That medium format 'look': what is it?

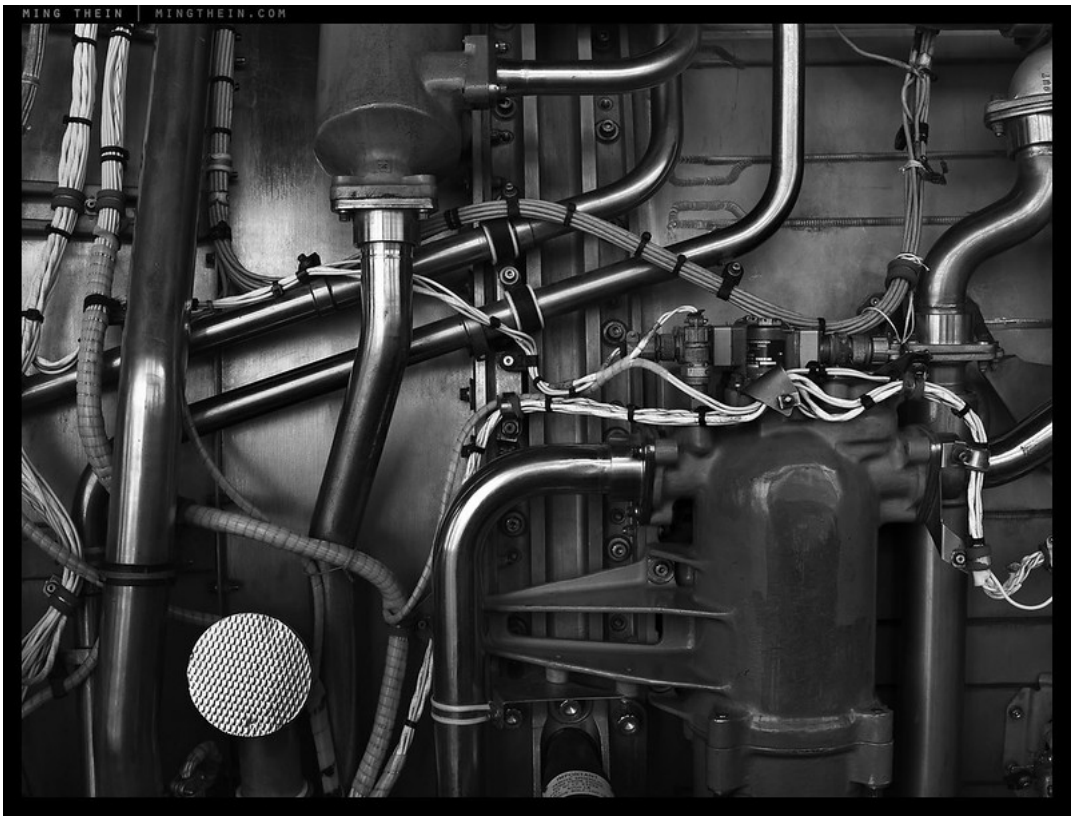
FEBRUARY 24, 2015 BY MING THEIN

Four

Today's article attempts to answer a question which I've been asked quite a few times, both in comments and offline correspondence: what is the 'medium format look', and why do we find it attractive?

We must first assume that the output medium is sufficient to identify differences. Beyond the obvious very large print or Ultraprint, if you're judging images at web sizes on a computer – or worse, a phone – sorry, you're just not going to see it. A typical web image is less than 1% by area of a 40-50MP medium format camera. There is simply no way you can oversample that much resolution information in a meaningful way to those sizes, unless you're heavily, heavily cropping, I suppose. How large would you have to go to see the difference? I'd say at least ~4MP (2560×1440, most 24"-30" monitors) or better yet, 4K. And that assumes the downsizing has been done in an optimal way, of course. It's quite possible that some methods will completely throw away any resolution advantage whatsoever (line skipping, for instance).

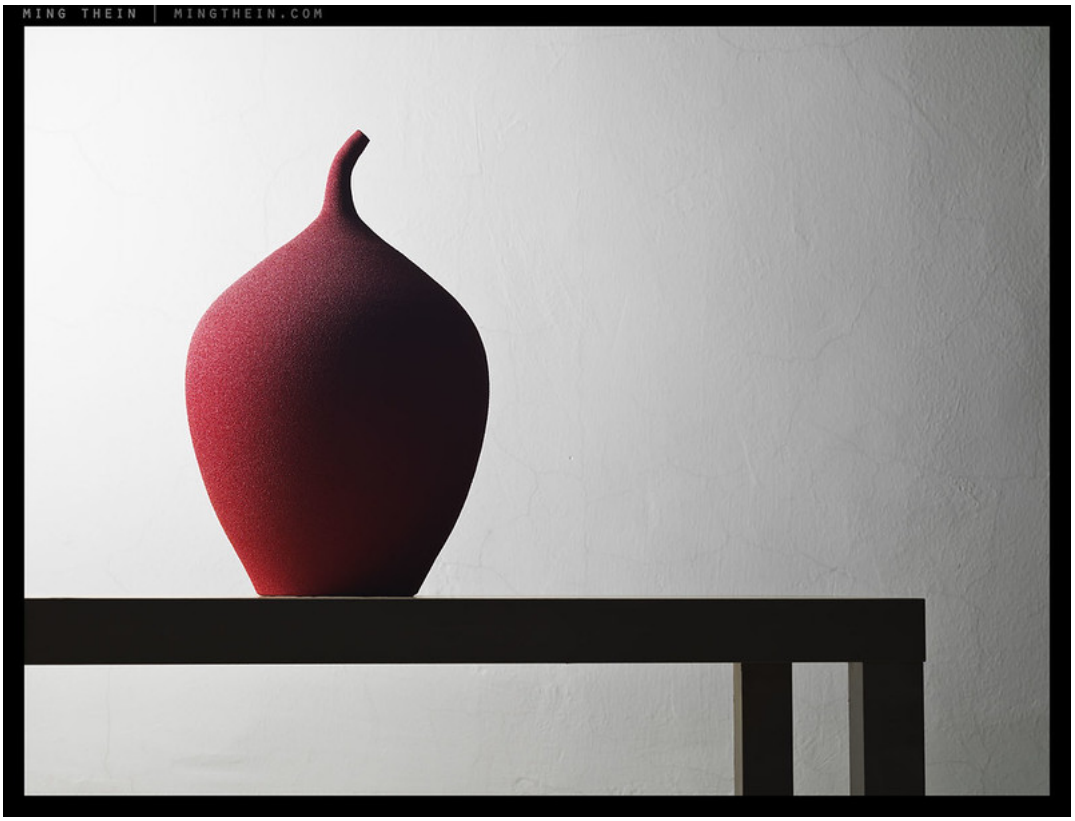
What I'm going to attempt to do is break it down into five main categories – for digital – and please feel free to add your thoughts in the comments if you feel I've missed anything.



