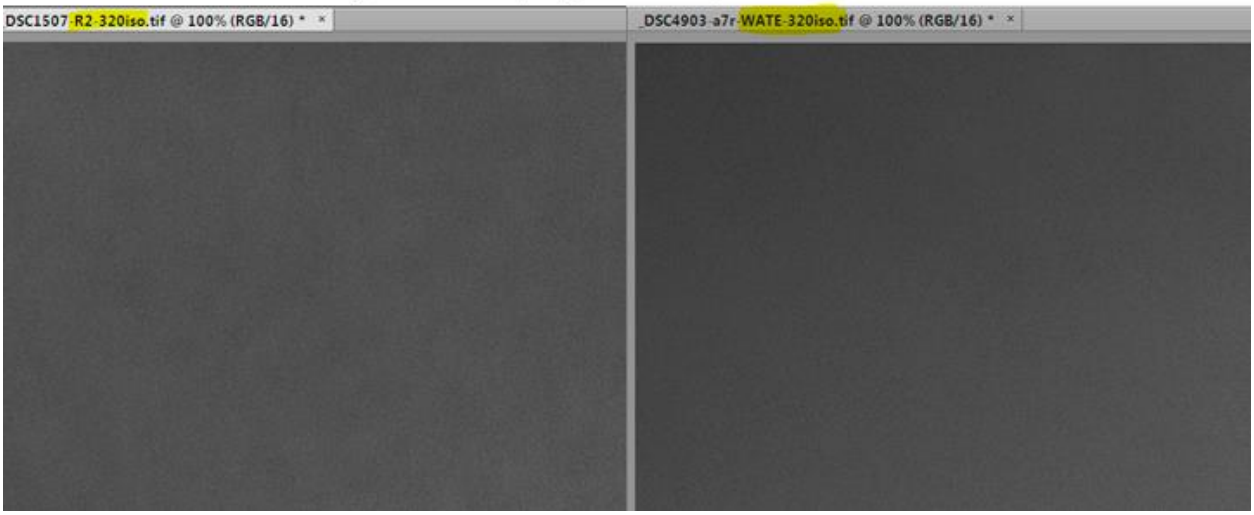
Using the Photoshop Image>Adjust>Black and White approach, it takes a significantly larger move of the Cyan and Blue Sliders for the non-converted Sony image than for the astro glass converted camera to reach the same degree of sky-cloud separation. The lower degree of manipulation needed to get to the same sky red-filtered sky look results in a much smoother sky.

Even when the degree of Cyan and Blue slider adjustment is the same, the astro-converted image is better. The images below compare the same area of sky taken with the OEM Sony cover glass and the astro conversion, both using the same 320 ISO. The segment enlarged to 100% is the identical upper left corner, mostly blue sky. To make it easier to see on some monitors, I've included a copy with the Brightness increased in PS.

