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Effect of Using 35 mm Film Lenses for Micro-Four-Thirds Digital Cameras

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Using 35 mm Film Lenses for Micro-Four-Thirds Digital Cameras

by Chris Lantz, Ph.D. • Western Illinois University

Introduction

Interchangeable lenses are getting more expensive due to the price increases of manufacturing optical glass. This has become a problem for technical photography programs that wish to teach perspective control with different focal length lenses but do not have the budget to buy modern digital lenses. Adopting older less expensive film lenses is one approach to solving this problem. The key to finding the low cost, but high optical quality lenses is to pick an older film lens system with digital camera compatibility.

Nikon non-AI (non-auto indexing) lenses are often undervalued but have high optical quality and are part of a complete system of 38 lenses. These Nikon lenses are compatible with micro 4/3 (micro-four-thirds) mount digital cameras using an inexpensive lens adaptor. Nikon produced the following common prime fixed angle of view non-AI lenses: 20, 28, 35, 50, 55, 85, 105, 135, 180, 200, 300 and 400. Nikon also made the following common non-AI variable angle of view zooms: 28–45, 43–86, and 80–200. The least expensive Nikon non-AI lenses are reviewed for use on a micro 4/3 digital camera at the end of this paper. There are many lower cost non-AI lenses made by secondary manufacturers such as Vivitar, Soligar and Tamron. These were not chosen for review because their optical quality is more variable.

The mirror box or optical prism of a DSLR (digital single lens reflex) camera increases the distance between the lens mount and the camera sensor. This restricts DSLR digital cameras from using a wide variety of film lenses without an additional optical element in the film lens adaptor (figure 1). This glass element in the adaptor significantly diminishes the optical quality of the attached lens. The glass element in the DSLR adaptors are not designed to be removed but can be unscrewed in most cases. Removing this optical element would result in a higher quality image but would render the film lens incapable of focusing at far distances. Micro 4/3 lens mount adaptors do not need this optical element and therefore produce sharper images with film lenses compared with DSLR's. The micro 4/3 camera mount is a good choice for lens compatibility because its design without a mirror box viewing system. Other mirrorless camera systems with different lens mounts include Nikon

1, Pentax Q, Sony Alpha, Fuji X, and Samsung NX. These cameras also have a large variety of film lens mount adaptors available. Micro 4/3 cameras were selling for lower prices at the time of this writing possibly because it was one of the earliest mirrorless cameras on the market with many used models available.

There are many combinations of film lens systems and micro 4/3 digital cameras. This paper will detail one specific micro-4/3 adaptor (the Nikon F mount) for educational applications. Mounts for the following brands of 35 mm film lenses are widely available at a low cost for micro 4/3 and other mirrorless camera mounts: Canon, Olympus, Pentax-K, Pentax screw mount, Minolta SRT, Minolta/Sony, Contax-Yashica, Topcon, Leica, Konica, and Mamiya (figure 2). Some of these lens mount adaptors have built-in secondary apertures. This is because, with some lenses, the aperture cannot be controlled without being mounted on their respective film camera. This is not the case with non-AI lenses and as a result the adaptors are inexpensive (\$15–20).

Medium format lenses can also be used on micro 4/3 cameras in the following mounts: Bronica, Hasselblad, Mamiya and Rollei. Some of these medium format adaptors have a lens tilting control to allow the same sharpness plane effect achieved with a tilt-shift lens or Lensbaby portrait lens system widely used on DSLR cameras. This

Film lens adaptors for DSLR's have an optical element in them to compensate for their mirror box (lower left) and this lowers the optical quality of the film lens considerably.



Figure 1

Shown are Micro 4/3 adaptors for Canon, Pentax screw mount, and Nikon along with the Pentax and Canon film camera bodies they originated from.



Figure 2

lens pivot moves the zone of sharpness of the lens into different planes that intersect the subject. This either makes part of a 3D subject sharper or purposely blurs it for a selective soft focus effect.