Engine

Resolution

The most obvious of the bunch; there's no question that at large print sizes and relatively near viewing distances – where you have to move your head to see the entire image – the increase in pixels per inch is going to be very noticeable. The overall impression is one of looking into a scene, or at the subject, rather than *at a photograph*. It's a level of clarity that you might not otherwise see. I like to think of this quality as transparency, or immersiveness.



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Red vase

Acuity

Until Sony decides to try to see how many of its 1.4u smartphone pixels it can cram into a 645 chip, it's generally true for most cases that the larger the sensor, the larger the individual photosites. This in turn results in a much better signal-to-noise ratio, and higher individual pixel quality – perceived as edge definition and 'sharpness'. This was obvious at base ISO with older CCD medium format backs, but I think it's just as telling with the current Sony 51MP 33x44mm sensor because it has even higher quantum efficiency and better signal-to-noise ratio than the older backs, especially at high ISOs.

The optics *may* have something to do with it, though the previous myth of medium format lenses being better than smaller formats no longer appears to be the case; if anything, the smaller format lenses must have higher resolving power to deal with the much smaller pixel pitch – just not across as much of the frame. I'd say for the most part this is a wash with current (late 2014) product offerings – higher resolving power and smaller pixels, or lower resolving power and larger pixels.

Sunset and ladies

Color accuracy

More bits are better because it means there are more possible tonal values for each channel. It results in both higher tonal accuracy – especially in highlights, which benefit the most from the extra bits – with the penalty of larger file sizes. Until a couple of years ago, anything below medium format delivered 12-bit color, both for speed and storage considerations. Medium format captures were measured in seconds per frame, not frames per second – that would never have flown for news photographers or consumer marketing departments. Now that we have sufficient processing power, 14 bits is common across most of the board, with some inexplicable deviations (Sony's lossy compression, for instance).

It's worth noting however that not all bits are created equal: just because a camera outputs 16 bit *files* does not mean that it fills all 16 bits with information, nor does it mean that a 14 bit file is necessary inferior to a 16 bit one if it *does* fill all of the available tonal range well. There are Hasselblads that make 16 bit files but state very clearly they only use 15 bits; much ado was made of the Pentax 645Z only outputting 14 bit files, never mind the fact that the Phase One IQ250 uses the same sensor and *also* only outputs 14 bits. Or even more importantly, the 14 bits that come out of the 645Z have more latitude and equal color accuracy to the previous digital back I owned, and more dynamic range than the D800E or D810 – which are also 14 bits. The processing pipeline matters, a lot.

From an airplane

Tonal transitions and dynamic range

We’ve now wandered into the realm of dynamic range. This is a camera’s ability to simultaneously capture luminance variation across a large spread of brightness; the greater the difference between shadow and highlight clipping points for a sensor, the greater its dynamic range. Our eyes are capable of registering perhaps 19-20 stops; note however that perceptually, most of the very brightest stops don’t appear very different.

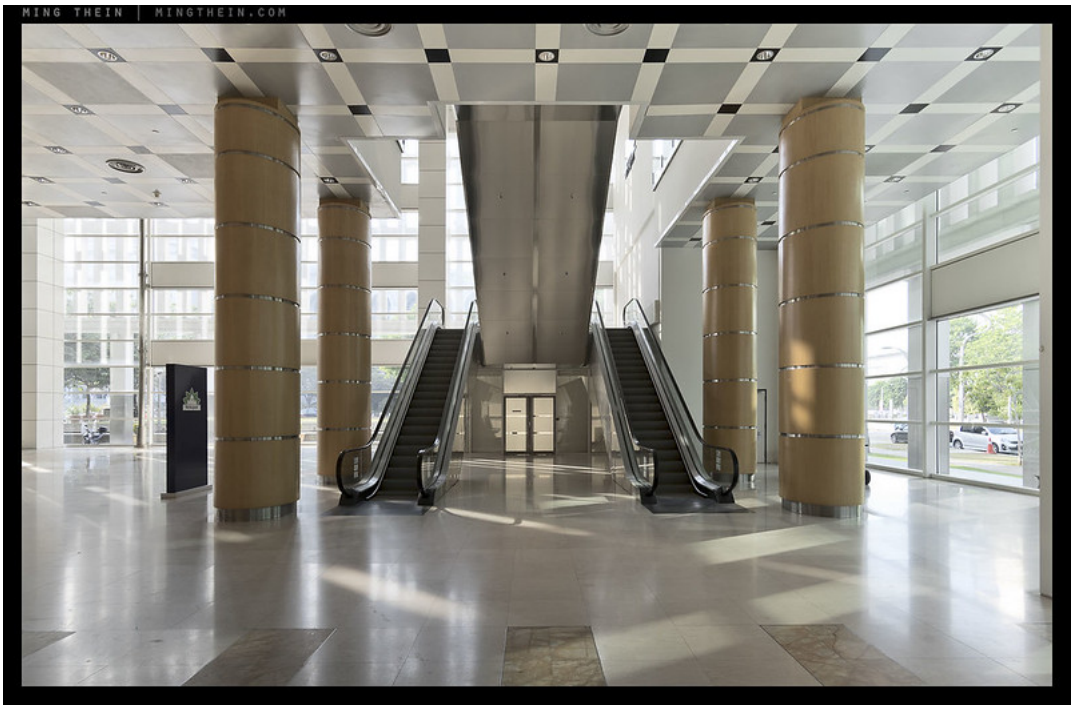
From a digital capture standpoint, I find that *absolute* dynamic range doesn’t matter so much as how the sensor handles clipping – very linear sensors with large dynamic range that clip abruptly at either end (especially the highlights) tend to look more unnatural than ones with less dynamic range but smooth transitions to overexposure. The reason why we want more dynamic range is because it makes it easier to use a curve afterwards in postprocessing to manage that rolloff. One of the reasons black and white film has such a distinct look is because it has an enormous amount of highlight dynamic range – the rolloff to overexposure is gradual and very closely mimicks the way our eyes work.