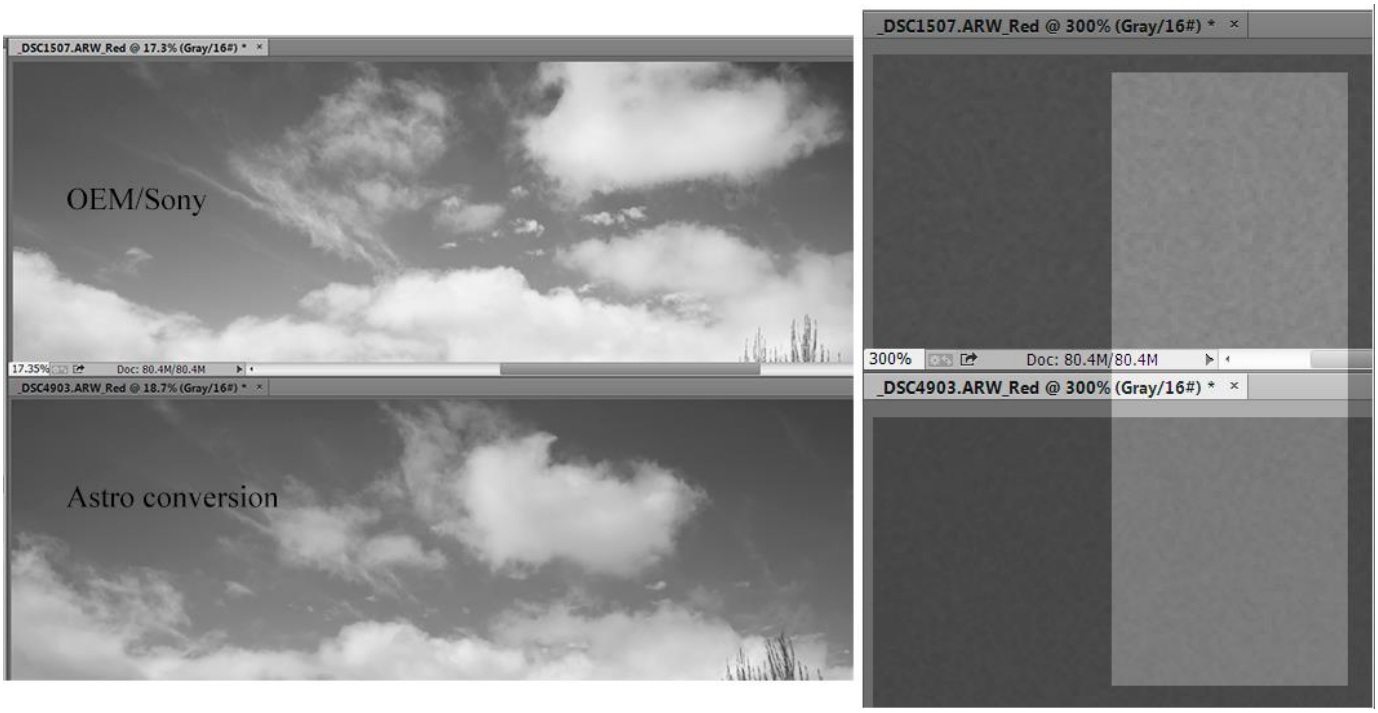
OEM cover glass

Astro conversion

OEM cover glass (Brightness +50) Astro conversion



I often use the underlying red-filtered channel instead of the PS "Black & White" adjustment because the red channel can result in a smoother image. Below are segments from the upper left corners of the images, red channel only. This is after the red channel images were equalized as closely as possible. The left side of the image shows the upper parts of the OEM Sony setup, on the top, and the astro converted setup on the bottom. On the right side of the image are 300% blowups of the upper left corners. They have the same Lab L values. To better see the differences in smoothness, I have increased the Brightness of a selected segment of these comparable portions of "blue sky."



I have looked at other areas of the Red channel frame, and the pattern seems to be the same. The astro-converted camera appears to have a lower noise red channel.

It seems likely that the superior red channel performance of the astro glass conversion is due to the astro conversion exposing the red channel relatively more, thus lowering the noise level. This would be consistent with the extended red sensitivity. Whereas the standard cover glass favors the green channel, the astro conversion favors the red channel. It suggests that, for those like me who like dramatic B&W skies, the astro cover glass is going to have an inherent quality advantage. The standard cover glass is, relatively, starving the red channel, which in my type of photography is where significant parts of the image comes from, and, in particular, the smoothest parts of the image that will show the noise the worst.

With B&W film, a red (or deep orange) filter was the most important one I always carried. For my large landscape photos I need the highest quality red channel to achieve the best large B&W prints. The astro conversion accomplishes this. As Technical Pan did for B&W film, the extended red sensitivity or the astro cover glass allows better "red filtered" B&W images. Yet, unlike the Leica monochrome, I continue to have nice color shots as well as the very important ability to do variable color filtration in Photoshop within a single frame. For me, this sets a new standard for B&W photography.

(This is a continuing exploration. This PDF will be updated as I learn more about the properties of the conversion glass.)

(That's it for now)