Film lenses versus digital lenses

One argument against using film lenses for digital photography is that they are designed for a different imaging medium and will not produce acceptably sharp or color corrected images. In practice, the quality of the lens manufacturing (including coatings to reduce flare and the type of glass including low dispersion glass for color correction) are more important than if it is a digital or film lens. Many digital photographers that did not start out as film photographers, are unaware that slow speed

film stock (ISO 25-100 film) can be higher in resolution than some current digital cameras. High quality older film lenses were designed to produce or exceed this specification for low speed, high-resolution films. Results will also vary depending if the film lens is a prime single focal length or a zoom. Prime lenses are a fixed focal length or angle of view and do not zoom. Zooms have a variable focal length or angle of view and a zoom ring or control. Primes or single focal length lenses can have more resolution than zooms because they have fewer glass elements and less flare. Digital lenses are designed to focus on a one-dimensional focal plane and film lenses are tuned to produce an image on a multi-layer 3D imaging substrate (Schneider, 2006). Digital lenses have less color fringing, but fringing in film lenses can be corrected in Photoshop's Camera Raw tool. The "manual" tab of the "lens correction" control in Photoshop CS6 Camera Raw has a "defringe all" or "defringe highlight edges" option that in many cases can remove color fringes.

The Hasselblad-H camera system is one example where a digital lens manufacturer's claim of greater optical quality over film lenses is not always true. The Hasselblad H-lenses were originally designed for both film-based and digital photography with the H1. Hasselblad's current 40-50 megapixel digital cameras use the same lenses. These original Fuji manufactured lenses made in Japan for Hasselblad were not redesigned exclusively for digital photography and are the same designs used today for the digital-only H5 camera systems. Having used the H-series 80 mm 2.8 HC lens with digital back photography it was subjectively considered sharper by the author when compared to another 80 mm lens (Sinar Sinaron Digital 80 mm f4.5) designed specifically for digital photography.

Padeste & Kraus (2004) compared one of Sinar's highest quality digital lenses, the Sinaron digital HR 60 mm f4, with the Leica 60 mm Macro-Elmar-R 35 mm film lens and a Sinaron-W 65 mm 4.5 wide angle film lens for large format photography. Analysis of images taken of the same subjects determined that the Sinar digital lens produced higher resolution results than the two different film lenses.

The Hasselblad-H lenses were not included in this review. The current Hasselblad-H5 with a 40 megapixel digital back and the 80 mm 2.8 HC mentioned earlier is \$15,495 or \$45,000 as of 2014 for the 50-megapixel version with multi-shot capability. Older and less expensive multi-shot digital camera systems and digital lenses which may be

within the budget of some photography programs were defined and reviewed by the author (Lantz 2015).

Nikon film lenses for micro 4/3

The original Nikon 35 mm SLR film lens has the F-mount. This is also called non-AI or non-auto indexing because the lens maximum aperture has to be indexed by moving the f-stop ring of the lens back and forth after mounting the lens on the film camera (figure 3). The non-AI lens will not work directly on a digital SLR without breaking the lens indexing pin on the camera body (figure 4). Manual and autofocus focus Nikon AI and AIS lenses interface with the lens indexing pin on Nikon DSLR cameras and do not damage the camera (figure 5). AI and AIS lenses are more expensive on the used market for this reason.

The non-AI lenses are still useful for manual macro bellows, some extension tubes for close up work and for micro 4/3's cameras because an indexing pin is not used. When lenses transitioned from manual focus to autofocus the build quality of lenses suffered because metal is not a material that can be machined easily to produce autofocus lenses. Almost all autofocus lenses are plastic and many modern autofocus kit lenses even have a plastic lens mount with will not withstand any twisting action on the lens mount. Non-AI lenses all have a metal lens mount.

Digital kit lenses bundled with interchangeable lens cameras are still important because of their wide-angle focal length capability for some photography assignments. The

2x multiplication factor converts almost all wide angle film lenses into normal to slight telephoto lenses on micro 4/3. Virtually all film lenses are used as telephoto narrow angle of view lenses on micro 4/3 due to the 2x factor. Old film lenses are adequate especially with a six megapixel file size for many photography assignments where a wide-angle perspective or angle of view is not necessary.

Lens indexing pin on a DSLR that would be damaged if a non-AI lens were attached to the lens mount.



Figure 4

The Nikon F2 on the left is an example of a film camera that non-AI lenses were designed to be used on and the micro 4/3 camera on the right has a Nikon non-AI 55mm 3.5 Micro-Nikkor lens attached.



