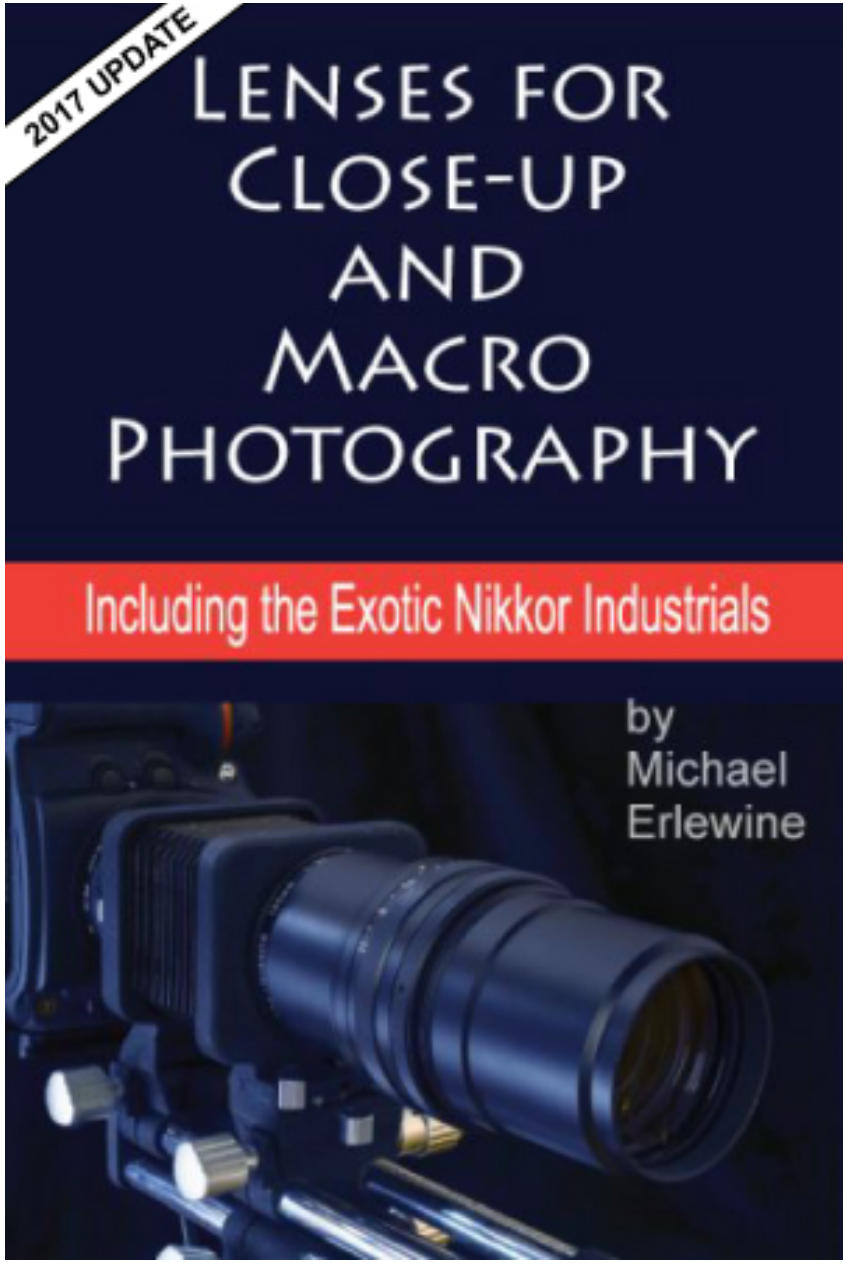

2017 UPDATE
LENSES FOR CLOSE-UP AND MACRO PHOTOGRAPHY
Including the Exotic Nikkor Industrials
by Michael Erlewine

Lenses for Close-up And Macro Photography

By Michael Erlewine

This collection of information is respectfully dedicated to the lens-men from whom I learned a lot of what I know. My sincerest thanks!

Bjørn Rørslett
Lloyd Chambers
Klaus D. Schmitt
Thom Hogan
Roland Vink

Contents

Lenses That Can Be Used for Close-up Work 8
Voigtlander 125mm f/2.5 Macro APO- Lanthar 12
Zeiss 55mm f/1.4 APO Otus Distagon..... 14
Zeiss 135mm f/2 APO Sonnar T* ZF.2..... 20
Zeiss 50mm f/2 ZF.2 Makro-Planar..... 19
Micro-Nikkon 45mm f/2.8 PC-E Tilt/Shift..... 22
Nikon Nikkor 24mm PC-E f/3.5 26
Zeiss 100mm f/2 ZF.2 Makro-Planar..... 30
Micro-Nikkor 60mm f/2.8 G 32
Nikon Nikkor 35mm f/1.4 G 35
Coastal Optics 60mm f/4.0 APO Macro..... 38
Voigtlander 58mm f/1.4 Nokton..... 41
Nikon Nikkor 24mm-70mm AF-S f/2.8 G ED 44
Nikon Nkikor 16mm f/2.8 Fisheye 46
Leica 100mm Apo Macro Elmarit R Lens f/2.8..... 49
Leica Elpro 1:2-1:1 Close-Up Lens R..... 53
Micro-Nikkor 105mm f/2.8 VR Lens..... 56
OLDER 105mm Miicro-Nikkors 57
Nikon Nikkor 85mm f/1.4 G 59
Micro-Nikkor 70mm-180mm AF f/4.5-5.6 D..... 61
Micro-Nikkor 200m AF f/4 ED-IF Macro 64
Nikkor 35-70mm AF Zoom f/2.8 D Lens..... 67
Nikon Nikkor 135mm AF DC f/2 70
Nikon Nikkor 85mm f/1.4 D 72
Nikon Nikkor 300mm AF-S f/4 ED..... 74

Nikkor 70mm-200mm FL ED VR f/2.8 81
Voigtlander 180mm APO f/4 84
Micro-Nikkor 85mm f/2.8 PC Tilt/Shift Lens 87
Voigtlander 90mm f/3.5 SL-II APO-Lanthar 91
Nikon Nikkor 105mm AI-S f/2.5 (built-in hood) 94
Kiron (Lester A. Dine) 100mm f/2.8 Macro 96
Micro-Nikkor 55mm P Auto 55mm f/3.5 (672490) 98
Micro-Nikkor 105mm P f/4 Macro Bellows Lens 101
Nikon Nikkor 28mm f/2.8 103
Micro-Nikkor 60mm f/2.8 D Lens 105
Nikon Nikkor 50mm f/1.8 AIS 108
Nikon Nikkor 24mm f/2.8 110
Voigtlander 40mm Ultron f/2.0 SL II 112
Nikon Nikkor 35mm f/2.8 AI K-Series 115
Nikon Nikkor 28mm-105mm 1:35/4.5mm D Zoom 117
Micro-Nikkor 105mm P f/4 Macro Lens 119
Nikon Nikkor 14mm-24mm AF-S f/2.8 G ED 122
Nikon Nikkor 50mm f/1.4 D 125
Nikon Nikkor 50mm AF-S f/1.4 G Lens 127
Sigma 180mm f/2.8 APO Macro EX DG OS HSM 128
The Exotic Nikkors and Other Industrial Lenses 130
The Exotic Nikkors 131
Industrial Macro and Close-Up Lens for Stacking 136
Using the Exotic Industrial Nikkors 144
The Exotic Macro Nikkors: An Update 147
The Nikkor Multiphot Machine 150
Lens: Macro-Nikkor 19mm, f/2.8, Multiphot 151
Lens: Macro-Nikkor 35mm, f/4.5, Multiphot 154

Lens: Macro-Nikkor 65mm, f/4.5, Multiphot 156
Lens: Macro-Nikkor 120mm, f/6.3, Multiphot 158
The Printing Nikkors 160
Lens: Printing Nikkor 75mm, f/2.8 160
Lens: Printing Nikkor 95mm, f/2.8 161
Lens: Printing Nikkor 105mm, f/2.8 163
Lens: Printing Nikkor 150mm, f/2.8 165
Lens: Nikkor “O” 55mm, f/1.2 CRT Oscilloscope 167
Lens: Repro Nikkor 85mm 170
Lens: Zeiss 74mm S-Planar f/4 172
Lens: Rodenstock Scitex-S3 89mm 173
Lens: APO El-Nikkor 105mm f/5.6 APO 175
Lens: APO El-Nikkor 210mm f/5.6 APO 177
Lens: Nikon Macro 120mm f/5.6 AM-ED lens 180
Lens: Schneider APO-Digitar 120mm M-26° MC 183
FOCUS STACKING COMMENTS 188
FASTER GLASS 188
BASIC FOCUS STACKING 189
SHORT STACKS 189
LONG STACKS 190
STACKING AT THE NARROW END 190
STACKING AT THE OPTIMUM APERTURE 190
STACKING AT THE WIDE END 190
FAST, SHARP, AND CORRECTED 191
FEATHERING BACKGROUNDS 191
STYLE ONE 191
STYLE TWO 192
PARTIAL STACKS AND SINGLE-FRAMES 192