Koenigsegg

Angle of view, depth of field and depth of field transition

I’ve left the most contentious bit for last: personally, I think the distinctive signature of larger formats is the way different angles of view render. A different focal length *on a given format* changes magnification. Depth of field remains a function of distance, subject distance and background distance. What changes between formats is the fact that *a larger format requires a longer focal length to maintain the same angle of view compared to a smaller one*. To cover a normal angle of view – say 50mm-e in 135 format – you need 25mm on 4/3rds, 35mm on APS-C, 50mm on full frame, 70mm on 33×44, 80mm on 645 and ~85-90mm on 6×6/6×7/6×8 (aspect ratios differ).

Clearly, given the same subject and background distances, you’re going to have to use different apertures to get the same depth of field for each format: f1 on 4/3, f1.4 on APS-C, f2 on 135, F2.8 on 645 and around f3.5-4 on 6×6/6×7/6×8. But this doesn’t tell the entire story: the abruptness of the out of focus transition is very different for all of these focal lengths, partially because of the focal length, and partially because it’s very difficult to design a fast wide that’s also a) distortion free and b) sufficiently aberration free that it can still split the scene into planes with a sharp transition.



19mm-e that doesn’t feel anywhere near as wide as you’d expect.

There are also optical design considerations: to make a say 19mm-e lens for 33x44mm (25mm real focal length) is a different challenge to making another 19mm-e for 4/3rds that has a real focal length of 9.5mm – and both have different coverage requirements. This results in optics that have very different ‘looks’. Subjectively, this means that a lens that covers a very wide angle of view on a larger format just feels less ‘wide’ (usually characterized by geometric distortion, think edge stretching) than the same angle of view on a smaller format. I cannot explain why in scientific terms; I welcome somebody better versed in the technicalities to explain it better and more accurately than I can. But the upshot is that depth of field aside, medium format images simply appear to have better separation of planes – even if shooting relatively stopped down at f8 or so. Personally, I like this because it means I can have my subject in sharp focus, a clearly identifiable background, but still have obvious separation between the two.

Offset door reflection

Commentary on film vs. digital at larger format sizes

The last thing I'd like to touch on is that we often associate much larger formats (think 4×5", 8×10" and up) with being almost aperspective: partially because these cameras almost always offer movements to correct for keystoning and perspective distortion but also because they offer full control over depth of field, and most images shot with large format tend to be panfocal. These images in themselves offer a typically distinctive look anyway because they're almost always shot on film which in itself has distinctive visual charachteristics; the only digital solutions for large formats that retain the whole capture size involve scanning backs, tethering, and are generally impossible to use on anything other than static subjects in constant light – architecture, product and landscape, mainly.

Translating the look of larger formats to smaller ones has been something I've personally been trying to work on for some time; I've come to the conclusion that it's not easy. If you operate inside the limitations of output size, sensor and optics, it's possible to make images that have no identifiable format signature, but not deliberately transfer the 'large sensor look' downwards. Sensor technology has been constantly improving, so that dynamic range remains less of a challenge than previously. A bigger problem is the optics: even if you avoid extremely wide lenses and work with everything mostly in focus (or lenses that have sharp depth of field transitions such as the Zeiss Otuses), there's still a difference, especially at larger sizes. It's of course very important to remember that despite the obvious (or not so obvious) technical differences, none of the mean a thing if they are not in support of the image and your output lacks the ability to show it...MT

All of the images in this article were of course shot with medium format cameras – either digital or film. For more medium format work, see this set on flickr.

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Comments

Tom says:
September 4, 2019 at 2:18 PM

To my eyes digital medium format images retain their special look (nicer than you get from smaller sensors) even when downsized. This is hard to explain.

Ming Thein says:
September 4, 2019 at 7:08 PM

Tonality and greater DOF separation?

Paulusz. says:
February 13, 2019 at 8:11 PM

Medium (large) formatmagic is a mysterious thing... or not?
Expirimenting with high-end Hasselblad/Leica S camera"s showed that we could take ridiculous/useless pictures of -say- dirty dishes and the photo's were just fascinating to look at, weird, what's going on?
My Guess; We use our eyes to look with our brain, if we see our pictures as brainfood for a moment a simple unsharp picture containing just a few gradations is being 'swallowed' at once and the brain is bored.
The Hasselbladpic. of the dirty dishes was so sharp and had a seemingly endless amount of gradations making every different material really different, all the detail, all the teints, brainfood!

Happy brain, magic feeling....

Ming Thein says:
February 13, 2019 at 8:30 PM

Ah, I think I understand now. I've long said that resolution and tonality are *not* independent: the more spatial divisions you have, the finer the tonal transitions you can represent. Compound that with higher bit depth and more possible colors/luminosity at a given location, and you have a lot more nuance and thus transparency...it's this transparency/ immersion that makes the images compelling: the illusion you are looking at the object in two dimensions, rather than a *representation* of the object. 🙂

Talia says:
March 23, 2017 at 10:54 AM

Hello Ming. So if following your explanation correctly, does a smaller sensor, like m43, means images with less volume? This photographer here even says m43 are flat: http://yannickkhong.com/blog/2015/11/14/is-m43-flat-the-side-by-side-comparisons. What do you think? Thank you!

Ming Thein says:
March 23, 2017 at 1:01 PM

Err...no. Frankly, I do not think he's a credible source: this is the same person who claimed lenses with fewer elements were better. Apparently he does not understand physics...

Talia says:
March 24, 2017 at 1:36 AM

I just love you "Err..." It says a lot! I gotta say I was dubitous since most expensive lenses seem to have lots of elements, and each piece is supposed to gather light in a way that it does not add distortions or color aberrations, right?

That being said, would a small sensor render images flatter than a bigger one?

I am quite tempted by the Panasonic Leica 42.5 f1.2 noctricon over a GH5, despite the premium price, but if a smaller sensor can't output a 3D feel as much as a bigger one, then for the same price a D750 w/ 85mm 1.4 is probably the way to go (though without the video capabilities).