Figure 3

A Nikon AI lens mount (left) can be identified by the milled out shelf on the upper left of the mount that is designed to interface with the lens indexing pin in figure 4. On the right is a Nikon non-AI lens without this milling of the aperture ring. There is no space milled out for the indexing pin and it would be broken off when mounting a non-AI lens on a digital camera.



Figure 5

Zooms versus prime lenses

Low cost zooms of the 1980's-2000 vintage can be used with six mp size files if they are of modest zoom ranges and images are defringed in Photoshop. Low cost examples include: 35-70 mm f4, 70-150 f4.5 or 80-200 f4.5. Large zoom range lenses from the 1980's such as 35-135 f3.5-4.5 or 100-300 mm f5.6 can be soft with color fringes at 135 mm or 300 mm even at only six mp. Low dispersion glass is present in digital specific low cost kit zooms today and was less common for older film zooms. Only expensive older film lenses used low dispersion glass. Primes do not usually require this special type of glass in their design. Primes require fewer glass elements and are more simple designs than zooms. Fewer glass elements result in less flare or refraction on the surfaces of glass elements. Old prime lenses often have lower resolution at the widest f-stop setting such as f1.4 on a 50 mm or f2.8 on a 135 mm lens. Many students enjoy this soft and shallow depth of field style in available light portraits. Portraits often look better with lenses of lower resolving power, which is common with dedicated soft focus portrait lenses.

Starter kit zooms are less expensive than primes because there is a smaller market for current primes and fewer are made. On the other hand, fast zooms with good low light gathering capability are more expensive than entry-level primes. This is because the 12 or more glass elements in a zoom must increase in diameter versus four to six elements in a prime. Optical glass is expensive and the more optical glass used in a lens design the more expensive, bulky and heavy it will become. The lowest cost kit zoom for a micro 4/3 digital camera would be \$140 (Olympus 14-42 mm f/3.5-5.6) and the faster f2.8 version (Olympus M. Zuiko Digital ED 12-40 mm f/2.8 PRO) lens is \$1000 (as of 2014) for a similar focal length range. The 2.8 zoom lens is not necessarily sharper because of the bigger surface area of its lens elements. Large diameter lens elements can collect more flare or light reflection depending on their coatings but have more light gathering capability for available light photography. Everything in lens design is a compromise unless you have a system of lenses that are made for different tasks. One lens for all photography assignments is very limiting even if it is an expensive lens with a wide zoom range and wide aperture.

Another advantage of primes is that they have a fixed magnification and the effects of forced perspective can be predicted easily. When the focal length varies with a zoom, so does the perspective of the distance between

objects. At a wide-angle setting objects appear to be spread apart. With a long focal length objects are compressed together (figure 6). It is much easier to learn the perspective properties of lenses with a fixed focal length lens. With a system of fixed primes, a specific lens perspective can be fully predicted without noting the zoom ring setting. Many beginning photographers have an inadequate perception of how focal length influences perspective. Students constantly move their zoom ring instead of changing the camera to subject distance with a specific zoom setting. In order to achieve more dramatic compositions, students should often use a wide angle setting on their zoom and move closer for a "forced" wide angle perspective. Students could also move back with a longer focal length setting on their lens for a forced compressed perspective and a more orthographic view. Students need to learn to use the focal length of lenses for perspective effects and not just for cropping. A set of fixed primes is useful for this purpose.

Normal lenses

For scientific or documentary photography a normal focal length lens is important for a realistic interpretation. With fixed prime normal lenses the perceived distances between elements in the photo will be the same as the human eye. 50 mm primes (or the "nifty fifty") were once the most common lenses bundled as a starting lens with a 35 mm film SLR camera. On a micro 4/3 camera, a 25 mm is a normal lens and the 50 mm film lens would not provide a normal perspective. A 50 mm normal film lens would have a telephoto effect equivalent to 100 mm on micro 4/3. An 18 mm is not a common and inexpensive film lens, although it would work as a near normal lens on a micro 4/3 camera. The 18 mm film lens would be just about the same cost as a higher resolution 25 mm micro 4/3 lens (figure 7). An example of a 25 mm normal focal length lens for micro 4/3 is the Olympus M.Zuiko Digital 25 mm f/1.8 (\$350 in 2014).