BELLOWS AND TILT 192
DSLR OR TECHNICAL CAMERA? 193
MY FAVORITE CLOSE-UP LENSES 194
Main Lenses I use 194
Nikon AF Nikkor 300mm f/4 ED Lens PROCESS AND RESULT 195
STACKING SOFTWARE 196
RETOUCHING TIPS 196
USING PHOTOSHOP 197
The Voigtlander 125mm f/2.5 APO-Lanthar (CV-125) 198
THE SONY A7R3 200
NIKON D810 AND D850 203
NOTES ON THE Nikon D850 205
MORE ON THE NIKON D850 207
In Praise of the APO-El Nikkor 105mm 209
VOIGTLANDER 65MM MACRO APO-LANTHAR F/2 211
ZEISS MILVUS 35MM F/1.4 214
CLOSE-UP TECHNIQUES: CAMBO MINI-ACTUS ... 216
PRIME LENSES FOR CLOSE-UP WORK 219
FOCUS RAILS 220
EXTENSIONS 221
CLOSE-UP LENSES 221
COMBINING F/STOPS 221
SOMETHING ON MY PHOTO HISTORY 223
THE CAMBO ACTUS MINI 229
SELLING MY HASSEKBLAD X1D 231
MORE ON THE HASSELBLAD X1D 233
TECHNIQUE UPDATE 235

THE FUJIFILM GFX 50 AND CAMBO ACTUS 238
Test Results for a Few Close-Up lenses 241

Lenses That Can Be Used for Close-up Work

This is a collection of information on lenses related to use in close-up and macro photography, along with several essays and blogs I put together on some of the Nikon industrial lenses, often called the "Exotic Nikkors." I do this in my spare times, so the format may be a little rough, but the price is right. Hopefully, some few of you will find this material interesting and we can discuss.

Therefore, what follows is a bunch of lens profiles,

most of them macro or close-up lenses, but not all of them. Along with the macro lenses are a number of non-macro lenses that many of us already know. Why list these? Because I am always looking at how any lens can be used for close-up and macro work, even if it was not made for it. I try to bend any lens that I have (at least once) and put it to work (or crop) to see its results for close-up photography.

And following those lenses, as mentioned, is a series of what are known as industrial lenses, lenses used in enlargers, scanners, and high-tech machines, the so-called Exotic Nikkors and others.

There is a companion volume to this book having to do with macro and close-up equipment, and technique to be issued soon. It is titled "Close-up and Macro Photography." Enjoy.

http://spiritgrooves.net/pdf/e-books/Close-Up%20and%20Macro%20Photography%20V.0.pdf

Michael Erlewine
November 2017
Michael@Erlewine.net

P.S. Thanks to Roland Vink for useful comments, which I have appended with the tag RVink. Visit his very useful site on Nikon gear at:

http://www.photosynthesis.co.nz/nikon/lenses.html


© Michael Erlewine


m ∞ 5 3 2 1.5
0.45
0.43
22 16 11 8 5.6 4 2.5

Voigtlander 125mm f/2.5 Macro APO-Lanthar

Focal Length: 125mm
Widest Aperture: f/2.5
Narrowest Aperture: 22
Aperture Blades: 9
Filter Size: 58mm
Hood: Included, Square
Close Focus Distance: 14.96 inches (38 centimeters)
Reproduction Ratio: 1:1
Focus Throw: 630º
Weight: 28 ounces (794 grams)

Pros: Fast lens, very sharp lens, 9 blades, close focus, goes 1:1, long focus throw.

Cons: None. Build-quality is a little fragile; I have heard of several accounts of lenses breaking or needing service after heavy use. Also rather expensive, but IMO worth every penny.

I could write a book about this lens, but I will spare you that. The CV-125 is, hands down, the best all-around macro lens that I own and I use it all the time, even though I have a shelf full of some of the best macro lenses in the world at the ready. It has no major negatives. It is very fast, very sharp, focuses close, has a long focus throw, reproduced to 1:1, has 9 blades (great bokeh) – the works.

If I want to complain, it is not the lightest lens, but it is compared to anything in its class, so I am always happy to carry this piece of glass in the field.

The lens can be very difficult to find in the Nikon format and also very expensive, with copies now

going for $1700-2500 or so.

Despite all the good qualities, probably the features that set this lens apart from other fine macro lenses are the fact that it is truly apochromatic (APO) and has such an exceptional bokeh (lovely out-of- focus blur in the background).

Of course, IMO, I would add that it has a “magic” quality or “style” that few lenses have and that words can’t express and a very-long focus throw that makes macros and stacked-photos so very easy. I find it very stable when it comes to handling various types of light in the same frame, like shade with rays of sunlight. This is real workhorse and I have used mine day in and day out for years.

It focuses to 1:1 and lets you get very close in on your subjects. A feature not often mentioned about this lens is that it is also very sharp at mid-range and even at landscape distances. This is ”the little lens that could” and it does. If you ever find one, buy it. You will never be sorry.

Zeiss 55mm f/1.4 APO Otus Distagon

Focal Length: 55mm
Widest Aperture: f/1.4
Narrowest Aperture: 16
Angle of View: 28.24 degrees
Aperture Blades: 9
Filter Size: 77mm
Hood: Included
Close Focus Distance: 19.7 inches (.50m)
Reproduction Ratio: 1:7
Focus Throw: ~ 270º
Weight: 2.14 lb (970 g)

Pros: Best APO, Razor-Sharp

Cons: None. It is a heavier lens.

This is one of the finest lenses I have ever used, bar none, when it comes to being sharp wide-open and well corrected (apochromatic) and it is not even a close-up or macro lens, and is mere $3,990.00, but absolutely worth every penny.

This lens has a minimum-focus distance of 19.7" (.50m) and a healthy focus-throw. As far as close-up work, I can either crop what I want out of an image or add a small amount of extension. I can get away with adding the Nikon PK-11A 8mm extension tube to it, which shortens the near-focus distance, but at a sacrifice of some image quality wide-open. I have to stop the lens down to about f/4 to keep the sharpness, but that is not too bad for bokeh. More often, I use the K-1 Ring as extension, which is 5.8 mm. This the lens does not seem to mind so much, as to deterioration of the image. I use this often.

So this and the following lens are the two of the best lenses I have ever found. I use them all the time.


Apo Planar 1.4/85 ZEISS T*
Otus
1.4/85
∞
50
15
2
ft
m
16 8 4 4 8 16
16 11 8 5.6 4 2.8 2 1.4

Zeiss 85mm f/1.4 APO Otus Distagon T*

Focal Length: 85mm
Widest Aperture: f/1.4
Narrowest Aperture: 16
Aperture Blades:
9, rounde3d
Filter Size: 86mm
Hood: Included
Close Focus Distance: 2.62’ (80 cm)
Reproduction Ratio: 1:7.7
Focus Throw: ~ 270º
Weight: 2.51 lb (1.14
kg)

Pros: Best APO, Razor-Sharp
Cons: None, except it is not a close-up lens. It is a heavier lens.

This is one of the Zeiss Otus series, the finest lenses I have ever used, bar none, when it comes to being sharp wide-open and well corrected (apochromatic) and it is not even a close-up or macro lens, and is mere $3,990.00, but absolutely worth every penny.

This lens has a minimum-focus distance of 2.62’ (80cm) and a healthy focus-throw. As far as close-up work, I can either crop what I want out of an image or add a small amount of extension. I can get away with adding the Nikon PK-11A 8mm extension tube to it, which shortens the near-focus distance, but at a sacrifice of some image quality wide-open. I have to stop the lens down to about f/4 to keep the sharpness, but that is not too bad for bokeh. More often, I use the K-1 Ring as extension, which is 5.8 mm. This lens IMO does not lend itself to extension too well.


Otus
1.4/28
ft
m
1
6
2
∞
16 8 4 4 8 16

Zeiss 28mm f/1.4 APO Otus Distagon T*

Focal Length: 28mm
Widest Aperture: f/1.4
Narrowest Aperture: 16
Aperture Blades: 9
Filter Size: 95mm
Hood: Included
Close Focus Distance: 11.81” (30 cm)
Reproduction Ratio: 1:6.25
Focus Throw: ~ 270º
Weight: 3.06 lb (1.39
kg)

Pros: Best APO, Razor-Sharp Cons:
None. It is a heavy lens, not idea for
close-up work, but it works..

This is one of the finest lenses I have ever used, bar none, when it comes to being sharp wide-open and well corrected (apochromatic) and it is not even a close-up or macro lens, and is mere $4,990.00, but absolutely worth every penny.

This lens has a minimum-focus distance of 11.81" (30m) and a healthy focus-throw. As far as close-up work, I can either crop what I want out of an image or add a small amount of extension. I don’t like to add extension to this Lens, but the K-1 Ring as extension (which is 5.8 mm) works.