Now when I loom at your images with the last Olympus, they don't look flat, hence the RAW development probably have a great impact. I have been lurking on your videos, and may be it is where I should start.

Thanks!

Ming Thein says:
March 24, 2017 at 6:37 AM

More elements mean higher correction for aberrations, distortion, etc.

Flatter: depends if you're talking about DOF or tonal qualities. Flatter DOF – i.e. everything in focus; yes. Flatter tonality: no, usually the opposite: much more apparent contrast from the same scene because the camera has less input tonal range. But you can always make a flatter image look more contrasty; you can't do the opposite.

Talia says:
March 24, 2017 at 8:52 AM

Thank you Ming for your answers. Always appreciated. Is your video course A where to start on rwa processing, or should I jump right into A3 since I work in Lightroom?

Ming Thein says:
March 24, 2017 at 1:14 PM

I'd go straight to A3 – it also has profiles. A1 is for extreme edge cases, A2 is for curation and making profiles from scratch.

SirusVirus says:
July 12, 2015 at 4:12 AM

Thank you for sharing your thoughts on medium format. I was feeling the same thing, I was always been amazed with that medium format "look", which I can't reach (of course 🙂) on my APS-C camera and I believe 35mm will also be not enough for me...

The only bad thing (for me) in medium format is that it is very expensive. But definitely it has that joe-falling effect when looking to the final results (just look at commercial photographers' works, they look somehow special, just out of reach. So camera matters 🙂 anyways).

Ming Thein says:
July 12, 2015 at 8:14 AM

A lot of what you describe may well also be controlled lighting and PP...

Kadi says:
July 13, 2015 at 6:17 AM

It is difficult to define that medium format "look". It will be different from person to person. Most will not see what I see and neither you or I will see what SirusVirus sees. I shoot a lot with two Sigma Merrills and for my work they are outstanding performers. But, I can shoot with my Rolleicord and the images for my tastes are much more captivating. There is no way for me to describe the differences using the standard terms of sharpness, resolution, etc... I just know that the Rolleicord images are more immersive. I don't own one, but I have borrowed a D800 with a 50mm and the look from that camera is more the same as the Sigma, still not the same. The Nikon and Sigma rate high in all the standard quality measurements, but the "look" isn't there. I have viewed some of your film images and they too have that "look". Lighting and PP, I agree can make up differences, but no. What always bothers me is judging a camera or lens over the internet is next to impossible as good PP may as much be the key. As in film and the darkroom and Photoshop, it isn't about the image as it comes from the camera, but rather what you do with it afterward. This I can see in your images. But, we credit too much the camera and lens. That brings a lot of disappointment to those that chase only the cameras and lenses; and not considering PP hardware and software. I always see where you emphasize PP as part of the equation.

Ming Thein says:
July 13, 2015 at 7:50 AM

I think it's also impossible because of viewing sizes – that subtle difference DOF transition often isn't there anymore or difficult to see.

Kadi says:
July 13, 2015 at 9:35 AM

Too many variables...

Roberto Palmari says:
July 3, 2015 at 11:39 PM

Really nice article, thank you for sharing Ming.
I am currently considering switching to MF just because I cannot find on the FF format that immersive feel you usually find in a well executed MF image.
Not to mention the leaf shutter lenses but that's a totally different topic.

Leong Qi Jin says:
December 19, 2016 at 11:29 PM

But you might consider about the angle of view thing – it's scientifically known to be bullshit.

Kadi says:
December 20, 2016 at 1:22 PM

Leaf shutters can be a noticeable improvement. Less vibration.

Mathias says:
March 5, 2015 at 5:16 AM

Interesting read. Stephen Shore states in an interview from 2014 that he uses digital 35mm almost exclusively now, because the differences in image quality to an 8×10" negative are almost undistinguishable in the print sizes he uses.

Ming Thein says:

March 5, 2015 at 7:25 AM

Assuming everything is in focus and you're at the maximum of what FF digital can give, you've got to be printing very, very large to see the difference quality-wise – movements etc. aside.

Walter says:
March 5, 2015 at 8:49 AM

Define "quality-wise"...

Ming Thein says:
March 5, 2015 at 9:07 AM

Well if you're not printing either beyond A3, then the potential additional resolution of LF is wasted even with an Ultraprint.

Walter says:
March 6, 2015 at 1:31 AM

If resolution is the criteria... A quote often used by audiophiles and most often credited to Henry Kloss: "If it measures good and it sounds bad, it is bad; if it measures bad and it sounds good, you have measured the wrong thing." Most of us don't trust our eyes any more than we trust our ears.

Ming Thein says:
March 6, 2015 at 7:45 AM

It isn't; it was an example.

Walter says:
March 6, 2015 at 11:59 AM

Interesting...

Walter says:
March 6, 2015 at 1:37 AM

And of course, there will be enough photographers that will claim to see a difference in image quality, depending on their criteria and needs. Sometimes good enough is good enough.

dierk says:
February 26, 2015 at 4:19 AM

Ming, great post and interesting arguments again!

I don't know, if it is of any interest.
I am using the Rhinocam adapter for Hasselblad Zeiss lenses (40mm, 120mm macro, 150mm) and the Sony NEX-6 (APS-C, 16 MP), giving resolution of 80 to 100 MPixel, with the NEX-7 (24 MP) up to 170 MP. With this combo you can shoot real 645 size, that is more than the digital MF does. And it is with a modern small pixel sensor. I don't have a chance to compare the digital Hasselbad with the new corrected lenses, but for me the resolution is very impressive.

Most of the time I only use the 120mm Makro-Planar now for stills. For landscape I just do the normal multi row stitching (the 40mm Zeiss is collecting dust), with the OTUS on the A7R up to 20 images (not quite like your 50 images 🙂).

Here is an image made with the OTUS and f/1.4! (2×4 images, 170 MP, the method is also called Brenizer method)

BTW: I use this Rinocam adapter with NEX-6 also on a Sinar P and get images of up to 300 MP of even more, depending on how much I shift the rear standard in x and y direction for extra rows and columns of images.

thanks for your always interesting work!

dierk says:
February 26, 2015 at 4:21 AM

sorry Ming,
I did not know, that the real image will be included in the post, I just wanted to post a link 😕
feel free to delete it!