Telephoto micro 4/3 primes such as the Olympus M. Zuiko Digital ED 45 mm f1.8 (\$349) have more resolving power than non-AI lenses normal lenses used as telephotos. The Nikon 55 mm Micro-Nikkor non-AI (\$50 with adaptor) does approach the resolution that a dedicated Micro 4/3 kit zoom would produce, such as the Olympus 14-42 mm f/3.5-5.6 (\$140). The 55 mm Micro-Nikkor non-AI lens would also provide close focusing capability that the kit zoom does not provide. One example of a 4/3 close-up lens is the Olympus M.Zuiko Digital ED 60 mm f/2.8 Macro (\$449).

Four thirds cameras versus FX cameras

Many photographers favor the higher image quality and better low light capability of larger FX sized sensors used in more bulky high-end DSLR's. Micro 4/3 and mirrorless cameras in general have not become as popular at the

The advantage of the 2x magnification factor for film lenses on micro 4/3 cameras is that they turn a 200mm lens into a 400mm lens. In this photo of architectural detail the compressed perspective or the foreshortened distance between the decorative brick work makes it more dramatic and graphic.



Figure 6

Using a Nikon 18 mm f4 Rectilinear extreme wide angle film lens on a micro 4/3 camera gives a close to normal focal length but the price of this special wide angle lens with no barrel distortion would be equal to or greater than a micro 4/3 normal lens. Photography with a normal angle of view and wide angle photography is not a good application for film lenses on Micro 4/3. Micro 4/3 cameras are best suited for a telephoto effect with film lenses.



Figure 7

high end of the market for this reason. The used value of a three year old FX sized sensor DSLR camera body is as much as 3/4 of its retail price. Micro 4/3 cameras of three years ago have lost most of their value selling at 1/3 of their retail price. This is the reason the Olympus line of micro 4/3 cameras were chosen for this paper. The higher noise factors of smaller micro 4/3 sensors are less important because they help to disguise the lower resolution of a film lens. The Olympus EPL-1 camera has a 12 MP resolution, which is more than adequate for non-AI lenses. It is a live view camera and students will open the lens wide open for manual focusing and then stop down for final exposure. The EPL-1 camera would be a good resolution match for the 55 mm 3.5 Micro-Nikkor Non-AI for a \$150 total cost (as of 2014). It is easy to mistake the older 4/3 format with micro 4/3 format, which is a totally different lens mount.

Non-AI Lens examples

The balance of this paper will review the least expensive non-AI film lenses. Manual focus Canon breach lock film lenses are another good choice for Micro 4/3 and also are very low in price due to the fact that they will not fit on Canon DSLR cameras. Another reason Nikon non-AI lenses were chosen is that they are compatible with the Sinarcam medium-format digital camera system (Lantz, 2015).

Nikon 55 mm 3.5 Micro-Nikkor non-AI

The 55 mm 3.5 Micro-Nikkor non-AI is a close-up specific 35 mm film lens but can be used as a longer (100 mm) telephoto focal length equivalent on micro 4/3 because it focuses at far distances (figure 8). The resolving power of this lens is higher than a typical 50 mm f2 film kit lens. It is useful when used at the full 12 megapixel resolution of a micro 4/3 sized sensor. The 55 mm 3.5 Micro-Nikkor non-AI is very common on the used market.

Nikon 50 mm 1.4 non-AI

The Nikon 50 mm 1.4 non-AI lens is not particularly sharp at f1.4 but is a good lens to use for available light portraits (\$50–100 in 2014) (figure 9). Stopped down two to four stops it is also a sharp lens to use in brighter lighting environments (Figure 10) or for still life tripod use. This lens is equivalent to a portrait lens focal length providing a natural perspective for head and shoulder portraits and was chosen for environmental low light photography.

Nikon 135 mm 3.5 and Nikon 200 mm f4 non-AI

The Nikon 135 mm 3.5 non-AI is a long telephoto that is good for low light photography on micro 4/3 (figure 11). The resolution is not high at f3.5 for 12 megapixel. At f3.5 the lower resolution is not as noticeable for applications such as night shooting. This is because the high ISOs and higher than normal noise levels for night photography on small-sized sensors. Sensor noise masks the low resolution of the wide open setting. This lens is sharper when stopped down two stops.