Zeiss 135mm f/2 APO Sonnar T* ZF.2

Focal Length: 135mm
Widest Aperture: f/2
Narrowest Aperture: 22
Aperture Blades: 9
Filter Size: 77mm
Hood: Included
Close Focus Distance: 2.62 feet (.80 m) Reproduction Ratio: 1:4
Focus Throw: ~ 270º
Weight: 2.02 lb (920 g)

Pros: Best APO, Razor-Sharp
Cons: None. Perhaps a little heavy.
Quite long.

This is not even a close-up or macro lens, but rather a telephoto, but it is so highly-corrected (so great) that I use it all the time and crop out the part of the photo I am after. Of course, with the Nikon D810/D850 as a camera I am working with 36 or 45 Mpx, so I have a lot to crop from. This is an exquisite lens that costs $2,122.00, but of course is worth it. I just sold some of the dozens of close-up lenses I never use and bought this one. It is perfect, but is not the easiest to use. It is a special lens for a certain kind of work, IMO.

The Zeiss 135mm It has a great focus-throw, but a not-so-great minimum close-focus distance of 2.62' (.80m), which is a ways back. Nevertheless, I use it and I use it all the time and am delighted with the results.

From RVink: I agree this is not a macro lens, but with a magnification ratio of 1:4, I do consider this a "close-up" lens. After all, 1:4 is half the magnification of the Zeiss 50/2 and 100/2 macros! This is sufficient for close-ups of larger flowers and insects."

I guess it depends on the interpretation of "close-up" - for me it is the ability to focus closer than normal without going into the "macro" range. The reason the close limit of 0.8m seems "way back there" is due to the relatively long focal length (which also permits a very generous working distance). Compared to other 135mm lenses, it is not way back there at all, it's very close! The Nikon AF-S 300/4 falls into the same

category with the same magnification at close range but with even greater working distance - 1.45m.

This lens is wicked sharp. I have all of the Zeiss Otus lenses (55mm, 85mm, 28mm) and this lens is as sharp (or sharper) than any of them. In fact, when I notate which lens I am using, I call this the Zeiss Otus 135mm because it was the precursor and harbinger of the who Otus series. You can put some extension on this lens to get closer, but I never do. And this because it is so wonderfully sharp that dulling it even a little goes against the grain for me.


Made in Japan
1:10
10 6 3 2
∞ 5 2 1 0,7
22 16 8 8 16 22
22 16 11 8 5,6 4 2,8 2

Zeiss 50mm f/2 ZF.2 Makro-Planar

Focal Length: 50mm
Widest Aperture: f/2
Narrowest Aperture: 22
Aperture Blades: 9
Filter Size: 67mm
Hood: Included
Close Focus Distance: 9.5 inches (24 centimeters)
Reproduction Ratio: 1:2
Focus Throw: 300º
Weight: 18.72 ounces (531 grams)

Pros: Very sharp lens, fast lens, 9 blades, good focus distance, good focus throw.

Cons: No 1:1, heavy-ish. Not well corrected.

This is a wonderful little lens, more interesting to me than its big brother the 100mm Makro-Planar. It is very, very sharp and with such a close focus you can treat it like a wide-angle lens and poke it right into the middle of things. It stacks very well and has a luxurious 300 degrees focus throw. It does not reach 1:1, but I don't care, because I don't use if for the nitty- gritty ultra-close shots. I treat it, as mentioned above, more as a wide angle lens and reserve it for that.

It has a superb build and if there is any fault at all with this lens (IMO) it is that it may be perhaps too "contrasty" and not corrected enough for aberration, etc. and not quite subtle enough in color. It is not an

APO lens and that is the only thing I have noticed that I do not love. However, I finally sold this lens because, although I like it, I never use it because of the chromatic aberration, etc. I can no longer recommend it for my kind of work.


Nikon
45mm 1:2.8D ED

Micro-Nikkon 45mm f/2.8 PC-E Tilt/Shift

Focal Length: 45mm
Widest Aperture: f/2.8
Narrowest Aperture: 32
Aperture Blades: 9
Filter Size: 77mm
Hood: HB-43
Close Focus Distance: 10 inches (25 centimeters)
Reproduction Ratio: 1:2
Focus Throw: 120º
Weight: 26 ounces (737 grams)

Pros: Fast lens, 9 blades, very sharp, good close focus. Macro lens.

Cons: Short focus throw, does not go to 1:1, tilt/shift features require a learning curve.

I have all three of the most recent Nikon PC (tilt/shift) lenses, this one plus the 85mm and 24mm PC. While all three are exemplary lenses, I find the 45mm PC the most useful for macro and close-up work. The “PC” stands for perspective control through the tilt and shift features.

The tilt feature allows the lens to tilt (either up and down, or right and left) a total of 8.5 degrees. There are many tutorials on the web for learning to use this feature, but the idea is that in any photo there is one and only one plane of focus. “Tilt” allows the lens to align the plane of the lens with that of the image plain. An example might be a field of flowers stretching toward the horizon. Instead of just having the front flowers in focus, by tilting the lens it can be possible have the whole field in focus.

The shift feature allows the lens to be shifted right or left (or up and down) bringing what normally would be out-of-frame in-frame without having to move the camera. Notice that these lenses have large box-like Mid-sections. This allows a lens to have a larger image circle than a normal lens, so that shifting the lens to either side allows more or less of the subject to come into view. At total shift of 11.5 mm to either side is permitted.

In addition the whole lens barrel can be rotated plus or minus 90-degrees by 30-degree increments allowing you to combine the tilt/shift features in various combinations. Sound amazing? It is, but don't run out and buy one unless you really need these features. These lenses are bulky and heavy. Both the tilt and shift features (and especially the tilt feature) have a steep learning curve and are not easy to learn. The focus throw is very smooth, but sadly very short, making it not ideal for close-up focus stacking.

That being said, the Nikon 45mm PC-E lens is a lens I frequently carry with me for wider views than my CV-125 requires. Using this lens, I can stick it very close to a flower and capture it and the surrounding space easily. The shift feature allows me to take three photos (left-shift, middle, right-shift) and combine them with a stitching program to produce a seamless mini-panorama. Since all three photos already share a common image circle within the camera, this guarantees a seamless panorama. However, I find that I can only shift (left or right) one-half of the permitted distance without causing some vignetting.

Still, I can produce a three-shot panorama with no special panorama head in a jiffy and they are excellent. I don’t feel they are as perfect for stacked three-shot panoramas using the CV-125 and a pano-head, however.

That being said, the lens is just not well corrected for my use. It is very nice and I love it, but I sold it off as I never use it because of the image quality. Most photographers would not care, perhaps, but I do. So I cannot recommend it for fine work.


Nikon
PC-E NIKKOR
24mm 1:3.5D ED

Nikon Nikkor 24mm PC-E f/3.5

Focal Length: 24mm
Widest Aperture: f/3.5
Narrowest Aperture: 32
Aperture Blades: 9
Filter Size: 77mm
Hood: HB-41
Close Focus Distance: 8.267 inches (21 centimeters)
Reproduction Ratio: 1:2.7
Focus Throw: 90º
Weight: 25.76 ounces (730 grams)
Pros: Sharp lens, 9 blades, tilt/shift, very close focus distance.

Cons: No 1:1, very short focus throw, heavy.

Pros: Fast lens, 9 blades, very sharp, good close focus. Cons: Short focus throw, does not go to 1:1, tilt/shift features require a learning curve.

I have all three of the most recent Nikon PC (tilt/shift) lenses, this one plus the 85mm and 45mm PC. The "PC" stands for perspective control through the tilt and shift features.

The tilt feature allows the lens to tilt (either up and down, or right and left) a total of 8.5 degrees. There are many tutorials on the web for learning to use this feature, but the idea is that in any photo there is one and only one plane of focus. "Tilt" allows the lens to align the plane the lens with that of the image plain. An example might be a field of flowers stretching toward the horizon. Instead of just having the front

flowers in focus, by tilting the lens it can be possible have the whole field in focus.

The shift feature allows the lens to be shifted right or left (or up and down) bringing what normally would be out-of-frame in frame without having to move the camera. Notice that these lenses have large box-like Mid-sections. This allows a lens to have a larger image circle than a normal lens, so that shifting the lens to either side allows more or less of the subject to come into view. At total shift of 11.5 mm to either side is permitted.

In addition the whole lens barrel can be rotated plus or minus 90-degrees by 30-degree increments allowing you to combine the tilt/shift features in various combinations. Sound amazing? It is, but don't run out and buy one unless you really need these features. These lenses are bulky and heavy. Both the tilt and shift features (and especially the tilt feature) have a steep learning curve and are not easy to learn. The focus throw is very smooth but also very short, making it not ideal for close-up focus stacking.