Ming Thein says:
February 26, 2015 at 8:01 AM

I honestly didn't see that much resolution with any of the Hassy lenses I owned. Also, you may want to check the math – allowing for adequate overlap for stitching, the theoretical maximum on the NEX7 is only about 130MP.

Back to the original conundrum though: it doesn't get around the compromised pixel level quality of the Sony cameras, nor is it easier than just stitching normally. Doesn't make much sense to buy more stuff if it doesn't do what you already can 🙂

Scott says:
February 27, 2015 at 2:14 AM

That imaging is incredible.

Ming Thein says:
February 27, 2015 at 7:58 AM

Thanks.

Walter says:
March 6, 2015 at 12:29 PM

Try cropping on the left side, the eyes will then follow the path down the right side. Looking at most good landscape paintings or other art there is usually somewhere for the eyes to escape. Too many photos leave the viewer blocked. Your beautiful photo already has the right elements. Those using waist level viewfinders more often get this right. That's partially why so many Rolleiflex and Hasselblad photos will look especially well composed. Looking at a group of photographers, all of different heights, each is shooting at eye level. Photographers purchase tripods with their height in mind. Not too many bother to bend at the knees to get a different view. That is, we tend to compose mostly from left to right, when there is still up and down to consider for good composition. Shooting downward on a scene isn't always best as it may create distortions. Your photo looks like it was shot with extra care and consideration. Even though it was not your intention, thanks for sharing.

El Aura says:
February 25, 2015 at 5:57 AM

In principal, taking a MF lens and shrinking it in all dimensions by a factor of two (or any other) and shrinking the sensor (and its pixels) equally by a factor of two should not impact the lens rendering because, if we speak in geometric optics, nothing has changed optically. The only way for things to not be identical is that we probably cannot shrink the lens tolerances by that factor of two. We probably also don't shrink the aperture blades (including its tolerances) by a factor of two (though wide-open that should not be visible). We also cannot shrink the coatings by a factor of two (though I have no idea if they could impact the rending besides their efficiency in suppressing reflection and thus affect contrast).

Ming Thein says:
February 25, 2015 at 8:05 AM

Not quite, because the DOF properties of a 50mm lens are not the same as a 25mm lens...a 50/2 will not have the same DOF as a 25/2. (Aperture should stay constant since all parameters are scaled equally). This is of course ignoring the fact that your rear flange distance will also have to scale down appropriately, which causes all sorts of other issues.

Basil Tahan says:
May 21, 2019 at 8:16 AM

True, but to get equal sized prints, the 25mm f/2 on the smaller format would need to be enlarged twice as much, equaling out the DOF again. In other words, the circle of confusion at the sensor / film plane would be different (smaller for the smaller format at f2) the necessary enlargement would produce equivalent images. Pixel level resolution and ease of lens making (longer flange distances) are the two large advantages.

Ming Thein says:
May 21, 2019 at 9:25 AM

This is not quite accurate. If the FOV remains the same, and we scale aperture to format accordingly, (e.g. 12.5/2 vs say 25/4) it should theoretically look similar but doesn't because of a whole host of other technical considerations – lens projection, corrections, drawing style, effective DOF transition, actual angular resolution, distortion etc...and even if angular resolution is identical, the pixels on the FF camera will be 4x the area – there's no way they have the same color or DR properties, changing things again.

Basil Tahan says:
May 21, 2019 at 12:07 PM

Can you clarify? is it 12.5/2 (small sensor) vs 25/4 (big sensor) or 12.5/2 v 25/2 to achieve equivalent FOV and DOF shot from same location in equal sized prints?

Ming Thein says:
May 21, 2019 at 1:52 PM

12.5/2 M4/3
24/5 FF
Same location, same angle of view (approximately, aspect ratio differences)
Same sized final print

Ron Scubadiver says:
February 25, 2015 at 2:03 AM

Great article, love the lead photo of the engine.

Ming Thein says:
February 25, 2015 at 8:04 AM

Thank you.

Daniel says:
February 25, 2015 at 12:56 AM

Thanks for your interesting writing, Ming. Maybe a little out of topic: I wonder if our thinking still is stuck in analog times, where film emulsion was equal for all film formats and the format was the only point that made the difference. Am I right that todays sensor tech of smaller sensor formats is years ahead of MF sensors? Therefore today sensor tech AND format make the difference. Still your described medium format look is there today without doubt, but shows in specific situations only (and is not that obvious with todays small MF sensors). I wonder if your described differences will keep relevance over time, since smaller sensors will become more and more capable and lens tech will improve either. We are not there yet, but paying that much for a foreseeable dying format is a bit of a hassle.

Ming Thein says:
February 25, 2015 at 8:03 AM

Film emulsion should be equal, so if you looked at say a 1x1cm area on a sheet of 4×5 or roll of 135 they'd look identical for the same type of film. Thus, larger is better. Sensor tech: impossible to compare directly because as far as I know, there are no sensors at different sizes that just use identical but more photosites of the same size and architecture. In that case, more would be better, too.

There are some thing that don't change, like properties of optics – a larger sensor will require a longer FL with shallower DOF to cover the same angle of view as a smaller one. That will *always* render differently irrespective of sensor tech.

Gerard Hilinski says:
February 24, 2015 at 10:27 PM

Thoughtful and informative. Makes considering a move toward medium format worthwhile. Images are inspiring, to say the least!

Ming Thein says:
February 25, 2015 at 8:01 AM

Thank you.

Mike says:
February 24, 2015 at 10:12 PM

Agree with all your thoughts. I've puzzled over this a bit myself (in film). I'd add my own observation/theory that in larger formats, smooth out-of-focus areas transition to much more detail in the in-focus areas. So it's the contrast in detail that looks different. That's my story and I'm sticking to it 🙂

Ming Thein says:
February 25, 2015 at 8:01 AM

I suspect it's also got to do with grain-level or pixel-level quality and lower magnifications for a given output size (or oversampling in the case of digital output).

Max says:
February 24, 2015 at 10:01 PM

Thanks. Great article. A side-by-side comparison of the same shot with different formats vs. medium format keeping all other parameters 'equivalent' might highlight the difference in the medium format look.