The Nikon 200 mm f4 non-AI is a very long telephoto with a 400 mm micro 4/3 equivalent. It can be acceptably sharp stopped down two stops for six megapixel resolution for a micro 4/3 camera. This lens is often found for under \$20 (2014 price). It has a larger size and weight when compared to a more modern 200 mm lenses but it much less expensive.

A Nikon 55 mm 3.5 Micro-Nikkor lens becomes a sharp 110 mm telephoto lens on micro 4/3. Here is an example shot.



Figure 8

Nikon 80-200 mm 4.5 zoom non-AI

This zoom has a convenient combination zoom/focus ring . It is a reasonably sharp early zoom design that will require defringing in Photoshop especially at 200 mm. It is best used at a three megapixel setting on a digital camera but can be acceptable with the unsharp masking filter in Photoshop at six megapixel (see figure 12). The key to buying this lens at a low price is the many heavily used zooms with a loose zoom ring. This is not a big problem for hand holding the lens. If the photographer is working on a tripod pointing down this can be a bigger problem unless a piece of duct tape is used to hold the big heavy zoom ring in place so gravity will not make it creep forward. This lens is \$25 if it has a loose zoom ring and \$59 with a good zoom ring.

Nikon 43-86 mm 3.5 zoom

This is Nikon's earliest zoom design and has some barrel distortion at the 86 mm zoom setting. Barrel distortion is the slight bending of straight-sided objects at the edges of the frame in the viewfinder screen. With many subjects the distortion is not visible at 86 mm, especially with micro 4/3 because of the 2x crop factor. Another reason this lens is low in cost is the restricted zoom range. A restricted zoom range was a design decision to produce a higher quality zoom lens without low dispersion glass,

Using a Nikon 50 mm 1.4 non-AI lens at f4 provides shallow depth of field that blurs distracting elements in the background of this dog portrait. This lens is not as sharp as the 55 mm 3.5 Micro-Nikkor in Figure 8 but it provides a good effect for portraits.



Figure 9

which has been very expensive in the past. The 46-86 mm is a sharper zoom when compared to more modern low cost zooms with higher zoom ranges, such as the 35-135 mm 3.5-4.5. There have no low dispersion glass. The 46-86 also has enough of a range for minor cropping and can be used at f3.5 at three megapixels or six megapixels at two stops down without sharpening. Like many old zooms it has a constant aperture range for all focal lengths, which makes it more usable in low light. This

Stopping the Nikon 50mm 1.4 non-AI down to f16 makes a considerably sharper image with greater depth of field. Old lenses have a sharper point of focus when stopped down two or more stops.



Figure 10

A Nikon 135 mm 3.5 non-AI lens turns into a 270mm lens on a micro 4/3 camera making it a good walk around lens for small elements in a composition.



Figure 11

lens has a very easy to read depth of field scale on the lens barrel which is useful in teaching depth of field concepts. This zoom was on the market for almost ten years so there are many for sale.

Conclusion

With micro 4/3 film lens photography students will learn to use manual focus and manual exposure. Students will also learn to be proficient with the motion control properties of shutter speeds and not dependent on vibration reduction technology. Vibration reduction does not exist on many older lower cost DSLR lenses. Micro 4/3 lenses do provide more resolving power than old Nikon non-AI film lenses. Even considering this, most educators would choose working with lower resolution lenses with all metal construction over the possibility of broken higher

An Nikon 80–200 4.5 Zoom non-AI lens set at 20 mm on a micro 4/3 camera can be a little soft in focus but unsharp masking and defringing in Photoshop can make it an acceptable image. Sometimes a zoom is necessary to get an exact cropping at a specific point of view but the images will be softer than a prime film lens.



Figure 12

resolution plastic lenses that are not worth repairing. The advantages of the modern higher resolving power lenses are minimized if the instructor evaluates images from single focal length non-AI prime lenses based on a six megapixel file. Six megapixels is a good file size for an 8x10 print. Instructors evaluate the technique of motion control with shutter speeds and the field of sharpness with f-stops and not the raw resolving power of the lens and sensor. Educators are not grading students based on how much was spent on the camera or lens but the skill and knowledge of the photographer.

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