That being said, the Nikon 24mm PC-E lens is a lens I don't frequently carry with me for wider views than my CV-125 requires. I used to favor the 45mm PC-E lens, but like all the PC lenses, they are not quite well-corrected enough IMO.

Using the 24mm PC-E lens I could stick it very close to a flower and capture the flower and the surrounding space easily. The shift feature allows me to take three photos (left-shift, middle, right-shift) and combine them with a stitching program to produce a seamless mini- panorama. Since all three photos already share a common image circle within the camera, this

guarantees a seamless panorama. However, I find that I can only shift (left or right) one-half of the permitted distance without causing some vignetting.

Still, I can produce a three- shot panorama with no special panorama head in a jiffy and they are excellent. I don’t feel they are as perfect for stacked three-shot panoramas than using the CV-125 and a pano head, however.

That being said, the lens is just not well corrected for my use. It is very nice and I love it, but I sold it off because I never use it because of the image quality. Most photographers would not care, perhaps, but I do. So I cannot recommend it for fine work.


Carl Zeiss
1:2
ft
0,44
m
∞ 10 5 3 2 1,5 1
22 11 11 22
22 16 11 8 5,6 4 2,8 2

Zeiss 100mm f/2 ZF.2 Makro-Planar

Focal Length: 100mm
Widest Aperture: f/2
Narrowest Aperture: 22
Aperture Blades: 9
Filter Size: 67mm
Hood: Included
Close Focus Distance: 16.8 inches (43 centimeters)
Reproduction Ratio: 1:2
Focus Throw: 360º
Weight: 26.5 ounces (751 grams)

Pros: Very sharp lens, Fast lens, good focus throw, 9 blades.

Cons: No 1:1, heavy-ish, near focus could be closer. Too contrasy and not well corrected.

This is a wonderful lens and, like its little brother the 50mm Makro-Planar, it very, very sharp. The build is tough and elegant. I wish its near-focus distance was a little shorter and it does not go to 1:1, which is perhaps its main fault aside from too much CA. It is no wonder it has such fanatical followers. As for my use of it, IMO there is a little too much contrast in the output and the colors are not APO and seem to lack some of the subtlety found in APO lenses like the CV-125 APO-Lanthar, Leica 100mm APO Elmarit R, and the Coastal Optics 60mm APO lens.

That aside, this would be a wonderful lens for anyone who is not fussy about lens correction. I cannot use and sold my copy because the CA and general correction of the lens just is not there. I don’t recommend this lens.


Nikon
AF-S Micro NIKKOR 60mm 1:2.8G ED

Micro-Nikkor 60mm f/2.8 G

Focal Length: 60mm
Widest Aperture: f/2.8
Narrowest Aperture: 32
Aperture Blades: 9
Filter Size: 62mm
Hood: HB-42
Close Focus Distance: 7.28 inches (18 centimeters)
Reproduction Ratio: 1:1
Focus Throw: 120º
Weight: 15 ounces (425 grams)

Pros: Fast lens, 9 blades, close focus, VERY sharp, goes to 1:1.

Cons: Short focus throw.

This is a real workhorse of a macro lens, especially for copy work. I shot over 30,000 concert posters with this lens and it worked better than any other lens I could put my hands on. If I had the Coastal Optics 60mm at the time, perhaps only that would have been a better lens for copy work.

The 60mm Nikon macro is not what the 105mm focal range can provide and most macro photographers want that extra distance between them and their subjects. The 60mm does not provide that and I never use it for that ultra-close work that the 100mm or 200mm macro lenses provide. Instead, 60mm macros are for larger subjects, what I call dioramas or mini-landscapes such as a close-up of a flower and as

much of the bush it is on also in the same frame, and so on.

If you are thinking of macro as the eye of the dragonfly or the bee's knees, this lens is not that. But the more I learn about close-up photography, the more the 60mm focal length is becoming useful to me. This lens is all about context and story. Wider-angle lenses allow us to tell more of a story than do the longer focal lengths.

However, the 120º focus throw is just too short and makes focusing a real problem, especially if you want to stack photos. The 1:1 image frame is a real plus and makes this lens very attractive. And it is light and can slip into a pocket. This is not an APO lens, but I still use it once in a while.

There are two versions of this lens and I have them both. The newer version 60mm f/2.8 G is improved over the earlier 60mm f/2.8 D, so that is the one to get. However, it is a "G" lens and can only be used on a Nikon, which I don't like.

These days, however, I don't use either of them because of their lack of correction. Great copy lenses!


Nikon
AF-S NIKKOR 35mm 1:1.4G

Nikon Nikkor 35mm f/1.4 G

Focal Length: 35mm
Widest Aperture: f/1.4
Narrowest Aperture: 16
Aperture Blades: 9
Filter Size: 77mm
Hood: HB-59
Close Focus Distance: 9.85 inches (25 centimeters)
Reproduction Ratio: 0.179x
Focus Throw: 090º
Weight: 21.165 ounces (600 grams)

Pros: Very fast lens, VERY sharp, 9 blades, short focus.

Cons: Short focus throw, no 1:1, heavy-ish. Autofocus problems.

This quite new and very expensive lens is very, very sharp. And while it may have been designed (only 90-degree focus throw) for people photos and as a walking-around lens, it makes a very good wide-angle close-up lens for macro shooters. With a very close near focus (< 10 inches), you can poke this little baby right in the midst of a bunch of flowers and get one very close and see everything else in the vicinity at the same time.

There has been some discussion about auto-focus not being exact on this lens but as a macro shooter that means little to me. I shoot with manual focus anyway. I am sorry the focus throw is so darned short, which makes focus stacking trickier than it otherwise would have been. And of course, as a wide angle it

does not go to 1:1. There are older Nikon wide-angle lenses (35mm and 28mm) that also do a superb job at a much lower cost, so don’t ignore those.

IMO this is an OK lens that is very useful for mini-landscapes, dioramas, and the like plus it is great for people and parties at the same time. The lack of a decent focus throw, which I need for stacking focus led me to sell this lens.


coastal
60mm 1:4 UV-VIS-IR Apo Macro
Made in USA

Coastal Optics 60mm f/4.0 APO Macro

Focal Length: 60mm
Widest Aperture: f/4
Narrowest Aperture: 45
Aperture Blades: 7
Filter Size: 52mm
Hood: Does not include a hood. Use Nikon HR-2
Close Focus Distance: 10.4 inches (26 centimeters)
Reproduction Ratio: 1:1.5 (2/3rds original size)
Focus Throw: 210º
Weight: 19 ounces (535 grams)

Pros: Wickedly sharp, short focus distance.

Cons: Slow lens, only 7 blades, short focus throw, does not go to 1:1, hot spot at 1:3. No hood. Hot spot.

Aside from being very expensive ($4500), the CO-60 APO lens is somewhat of a specialized lens. It is designed for use not only in the visual spectrum but also in the infrared and ultra-violet spectrums on either side of the visual spectrum. It was designed for forensic and scientific use. If you were looking for a copy-camera lens in a studio, this would be just about perfect. Lens expert Lloyd Chambers states that the CO-60mm is “a reference lens for other lenses… On a scale of 1 to 5, it is a 5+.”

However, it does have its problems; foremost among them is the fact that this lens has a prominent hotspot around magnifications of 1:3, where I like to shoot. For distances longer than this, there is no problem.
However, as a macro photographer the 1:3 range means I have run into these hotspots many times and

they do ruin a photo. Not sure what the thinking is on why such an expensive and perfect lens should have such a glaring fault. Perhaps it is that we should be grateful to have this fantastic lens, warts and all. A workaround is to use the very smallest extension ring to help bypass the hotspot range. Another trick is to use a high-megapixel camera like the Nikon D3x and avoid the hotspot range and then crop out what you are trying to capture, given the extra pixels. I have done both successfully, but what a PITA.

Aside from the hotspot, I have other issues with this lens, in particular the very short focus throw of around 210º degrees. An incredible error for a macro lens IMO!

Compared to 630º on the CV-125, 210º is difficult, especially since a focal length of 60mm is wide enough that even the smallest change in the focusing barrel produces a noticeable change. This makes it hard to focus stack with the CO-60mm. Macro lenses benefit from having long focus throws, the more so the wider they get.

The other issue that I have encountered, although no one else seems to worry about this, is that when shooting in mixed light such in the shadows of a forest canopy where a shaft of sunlight is cutting through the shade, the CO-60mm appears to be more sensitive to light dynamics. The result is the need to use diffusers carefully to filter the brighter light areas. I don’t like that either.

That being said, this is a wonderful lens indeed. It comes with no hood, but really needs one. I use the rubber hood, Nikon HR-2 on my copy. If you need, a reference lens for the truest color rendition, this

might be it. It is VERY well corrected. However, all of its poor qualities led me to sell it. At the end, I had to mount this lens on a camera on a focus rail to do find stacking. That is not something I was willing to do. So, take note.