Ming Thein says:
February 25, 2015 at 8:01 AM

I'll leave that to other reviewers who like to compare formats.

Wieger says:
February 24, 2015 at 7:08 PM

Very interesting, there's one thing I can't really figure out why.
And let's forget, noise, resolution, dynamic range etc. for a moment

Let's take two picture's of the same object

One on full frame with a 50mm lens at f4..

Then on a 2x crop sensor (aspect ratio aside) with a 25mm lens at f2..

Is it the same image? Or is there a tiny change of perspective which makes it a more natural picture in a very subtle way?

Ming Thein says:
February 25, 2015 at 7:59 AM

It should be the same image, but I think the DOF *transition* isn't the same – this then contributes to our perceptions of 'naturalness' etc.

Nick Adamson says:
February 25, 2015 at 5:48 PM

The issue we all have is we generally confuse focal length with field of view. Using Wieger's example, in order to have the same FOV on your photograph between the 2 sensors, you would have to use different focal lengths (or change your subject to camera distance, which affects DOF). Once you change the focal length, you change the dynamic of the light hitting the medium.

If you use the same lens, on both bodies, same subject to camera distance, you would get the same DOF, and for the most part the "feel" of the photo because the light would be hitting the medium the same, what would then change is your field of view, so how much area of what you are photographing would show up in your image. If you cropped the larger photo to match the smaller photo, you'll get essentially the same image, assuming if all other attributes of the medium recording are the same.

So to answer, no, it's not the same image. It's the same area photographed (field of view), or you can photograph the same focal length, but you cannot get the same image with differing focal planes, FOVs and focal lengths.

I'm not a physicist or expert on this by any means. With what knowledge I do have, my opinion is a major reason why medium and large formats already have a huge leap ahead of small formats (including FF, it's tiny when compared side by side) is because of the longer focal lengths used to get the same FOV on an image. A shorter focal length equates to a higher optical power, meaning the more the light has to bend to reach the focal plane. If you don't have to bend the light as much to obtain focus, then you'll get much less aberration of any sort (chromatic, spherical, etc), so the image will be sharper and there will be better separation between objects. Hence a "more natural look", and something closer to the average human eye.

From there you get into the other whole big discussion of photocell performance and size when talking about digital.

Fantastic article Ming Thein, and your images are inspirational.

kesztió says:
November 4, 2015 at 5:16 AM

Sorry, but your thoughts have nothing to do with science. If you forget noise, resolution, dynamic range etc. and think just about optical rendering there is ABSOLUTELY NO DIFFERENCE between 50/F4 on FF and 25/F2 on 4/3.
Yes, MF has clear advantages from the point of view of resolution, color accuracy, dynamic range etc. but please give up disseminating myths about a presumable different perspective perception of larger sensors.

Ming Thein says:
November 4, 2015 at 7:28 AM

That is untrue for two reasons. If you want to challenge me, please provide evidence or a credible source, not your personal opinion.
1. You cannot ignore the sensor parameters, because this is a reality of the implementation
2. Talk to any optical designer – and I've asked this question to both Zeiss and Sigma: a 25mm lens will project and render differently from a 50mm one within realistic requirements of required coverage and flange distance etc. I suppose both of those companies are talking nonsense too.

kesztió says:
November 4, 2015 at 4:33 PM

> *You cannot ignore the sensor parameters, because this is a reality of the implementation.*

This is absolutely true, but don't forget that in every 10 years the sensor technology gains up to 3–4 stops and even a bigger blow-up in terms of resolution. Hence a MFT camera from year 2025 might easily beat or at least meet any current medium format cameras. So the better image caused of better sensor parameters is not an **inherent** quality of the format itself, that is, which cannot be acquired by other formats.

> *a 25mm lens will project and render differently from a 50mm one within realistic requirements of required coverage and flange distance etc.*

Negative, assuming that the 25 mm lens has exactly half of image circle of the one of 50 mm. The only difference should be that you need **better quality** optical glass to achieve the **same** resolution, microcontrast etc. for the smaller sensor area. If you talk just about this issue then I apologise you for the misunderstanding but speaking strictly about optical projection there should be **absolutely no difference,** neither in perspective nor in optical distortion, etc.

Nick Adamson says:
November 4, 2015 at 5:48 PM

Kesztio, focal length is not directly related with the diameter of the opening of the lens. A 25mm lens will not have half the image circle of a 50mm, if that were the case you wouldn't be able to use a full range of focal lengths on your camera, nor would you be able to use much of a range of zoom lenses.

Focal length is focal length no matter what sensor size it is on. Your lens aperture is a ratio of focal length to diameter of the diaphragm. A 25mm lens will never equal a 50mm, no matter what it is you put it on. When people refer to lens equivalencies it is just an equivalent field of view, it has nothing to do with image quality.

The shorter the focal length, the more light has to bend to reach the focal plane. This is the major reason why medium format is better than smaller formats, you can an equivalent field of view out of a much longer focal length. The light has to bend less to reach the focal plane, which means better detail, and less aberration.

Yes sensor technology is getting better, and the average person probably won't notice a lot of detail difference. However, you can only cram so many photocells on a sensor, and until the technology allows for smaller cells and can capture more finite detail, it isn't going to get a whole lot better than now. And regardless of how good technology will get, a large sensor will always have an advantage, assuming equivalent technology is poured into it. Which really has all to do with as I said above, the equivalent field of view for a focal length. The less light has to bend, the better the detail, no matter how much technology you throw at a sensor, it cannot make up for the bend in the light coming through the lens.

kesztió says:
November 4, 2015 at 7:58 PM

> *A 25mm lens will not have half the image circle of a 50mm*

Image circle is the largest circle on the focal plane which can be resolved by the lens w/o compromising too much quality, usually the manufacturer is responsible to decide what image circle is designed the lens for, e.g. a Micro Four Thirds lens can cover the typical MFT image circle but it will have already very strong vignetting on APS-C. So a 25 mm lens designed for 4/3 can definitely have half the image circle compared to an 50 mm designed for FF.

> *The shorter the focal length, the more light has to bend to reach the focal plane. This is the major reason why medium format is better than smaller formats, you can an equivalent field of view out of a much longer focal length. The light has to bend less to reach the focal plane, which means better detail, and less aberration.*

Unless using proportionally brighter lenses. E.g. the ~$1600 Micro Four Thirds Leica Nocticron 42.5/F1.2 has roughly the same perspective, depth of field and light capturing ability (equivalent brightness) as the not exactly cheap, $4100 Hasselblad 150/F3.2.

Bernie Ess says:
January 28, 2017 at 1:11 AM

Sorry, I am terribly late to the party, and yet I am very much interested in that question. After 3 years of exclusively APSc and then a modern FF camera since one year (Sony a7rII) I had another look at my 2011 shots of my (long sold) Mamiya ZD (36x48mm sensor) and while the recent Sony FF sensors are lightyears ahead of the 12 year old MF CCD sensor in terms of noise, high ISO, detail resolution, the overall look of that Mamiya has something special and "expensive" I couldn't put a finger onto for a very long time. My old theory was: more clarity and acuity, better DR, but any new FF sensor without AA filter and very high reoslution is as good or better than the old MF.
I only recently found out that it is the look of the longer lenses!! Regardless of the sensor size behind, they typically have to be longer to capture the same field of view. No idea why it took me so long to find out, but obviously images out of an 80mm "normal" medium format lens with exactly the same framing (and even distance, thus perspective) have a different look compared to a 55mm lens on an FF sensor. It is quite evident. I am not sure how much in a 44×33 sensor, but the difference is quite obvious with a 36×48 sensor (exactly twice the FF sensor surface), and it must be even stronger in a full frame 645 sensor like in those expensive MF backs.
The reason: The different length compression. It changes the representation of objects at different distances, resulting in a look that is "fatter". With FF that compressed look becomes very apparent in a longer tele like 200mm. Closer and further objects look more similar in size. 80mm on a 36x48mm sensor is still a slight tele, except that there is more

sensor surface around the FF crop size that it can show a larger field of fiew, actually as much as a 55mm lens on an FF sensor. But the look is actually like a slight tele.
My Mamiya files (the only MF camera I could afford in the past) also look much more 3D than my FF files. Not because there is more DR, or detail or acuity, but because of the focal length. I have been feeling it for several years, but it took me that long to realize why.

Which makes me doubt of further investing in my Sony system because I have to admit that I really like that MF look. I may now search for a used ZD camera. They are very cheap once you find one, the old manual Mamiya lenses are cheap but very very good. I don't need more sharpness and DR or bit depth, but I want that MF look....

Roberto Palmari (@ropal) says:
January 28, 2017 at 2:05 AM

I think Mr Ess here is totally right, and there is no "equivalent focal length" of sort to compensate. The angle of view is different when you compare an 80mm MF to a 120mm FF. The wider field of view, the compression and shallow depth of field returned by a MF lens are, in my humble opinion, still another game.
I only wish I could afford one.

Kadi says:
January 28, 2017 at 2:29 AM

Bernie, your analysis may be spot on. Wonderful camera and lenses. Mamiya lenses have a unique signature.
For those that want to sample the look, consider the Nikon D200 and 50mm 1.8g, 105mm Sonnar.

Ming Thein says:
January 28, 2017 at 7:55 AM

It's definitely more apparent with larger sensors, but still visible in 44×33 vs 135. I do also think the LF stuff is perhaps *too* flat though – 4×5's normal is 150mm...

MarcoSartoriPhoto says:
February 24, 2015 at 5:40 PM

Interesting insight Ming, and beautiful lines on your photos, as usually. I like how the dark table on Red Vase matches your black frame.
A question off topic but not that much: since you own also a Dp2Quattro, how would you compare its output to a digital Mf file?

Ming Thein says:
February 24, 2015 at 5:45 PM

The DP2Q was on loan. Resolution is definitely competitive – especially with the earlier backs, but subjectively something feels missing in the way of smoothness – perhaps it's down to the much longer real focal lengths of MF and nature of such OOF transitions...

MarcoSartoriPhoto says:
February 24, 2015 at 6:31 PM

Thank you for the quick answer. I received mine a week ago and despite it being not a "Swiss knife" I find it a surprisingly good tool for landscapes, when used under the right conditions and in the right way.
I asked that because its IQ is different than that of a normal CMOS APSc sensor (obviously), but I really don't know how to "catalog" it, if there's a need to do it..

Ming Thein says:
February 24, 2015 at 6:35 PM

I think it's on par with the D810 and optimal lenses at base ISO, but drops rapidly at anything above that to the point where it's probably not much better than a M4/3 camera by ISO 1600. Definitely punches above APSC, but MF? Hmm...I suppose somewhat analogous to the older 31MP CCD backs.

Walter says:
February 25, 2015 at 7:36 AM

I have shot a lot of medium format film and also the DP2M and DP3M. I get some awesome photos with both Merrills. I don't find the Merrills in any way limiting, I don't need anything more. I have three medium format cameras, including the Mamiya 7 and Rolleicord. Recently looked at some Rolleicord pictures to print and I was reminded. Your words "looking into a scene, or at the subject" are great descriptions. I would add to that, a three dimensional look, which can be explained with other characteristics of medium format that you described. This is absolutely no reflection on the Merrills, as I would use the same descriptions when comparing 35mm film to medium format film, or any other smaller format digital that I have shot. Those that shoot shoot medium format appreciate the medium format "look." That said, most people if they casually looked at photos from both medium format and the Sigma cameras, aren't going to think that far into describing the differences, although they are there to be appreciated. They are more likely to just say, "nice colors!".

Walter says:
February 25, 2015 at 7:40 AM

Oh, please fix the typo...

Gerner says:
February 24, 2015 at 4:29 PM

Wonderful images again Ming. You know I adore *Red Vase* endlessly much!

**From a digital capture standpoint, I find that absolute dynamic range doesn't matter so much as how the sensor handles clipping – very linear sensors with large dynamic range that clip abruptly at either end (especially the highlights) tend to look more unnatural than ones with less dynamic range but smooth transitions to overexposure. **

Which were the main reason why I upgraded from MFT to Nikon D750 to Nikon D810.

Ming Thein says:
February 24, 2015 at 4:37 PM

Thanks Gerner. Generally, sensors that handle clipping well also have larger DR anyway – otherwise there isn't enough information to provide that smooth tonal transition in the first place.

Jeff Fenske says:
February 24, 2015 at 4:24 PM

I like your first car photo. Must have been fun to photograph those lines.