PRO OPTIC
58mm
MC-UV
0.5
0.45
1.75
1.5
16 8 8 16
16 11 8 5.6 4 2.8 2 1.4

Voigtlander 58mm f/1.4 Nokton

Focal Length: 58mm
Widest Aperture: f/4
Narrowest Aperture: 16
Aperture Blades: 9
Filter Size: 58mm
Hood: Use Pearstone 58mm snap-on Tulip hood.
Close Focus Distance: 17.76 inches (45 centimeters)
Reproduction Ratio: 1:5.8
Focus Throw: 210º
Weight: 11.29 ounces (320 grams)
Price 2010: $409 at B&H.

Pros: Very fast lens, very sharp lens, 9 blades.

Cons: Not close focus, no 1:1, 16mm smallest aperture.

This lens is an all-metal construction with a hard-rubber focusing ring. The included lens cap is a pain and should not be used as it requires you to remove the screw-in hood each time you use it. I bought a Nikon 52mm pinch-cap and that solved the problem. I intend to find a rubber 52mm hood and get rid of the original metal dome.

No less of an authority than Lloyd Chambers states that this lens is equal to the Zeiss 50mm f/1.4 Makro-Planar and better than the “Holy Grail” of Nikons, the legendary Noct-Nikkor 58mm/f.1.2. This is saying a lot and owning a Noct, I don’t find that to be true. Test results by others show this lens is not great wide open, but very strong from f/4 or f/5.6 and even stronger at f/8 and fine at f/11. This is unusual and

makes the Nokton perfect for close-up nature photography, but not for focus stacking wide open, which is what I like to do. It is also one of the least-expensive top quality lenses available today.

From RVink: "Better than the 'holy grail' of Nikons, the legendary Noct-Nikkor 58mm f/1.2".

I think it depends on what is meant by "better". The Voightlander has less field curvature so the corners are rendered sharper for landscapes etc, but I don't think this lens has the melting-soft bokeh of the Noct. The Noct is also better corrected for coma due to the aspheric front elements so it renders point sources (night time shots) better. However, for general use perhaps the Nokton does appear sharper, and it's certainly cheaper, but for portraits and night shots I prefer the Noct hands down. I have the Nokton, but seldom use it.


Nikon
HB-40
Nikon
AF-S NIKKOR
70
60

Nikon Nikkor 24mm-70mm AF-S f/2.8 G ED

Focal Length: 24mm-70mm
Widest Aperture: f/2.8
Narrowest Aperture: 22
Aperture Blades: 9
Filter Size: 77mm
Hood: HB-40
Close Focus Distance: 14.96 inches (38 centimeters)
Reproduction Ratio: 1:3.7
Focus Throw: 90º
Weight: 31.68 ounces (898 grams)

Pros: Fast lens, sharp lens, close focus distance, 9 blades.

Cons: No 1:1, very short focus throw, heavy. Not well enough corrected.

This is not a macro lens or even a close-up lens, but at the wide end it can do in a pinch for close-up mini-landscape shots. It is very sharp, fast, but has a very limited focus throw, typical for a lens designed (I guess) for shooting moving targets. Also, the lens is not well-enough corrected for my work. I sold my copy. It was good for family shots, but that's about it for my use.


Nikon
AF Fisheye
NIKKOR
ft 1 0.85
m 0.3 0.25
16 11 8 8 11 16
16mm
1:2.8D
22 16 11 8 5.6 4 2.8

Nikon Nkikor 16mm f/2.8 Fisheye

Focal Length: 16mm
Widest Aperture: f/2.8
Narrowest Aperture: 22
Aperture Blades: 7
Filter Size: CAP Hood: Built In
Close Focus Distance: 9.84 inches (25 centimeters)
Reproduction Ratio: 1:10
Focus Throw: 60º
Weight: 10.12 ounces (287 grams)

Pros: Fast lens, sharp-ish, good close focus, goes 1:1, 7 blades.

Cons: Very short focus throw, not sharp enough for the finest work.

The Nikon 16mm Fisheye lens is the opposite of a macro lens, which oddly enough makes it useful to me in my work as antidote for what I normally do. Instead of getting close-up, this rectilinear (framed like any other lens and not a circular fisheye lens) is able to cram almost the entire world into the shot, including my feet and too often the tripod itself.

Thanks to special software in post (I use the built-in feature in Adobe Lightroom) the resulting photos can be more-or- less straightened out to appear as a normal photo, but one maybe on LSD. For myself, I love this lens and it is small enough to jam in a pocket or a bag. With a near focus distance of some 10

Inches, I can highlight a single flower close-up and have the whole meadow in which it sits looking over its shoulder.

Although this is lens is relatively sharp, it is not sharp enough to be totally convincing, but that is not its purpose anyway. I love the 3D or otherworldly sense that this lens offers and I have sought to replicate this effect but with deep focus by using a panoramic head and focus stacking, and with some success. It took my years to succumb to owning this lens, but that was a mistake on my part. The 16mm rectilinear fisheye is a lens I would not part with. There is also an earlier version (which I have and use) that wide open is f/3.5. This is much sharper and the one to get, but it is older, etc.

From RVink: Closer focusing can be achieved by removing the rear filter, at the expense of losing infinity focus.


APO-MACRO-ELMARIT-R 1:2.8/
20 30 50 ∞ feet
25 3 4 5 7 10 20 ∞ m
100
22 16 8 4 2.8 4 8 16 22
2.8 4 5.6 8 11 16 22

Leica 100mm Apo Macro Elmarit R Lens f/2.8

Focal Length: 100mm
Widest Aperture: f/2.8
Narrowest Aperture: 22
Aperture Blades: 7
Filter Size: 60mm
Hood: Pull out hood.
Close Focus Distance: 17.71 inches (45 centimeters)
Reproduction Ratio: 1:2/1:1
Focus Throw: 710
Weight: 27 ounces (765 grams)

Pros: Fast lens, 7 blades, reasonable short focus, great focus throw.

Cons: Does not go to 1:1 without help, no automatic aperture (have to open to focus and close to shoot).

This is one of the legendary macro lenses, a true APO (apochromatic) lens. 100mm is a great macro focal length, and the focus throw is a whoppin' 710º, just what a focus- stacker like me is looking for – incremental focus. This lens was never made for the Nikon mount, so if you find one of these and want it on a Nikon, you will have to make the conversion yourself. That is what I did.

Not only is this one of the sharpest macro lenses ever made, but it has an almost movie-like feel to the color, very soft and delicate. I reminds me of Haselblad color. It does not got to 1:1, but only

to 1:2, so that is not great, although the accompanying Elpro diopter can be purchased which brings it to 1:1. However, as a rule I don't like close-up adapters, although this is probably the best one I have ever seen. But there is some bad news with this lens on a Nikon Camera.

There is no way that you can enable the ability of this lens on a Nikon to automatically open up when you use the viewfinder and then stop down at the appropriate aperture when the shot is taken. Can't be done, because what is needed is a mechanical lever and it just is not present. So, what this means is that for every shot you have to manually turn the aperture ring wide open, focus, and then look to see and turn the aperture to where you want it for the exposure.

This is an acquired taste and the learning curve involves forgetting to stop down and the resultant over-exposure. The net result is that, although this is one of the great lenses, I seldom choose it when I have other lenses that will let me see at the widest aperture in the viewfinder and automatically stop down for the exposure.

This lens is outstanding (a class act) and comes in a little form-fitting leather case that zips up.


ELPRO 1:2-1:1 FOR R 2.8/100

Leica Elpro 1:2-1:1 Close-Up Lens R

Focal Length: 100mm
Widest Aperture: f/2.8
Narrowest Aperture: N/A Aperture Blades: N/A Filter Size: 60mm
Hood: Included
Close Focus Distance: Filter
Reproduction Ratio: 1:2/1:1
Focus Throw: N/A, filter
Weight: 7 ounces (198 grams)

Pros: Works quite well with the 100mm Leica

Cons: Still is an add-on lens to get to 1:1.

This is one of the legendary macro lenses, a true APO (apochromatic) lens. 100mm is a great macro focal length, and the focus throw is a whoppin' 710º, just what a focus- stacker like me is looking for – incremental focus. This lens was never made for the Nikon mount, so if you find one of these and want it on a Nikon, you will have to make the conversion yourself. That is what I did.

Not only is this one of the sharpest macro lenses ever made, but it has an almost movie-like feel to the color, very soft and delicate. It does not got to 1:1, but only to 1:2, so that is not great, although the accompanying Elpro diopter can be purchased which brings it to 1:1. However, as a rule I don't like close-up adapters, although this is probably the best one I have ever seen. But there is some bad news with this lens on a Nikon Camera.

There is no way that you can enable the ability of this lens on a Nikon to automatically open up when you use the viewfinder and then stop down at the appropriate aperture when the shot is taken. Can't be done because what is needed is a mechanical lever and it just is not present. So, what this means is that for every shot you have to manually turn the aperture ring wide open, focus, and then look to see and turn the aperture to where you want it for the exposure.

This is an acquired taste and the learning curve involves forgetting to stop down and the resultant over-exposure. The net result is that, although this is one of the great lenses, I seldom choose it when I have other lenses that will let me see at the widest aperture in the viewfinder and automatically stop down for the exposure.

This lens is outstanding (a class act) and comes in a little form-fitting leather case that zips up.


Nikon
HB-30
Nikon
AF-S MICRO NIKKOR 105mm 1:2.8G ED
VR

Micro-Nikkor 105mm f/2.8 VR Lens

Focal Length: 105mm
Widest Aperture: f/2.8
Narrowest Aperture: 32
Aperture Blades: 9
Filter Size: 62mm
Hood: HB-38
Close Focus Distance: 12.36 inches (31 centimeters)
Reproduction Ratio: 1:1
Focus Throw: 270º
Weight: 27.84 ounces (789 grams)

Pros: Sharp lens, 9 blades, good near focus, ample focus throw, VR, gets to 1:1.

Cons: Could be sharper, a little heavy. Not quite well-enough corrected.

This is the current version of the classic Nikon 105mm Micro-Nikkor but is much bulkier, heavier, and more expensive than pulling an earlier model off Ebay. I would stick with the earlier models since (believe it or not) they are sharper, at least for very close work.

There is one and only one reason I still own this lens and that is for hand-held chase-the-butterfly photography. For the most part I am always on a tripod, but for some subjects I need to sneak up on them and follow their movements. The addition of the VR in this version works quite well and makes it the best lens for this kind of job.

The VR 105mm lens also is relatively fast and goes to the 1:1 reproduction ratio without the addition of extension tubes or close-up lenses. This alone is a big plus. In fact, if I sit down and add up all the qualities needed for a good macro lens, the Nikon 105mm VR is always near the top. It is fast, goes to 1:1, focuses close, has 9 blades for good bokeh, and has a reasonable focus throw. All these added together suggest that this might be the best all-around macro lens for beginners. If you don't have a lot of money to spend on a macro lens, this is probably your best bet IMO.

OLDER 105mm Miicro-Nikkors

There were a number of older 105mm macros. Here are the specs for the version before the VR release. All of these earlier 105mm macros are good basic macro lenses and worth picking up if the price is right.

Lens: Micro-Nikkor 105mm f/2.8 V
Widest Aperture: f/2.8
Narrowest Aperture: 32
Aperture Blades: 9
Filter Size: 52mm-62mm
Hood: HS-7
Focus Throw: 180º
Weight: 19.75 ounces (560 grams)

Pros: Sharp lens, 9 blades, good near focus

Cons: Could be sharper, a little heavy, marginal focus throw.


Nikon
HB-55
MADE IN JAPAN
Nikon
N
AF-S NIKKOR 85mm 1:1.4G

Nikon Nikkor 85mm f/1.4 G

Focal Length: 85mm
Widest Aperture: f/1.4
Narrowest Aperture: 16
Aperture Blades: 9
Filter Size: 77mm
Hood: N/A
Close Focus Distance: 36 inches (91 centimeters)
Reproduction Ratio: 1:8.3
Focus Throw: 90º
Weight: 20.98 ounces (595 grams)

Pros: Very fast lens, VERY sharp, 9 blades.

Cons: long focus distance, no 1:1, very short focus throw, heavy-ish. Not a close-up lens.

I mention this and the new “D” version of the classic 85mm f/1.4 not because I use it often but because it is a sharp lens that many professional photographers already have in their kit. I use it once in a while for extremely low-light occasions for shooting mid-sized bushes, plants, etc. Actually, more of the time now in low-light situations I am now using the D850 and pushing the ISO, so I list it here just to keep it in mind.


Nikon ED

Micro-Nikkor 70mm-180mm AF f/4.5-5.6 D

Focal Length: 70mm-180mm
Widest Aperture: f/4.5-5.6
Narrowest Aperture: 32-40
Aperture Blades: 9
Filter Size: 62mm
Hood: HB-14,HN-23
Close Focus Distance: 19.42 inches (49 centimeters)
Reproduction Ratio: 1:32/1:3.2
Focus Throw: 180º
Weight: 35 ounces (992 grams)

Pros: Zoom macro lens, 9 blades, reasonable focus throw. Amazing lens.

Cons: VERY slow lens, long near focus, does not get close to 1:1, heavy.

The 70-180mm Micro-Nikkor is a nice idea, a macro lens that zooms. I used this lens almost exclusively for almost two years, so I really know it inside and out. It is nice to zoom around, to pull out or focus in to adjust a shot without having to move the tripod. All this is fine. But I never do much macro or close-up work at 70mm. Most to all is done at the other end of the focus range, around 180mm and when down there the f-stop for this lens is f/5.6 which (simply put) is too damned dim for my eyes in the viewfinder. I like the early morning light of dawn or the twilight to shoot and I find there is not enough light to see to focus with this lens, especially if I want to stack photos. The viewfinder is dark at f'/5.6 except in bright light. Why bother?

I will say that there is a “magic” with this lens that I do love. Somehow, the images have an almost film look to them which I like. And the lens is sharp enough, but not tack sharp and the resulting photos tend to be too dark or heavy/contrast-y in some sense not present in my Zeiss or Voigtlander lenses. And it weighs almost two pounds!

If you work in bright light a lot, you might consider this lens. Otherwise, you are better off with a lens that will go 1:1 and is faster like the Nikon 105mm Micro-Nikkors.

From RVink: "...around 180mm where this lens is f/5.6 which is too darned dim for my eyes in the viewfinder"

True, but it is worth noting the aperture does not get slower as you focus closer, unlike most other macro lenses. Most macros such as the Nikon 60/2.8, 105/2.8 and 200/4, the aperture drops to f/5 or f/5.6 at close range, so are not really faster in the macro range. It is not well corrected IMO.

It achieves this trick by reducing the focal length at close range instead. The result is the working distance is rather short. It is not a replacement for the 200 Micro where the greater working distance and smaller angle of view is desirable. It's also not a replacement for the 105's greater magnification, especially when the 105 is used with teleconverters, extension or combinations to achieve reproduction ratios greater than 1:1. However the ability to zoom makes it an extremely flexible lens.


Nikon ED

Micro-Nikkor 200m AF f/4 ED-IF Macro

Focal Length: 200mm
Widest Aperture: f/4
Narrowest Aperture: 32
Aperture Blades: 9
Filter Size: 62mm
Hood: HN-30, HN-23, HN-30
Close Focus Distance: 19.68 inches (50 centimeters)
Reproduction Ratio: 1:1
Focus Throw: 300º
Weight: 41.6 ounces (1179 grams)

Pros: Very sharp lens, gets to 1:1, good focus throw, 10 inches from front of lens, rotating collar.

Cons: Slow lens, heavy, not great bokeh. Not well enough corrected for my work.

This is probably Nikon's sharpest macro lens and also its heaviest (over two pounds), so it really can only be used effectively on a solid tripod. This lens is well built, very sharp, and the focus throw is a healthy 300 degrees, which is good for focus stacking. My only complaint is that the f/4 wide aperture dims my viewfinder too much for really low light work, and it is heavy!

According to Canon users this Micro-Nikkor 200mm lens bests even the classic Canon 180mm f/3.5 L USM. This lens can also be used for normal landscape photography as can any macro lens. Not

all macros are sharp for distance shots, but this lens is, so it has a dual purpose, macro and landscape.

This is an auto-focus lens, but it is quite slow and no good macro shooter I have met ever uses auto-focus except perhaps to jump to the general ballpark area for the shot. This lens has internal focusing, so there is no change in the lens length while focusing. The tripod collar rotates 90-degrees so you can switch from horizontal to vertical (or back) in a moment, which is a real plus.

However it does get to 1:1 and is as sharp as you could want (a classic), so it is the favorite of many Nikon macro shooters. I have one but use it seldom as the Voigtlander 125mm APO is better in all ways I care about.

Lens expert Björn Rörslett points out that if you use the 6T close-up lens to extend the reproduction ratio, it should be mounted in reverse on this lens to obtain maximum corner sharpness. The lens collar that comes with this lens is weak and easily is broken.
Instead, I use a lens collar from Kirk Enterprises (part # NC-300) which avoids that problem.

I finally sold my copy for lack of use.


Nikon
AF NIKKOR
35-70mm
1:2.8 D
M f=35
35
50
70
22 16 11 8 5.6 4 2.8

Nikkor 35-70mm AF Zoom f/2.8 D Lens

Focal Length: 35mm-70mm
Widest Aperture: f/2.8
Narrowest Aperture: 22
Aperture Blades: 7
Filter Size: 62mm
Hood: HB-1
Close Focus Distance: 14 inches (36 centimeters)
Reproduction Ratio: 1:4.3
Focus Throw: 360º
Weight: 23.43 ounces (664 grams)
Price 2011: Approximately $300 on Ebay.