I've been very interested in understanding this elusive mystery, especially medium format color. I read this, last year at Luminous Landscape, which was shocking. It was hard to believe that Canon and Nikon have been compromising color to get high ISO performance. [Introduction is mine]: https://jefffenske.wordpress.com/2014/05/25/color-not-compromised-for-iso-the-phase-one-iq250-camera

You probably know about the CFA factor, but it's news to me. I've read since, that a main method Nikon and Canon have been using to get high ISO performance is through using a weaker color filter array (CFA), and that maybe Canon won't be doing this in the upcoming 5Ds and 5Ds R.

I think that Canon especially has been tweaking their latest SLRs for best video quality too, instead of best still shot quality — even in using a too strong anti-aliasing filter, cutting down resolution. So because the 5Ds and 5Ds R have too many pixels for best video quality they don't mind tuning it for best low-ISO single shot quality, instead.

So maybe they'll narrow the gap between medium format with the 5Ds and 5Ds R.

I feel kind of ripped off, that without telling us they compromised low-ISO color to get high-ISO bragging rights, and probably have compromised the SLRs to get best video quality too — while medium format has stuck with one main goal: best performance at low ISO.

Ming Thein says:
February 24, 2015 at 4:35 PM

Car: can't complain.

Color: I actually think the D810 made quite a big leap in tonality and color over the D800/E; not easily measurable but definitely visible. Far smaller shifts when profiling for me. The 645Z was incrementally better still. There's also another, more complex, relationship between dynamic range, noise, ISO, individual channel accuracy and overall color accuracy – so better high ISO (i.e. better SNR) doesn't necessarily always translate into worse color. I'd imagine it'd only do so at the very boundaries of gamut.

That said, there's still an enormous price difference between MF and smaller formats. Remember also that part of the performance and visual differences were also affected by CCD vs CMOS architecture, physical pixel size (and again SNR) and

native tonal response. In short: there's *a lot* going on, and I don't think pointing the finger solely on the CFA is telling the whole story.

Andy Umbo says:
April 30, 2015 at 9:51 PM

Just an aside, I've been managing large photographic departments for the retail business for years, and have managed through film into digital. I can tell you that different camera companies were talking with people like me when they were developing modern imaging,and I got to see a lot of 'test' stuff back in the mid 90's. I can tell you that I once saw a 24 bit color, 3 megapixel image, that looked far more like transparency film (except for the sharpness) than anything I see today out of 12, 14, or 16 bit color. Camera manufacturers may not use all the 'bits' that they claim in their specs, but there's no denying that much better bit depth at lease has the 'look' of a better image.

Ming Thein says:
April 30, 2015 at 9:54 PM

A shame we're still stuck at 12/14, then!

Eric Hanson says:
February 24, 2015 at 1:25 PM

Really like your MF images. Too bad about the lens quality not making it to the Otus level… 🙂

Ming Thein says:
February 24, 2015 at 4:31 PM

Thanks. As far as I know, there really aren't any MF lenses that reach the Otus level. But then again, the only lenses that reach the Otus level are the Otuses…

Paulusz says:
February 13, 2019 at 7:49 PM

Including the complete absense of depth?

Ming Thein says:
February 13, 2019 at 7:51 PM

Sorry, I don't understand your question in this context…?

Jeffrey McPheeters says:
February 24, 2015 at 1:12 PM

Thanks. It's interesting to consider the differences that formats bring to the art form. You articles are well though out and presented in combination with such inspiring photographs is always a double treat.

Ming Thein says:
February 24, 2015 at 4:31 PM

Thanks! The biggest difference is probably a psychological one, in reality: it forces us to work differently.

Martin Fritter says:
February 24, 2015 at 1:02 PM

"Engine" is a masterpiece. Worthy of Paul Strand. I think the big difference is angle of view, etc., which one _can_ detect in small reproductions, I think. There is something special about the medium format ultra-wide look. The movement capabilities of large format make 4×5 and up the supreme photographic medium, at least IMHO, little changed in 100 years.

Ming Thein says:
February 24, 2015 at 4:31 PM

Thank you.

Megatron says:
February 24, 2015 at 12:24 PM

Fun read! And yet, looking at these images, I feel that any of them could have been made with a FF DSLR and a little post processing. I've seen some Hasselblad 80mm portraits that are impossible to duplicate on a FF or smaller sensor, but not sure these images truly make the case for medium format. Also, these images are your finest!

Phil Spector says:
February 24, 2015 at 2:36 PM

Absolutely. Anyone who can't see the difference from an image taken with an 80mm normal lens (w/ 6 x 6 or 6 x 7 format) vs a 50mm lens taken with a 35mm sensor is either blind or has very unskillful eyes.

Ming Thein says:
February 24, 2015 at 4:31 PM

Possibly so, because 33×44 isn't that much bigger than 24×36. 54×54 on the other hand...

Andy Umbo says:
May 1, 2015 at 1:35 AM

Exactly...when I read that the "new" CMOS 120 digital format sensor was 33X44, I had to laugh, that's certainly NOT much bigger that full frame 35mm, at least not it percentages to make a really big difference. There were larger CCD sensors at the beginning of digital time. This is what I need, a 24 megapixel chip, with 24 bit color, and switchable between 4/3, 3/2, 16/9, and 1/1 aspect ratios. Paying 10K for a camera with a 33X44 chip over a camera that costs 3K and has a 24X36 chip, is not where I want to be heading...I'd pay 10K for a camera that had a 42X56 size chip (645 film)...

Ming Thein says:
May 1, 2015 at 8:47 AM

Time to scan the used market, then. I think there are at least 39x47mm chips out there in that price range.

dlqdprn says:
February 25, 2015 at 2:01 AM

Ming, I agree, and most especially with one of your last points, the final judge of the image is a human eye looking at a print in good lighting. 11, 12, 14, 16 bits, ... what do they mean if your images are only shown on computer monitors, nothing, because the final display is so severely limited, and not standardized or reproducible. Prints, the final frontier, how do we get more people to realize this and not discuss pixel quality, rather image quality. IMHO.

Ming Thein says:
February 25, 2015 at 8:03 AM

No idea, unfortunately. I'm trying but seemingly going nowhere.

Trackbacks

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