Pros: Fast lens, sharp lens, 7 blades, close focus distance, goo focus throw.

Cons: No 1:1, heavy.

This was for years one of Nikon's best and sharpest lenses. This is not a dedicated macro lens, but has a macro mode which lets you get to around 14 inches (24 inches is as close as the non-macro mode allows). The macro mode is a little softer than the standard mode. Although the lens is an early auto-focus lens, in macro mode it defaults to manual focus, which is what macro shooters need anyway.

I list this lens because I had it early on and it is a kind of lens for all seasons, even if it is an old-ish lens by this point. It has those ancient pull-out tubes, which are not my favorite. Still, some of you just starting out and on a budget could pick up a copy that will do portraits, landscapes, and even a little macro. There is no question it is a sharp lens. It has a solid build.


F 5.6 4 2.8 2 2 2.8 4 5.6 R
DEFOCUS IMAGE CONTROL
M A
Nikon
135mm
1:2
16 11 8 5.6 4 2.8 2

Nikon Nikkor 135mm AF DC f/2

Focal Length: 135mm
Widest Aperture: f/2
Narrowest Aperture: 16
Aperture Blades: 9
Filter Size: 72mm
Hood: BUILT-IN
Close Focus Distance: 3.6089 ‘ (1.0999 meters)
Reproduction Ratio: 1:7.1
Focus Throw: 130º
Weight: 30.68 ounces (870 grams)

Pros: Fast lens, sharp lens, 9 blades.

Cons: Long focus distance, no 1:1, very short focus throw, heavy.

This is not a macro or a really a close-up lens, but rather a portrait lens that features a de-focus control that allows you to selectively blur the background. It is useful only for mini- landscapes, plants, bushes, and so on.

The 105DC (39.37 inches) is similar.


Nikon
AF NIKKOR
M A
85mm
1:1.4D
16 11 8 5.6 4 2.8 2 1.4

Nikon Nikkor 85mm f/1.4 D

Focal Length: 85mm
Widest Aperture: f/1.4
Narrowest Aperture: 16
Aperture Blades: 9
Filter Size: 77mm
Hood: HN-31
Close Focus Distance: 33.46 inches (85 centimeters)
Reproduction Ratio: 1.9.09
Focus Throw: 90º
Weight: 19.4 ounces (550 grams)

Pros: Very fast lens, very sharp, 9 blades

Cons: No close distance, no 1:1, heavy, short focus throw.

Sharp lens, but not recommended for close-up work.


Nikon
AF-S NIKKOR 300mm 1:4D

Nikon Nikkor 300mm AF-S f/4 ED

Focal Length: 300mm
Widest Aperture: f/4
Narrowest Aperture: 32
Aperture Blades: 9
Filter Size: 77mm
Hood: Built-in
Close Focus Distance: 4.75721 ‘ (1.4499 meters)
Reproduction Ratio: 1:3.7
Focus Throw: 180º
Weight: 50.79 ounces (1437 grams)

Pros: Sharp lens, 9 blades, short focus distance for a telephoto.

Cons: No 1:1, short focus throw, heavy (of course).

What is a 300mm lens doing in the same context as macro and close-up lenses? This very sharp telephoto lens is here for one purpose and that is for use with the Nikon D810/D850 and that only thanks to the fact that it has relatively the shortest near distance of any good-sized telephoto lens, a little under five feet. Attach the Nikon 300mm f/4 lens on a D850 and you can pick off frogs in the middle of a pond and, because the resulting photo has so many megapixels, crop out the frog from the center of the image and still have enough pixels to make a decent photo out of your crop.

In addition, if you put the Nikon AF-S TC-20E-III 2x Teleconverter on any full-frame Nikon you can get right up close and take decent macro photos. No

doubt that the Nikon 300mm needs plenty of light for your viewfinder, it won’t be too useful in dim light.


200
VR

Nikkor 70mm-200mm FL ED VR f/2.8

Focal Length: 70mm-200mm
Widest Aperture: f/2.8
Narrowest Aperture: 22
Aperture Blades: 9
Filter Size: 77mm
Hood: HB-48, HN-28
Close Focus Distance: 4.59317 feet (1.3999 meters)
Reproduction Ratio: 1:8.3
Focus Throw: 90º
Weight: 51.79 ounces (1468 grams).

Pros: fast lens, sharp, VR, 9 blades.

Cons: Not close focus, very short focus throw, no 1:1, heavy.

There are several version of this classic Nikon zoom available. This very sharp, fast, and ever-so-popular telephoto lens is something most professional photographers have in their bag and already own. Attach the Nikon 200mm VRII on a D3x and you can pick off frogs in the middle of a pond and, because the resulting photo has so many megapixels, crop out the frog from the center of the image and still have enough pixels to make a decent photo out of your crop.

In addition, if you put the Nikon AF-S TC-20E-III 2x Teleconverter on any full-frame Nikon you can get right up close and take decent macro photos.

Of the several versions available, I have a couple of them. The very best of them IMO **Nikon AF-S NIKKOR 70-200mm f/2.8E FL ED VR**, which is very much sharper and better in all ways. Note the “FL.” Worth having IMO. I have one.


Voigtländer
12
m
ft
∞
20
10
7
6
5
4
50
25
22 11 5.6 5.6 11 22
22 16 11 8 5.6 4

Voigtlander 180mm APO f/4

Focal Length: 180mm
Widest Aperture: f/4
Narrowest Aperture: 22
Aperture Blades: 9
Filter Size: 49mm
Hood: Square, included.
Close Focus Distance: 47.24 inches (120 centimeters) Reproduction Ratio: 1:2
Focus Throw: 290º
Weight: 17 ounces (485 grams)

Pros: Sharp lens, 9 blades, reasonable focus throw.

Cons: No close focus, slow lens, a little heavy-ish.

This is not a macro lens and not really a close-up lens either, so let's say it is a semi-close-up lens. This is lovely little lens looks like a miniature version of its big brother the Voigtlander 125m APO-Lanthar. And like is brother, the 180mm is also APO and very sharp.

However, this lens is difficult to find and is no longer manufactured. Like the CV- 125, this lens has an outer metal shell and a relatively long (and very smooth) focus ring. The lens is sharp by f/5.6 and also still strong at f/8.

For nature photography it gives you plenty of distance (you have no choice), so shots of butterflies on flowers and plants of all kinds are what it is best for. It is light compared to the CV-125. I have not used it for landscapes or infinity shooting, so I can't speak to that. It took me years to find a copy of this lens, so good luck!

You can try some extension on it. Lovely lens.


2
0.6
1¾
0.55
0.5
1½
0.45
0.42
0.4
0.39
Nikon
PC MICRO NIKKOR 85mm 1:2.8 D

Micro-Nikkor 85mm f/2.8 PC Tilt/Shift Lens

Focal Length: 85mm
Widest Aperture: f/2.8
Narrowest Aperture: 32
Aperture Blades: 9
Filter Size: 77mm
Hood: HB-22
Close Focus Distance: 15.35 inches (39 centimeters)
Reproduction Ratio: 1:2
Focus Throw: 120º
Weight: 22.4 ounces (635 grams)

Pros: Fast lens, 9 blades, sharp lens.

Cons: Near focus a little long, does not get to 1:1, very short focus throw.

I have all three of the most recent Nikon PC (tilt/shift) lenses, this one plus the 85mm and 24mm PC. While all three are exemplary lenses, I find the 45mm PC the most useful for macro and close-up work. The "PC" stands for perspective control through the tilt and shift features.

The tilt feature allows the lens to tilt (either up and down, or right and left) a total of 8.5 degrees. There are many tutorials on the web for learning to use this feature, but the idea is that in any photo there is one and only one plane of focus. "Tilt" allows the lens to align the plane the lens with that of the image plain. An example might be a field of flowers stretching toward the horizon. Instead of just having the front flowers in focus, by tilting the lens it can be possible have the whole field in focus.

The shift feature allows the lens to be shifted right or left (or up and down) bringing what normally would be out-of-frame in frame without having to move the camera. Notice that these lenses have large box-like Mid-sections. This allows a lens to have a larger image circle than a normal lens, so that shifting the lens to either side allows more or less of the subject to come into view. At total shift of 11.5 mm to either side is permitted.

In addition the whole lens barrel can be rotated plus or minus 90-degrees by 30-degree increments allowing you to combine the tilt/shift features in various combinations. Sound amazing? It is, but don't run out and buy one unless you really need these features. These lenses are bulky and heavy. Both the tilt and shift features (and especially the tilt feature) have a steep learning curve and are not easy to learn. The focus throw is very smooth but also very short, making it not ideal for close-up focus stacking.

Using this lens I can stick it very close to a flower and capture it and the surrounding space easily. The shift feature allows me to take three photos (left-shift, middle, right-shift) and combine them with a stitching program to produce a seamless mini-panorama. Since all three photos already share a common image circle within the camera, this guarantees a seamless panorama. However, I find that I can only shift (left or right) one-half of the permitted distance without causing some vignetting. Still, I can produce a three-shot panorama with no special panorama head in a jiffy and they are excellent. I don't feel they are as perfect for stacked three-shot panoramas than using the CV-125 and a pano-head, however.

This is a wonderful lens that is indeed very sharp and may interest some of you. That being said, the Nikon 85mmPC-E lens is a lens I don’t frequently carry with me because I have a number of fine macro lenses in the 90-125mm focal range. Tilt and shift are not things I tend to do close-up although they can be useful on occasion. If I am shooting landscape or even mini- landscape I generally go wider than 85 degrees.

It no longer is well-enough corrected for my work.


CLOSE - UP LENS
m
ft
∞ 10 5 3 2 1.5 1.2
30 15 10 7 5 4
22 16 8
8 16 22
22 16 11 8 5.6 3.5

Voigtlander 90mm f/3.5 SL-II APO-Lanthar

Focal Length: 125mm
Widest Aperture: f/2.5
Narrowest Aperture: 22
Aperture Blades: 9
Filter Size: 58mm
Hood: Include, small hood.
Close Focus Distance: 19.68 inches (50 centimeters), 12.6 inches (32 centimeters)
Reproduction Ratio: 1:3.5/1:1.8
Focus Throw: 270º
Weight: 11.29 ounces (320 grams)

Pros: Very sharp lens, APO, 9 blades, close focus only with close-up lens, ample focus throw.

Cons: Slow lens.

This little gem is probably the least-expensive top quality APO lens (with macro capability) on the market for the value you get. This is an all-metal lens that is built like a tank. It is smallish and includes a close-up filter that screws into the hood of the lens. This is as odd-shaped lens compared to most lenses, but the sharpness and clarity are right up there with the best of lenses and here is APO at a price anyone can afford. The SL-II version (most recent) of this lens is fully metered to Nikon bodies. It is a manual focus lens.

The little 39mm hood adaptor allows you to screw in the small close-up lens which has its own tiny lens cap. Otherwise you can bag the close-up and hood and treat this as any 52mm lens. Just get yourself a 52mm rubber lens cap like the Nikon HR-2 (and

pinch-type lens cap) and presto!, you have a normal-looking lens.

If you yearn for the APO coloring you find in the Voigtlander CV-125 and Leica 100mm APO Elmarit, which are four or five times more expensive, then here is a lens that can get you there. It is a little slow and requires a close-up lens (so does the Leica) to get you to 1:1.

There are two versions of this lens, the later version is described above, but the earlier version (without a separate close-up diopter) is what I like to use and you can find them on Ebay. Built like the Voigtlander 125mm or 180mm, this is a lovely little lens and just nice to hold in your hand... an use..


5
1.5
4
1.2
3.5
1
22 16 11 8 5.6 4 2.5

Nikon Nikkor 105mm AI-S f/2.5 (built-in hood)

Focal Length: 105mm
Widest Aperture: f/2.5
Narrowest Aperture: 22
Aperture Blades: 7
Filter Size: 52mm
Hood: HN-8, HS-4
Close Focus Distance: 3.2808’ (0.999 meters)
Reproduction Ratio: 1:7.7
Focus Throw: 140º
Weight: 15.34 ounces (435 grams)

Pros: Fast lens, very sharp, 7 blades.

Cons: Long focus, short focus throw, no 1:1, heavy.

This lens was very popular years ago and there are many still available on Ebay at reasonable prices. This is not a macro lens but just a very, very sharp 105mm manual focus lens that you can easily find. It is useful for mini-landscapes, bushes, etc. – anything about three feet from wherever you are.


JCII
METERS
FEET
32 22 11 8 5.6 4 2.8

Kiron (Lester A. Dine) 100mm f/2.8 Macro

Focal Length: 100mm
Widest Aperture: f/2.8
Narrowest Aperture: 32
Aperture Blades: 8
Filter Size: 52mm
Hood: Pull out hood.
Close Focus Distance: 17.4 inches (44 centimeters)
Reproduction Ratio: 1:1
Focus Throw: 390º
Weight: 22 ounces (623.7 grams)

Pros: fast lens, Sharp, 8 blades, reasonable close focus, good focus throw, goes to 1:1.

Cons: None.

This lens produced by Kiron (Lester A. Dine) is a sharp lens and worth looking at especially if you are on a budget. There are many different lenses (both in 100mm and 105mm) that are essentially the same lens. They have also been issued not only under the Kiron and Lester A. Dine label, but also by Vivitar. I have seen them on Ebay for $250. This lens does go to 1:1 (which is rare!) and has a very good focus throw. It was originally marketed mostly to dentists. The same lens has been advertised as a f/2.5 when sold by Elcar and as a f/2.8 when sold by Cosina, Panagor, Soligor, Vivitar, Kiron, and sold to dentists as the Lester A. Dine. The results with this lens are sharp and this lens should be on your short list if you want a solid macro lens and don't want to lay out the big bucks. It will do the job. You should be able to find one if you look for a while. A solid inexpensive macro.


feet
m
32 22 16 11 8 5.6 3.5

Micro-Nikkor 55mm P Auto 55mm f/3.5 (672490)

Focal Length: 55mm
Widest Aperture: f/3.5
Narrowest Aperture: 32
Aperture Blades: 6
Filter Size: 52mm
Hood: HN-3
Close Focus Distance: 9.488 inches (24 centimeters)
Reproduction Ratio: 1:2
Focus Throw: 300º
Weight: 8.28 ounces (235 grams)

Pros: Close focus, long focus throw, very sharp.

Cons: 6 Blades, does not go to 1:1, slow lens.

This top-quality manual-focus macro lens is very sharp, at least at close distances and is not recommended for landscape or distance shooting. There were two versions, one with a compensating diagram (marked “P”) and one without (no “P” suffix). The “P” version is the one to get. There are a number of Nikon 55mm f/3.5 versions of this micro and some care has to be taken to find the correct lot. One way is the make sure the serial number of the lens is between 600001 and 728347. One good way to find this lens is to check KEH.com. They usually have a number of copies and at a reasonable price. This might be the sharpest macro lens for the least money available. It is all manual.

Lens expert Björn Rörslett suggest that the correct lens has a “chrome barrel, magnification factors

printed in light blue, and hill-and-dale focusing and aperture collars." See his site for more details: http://www.naturfotograf.com

From RVink: There are two main versions here. The first is the "compensating" version. It has a metal focus ring and serial numbers from 188101 - 273153. It is designed for cameras *without* TTL metering. As long as the lens is stopped down to f/5 or smaller, the lens will compensate for light lost due to extension by opening up the aperture (obviously it cannot work with the lens wide open because the aperture cannot open up further). The advantage of this mechanism is that the aperture, and therefore the exposure remain constant regardless of the focus distance/magnification. However it causes problems on cameras with TTL metering because they already compensate for the light loss due to extension, so you need to manually counter-compensate otherwise overexposure will result. According to Bjorn this lens is better corrected for macro focusing, but is not so good at greater distances.

It was replaced by the non-compensating Micro-Nikkor-P version (shown in your article). This is designed for cameras with TTL metering, which auto-compensate for light lost due to extension. It has a diamond rubber grip and serial numbers from 600001 upwards. According to Bjorn, the optics are better corrected for general shooting, with a slight loss of performance at close range. However, the technical drawings I have seen don't show any difference, and the manuals of all versions state that best performance is achieved at 1:10 magnification, so I'm not sure if the optics changed or not.

The Micro-Nikkor-P is single coated, it was replaced by the multicoated P.C version, then by the late pre-AI "K" version with modern styling, then by the AI. All have the same optics so one can consider lenses beyond the 600001 - 728347 range you quoted. I would recommend the AI version (940001 and up) simply because is multicoated and compatible with modern cameras.


NIKKOR-P 1:4
Micro-NIKKOR 105mm 1:4
PN

Micro-Nikkor 105mm P f/4 Macro Bellows Lens

Focal Length: 105mm
Widest Aperture: f/4
Narrowest Aperture: 32
Aperture Blades: 12
Filter Size: 52mm
Hood: None.
Close Focus Distance: N/A Reproduction Ratio: N/A
Focus Throw: N/A
Weight: 8.113 ounces (300 grams)

Pros: 12 blades, light
Cons: Slow lens.

I learned how to use this lens from Björn Rörslett and http://www.naturfotograf.com. Of course it works great on a bellows for studio work, but that is not how Rörslett uses it. Instead, he mounts this lens (not-reversed) on its sibling 105mm f/4 (which is the identical lens to this bellows version) but in a standard lens tube with focus ring, etc. The two lenses are coupled using the Nikon K3 ring. Through this amazing combination, Rörslett claims that no light is lost and the two lenses equal a 50 mm f/2 lens. See the above photo for the two combined lenses.

This lens combination is very effective for ultra-close macro shots although focus takes patience and there is very little distance between the end of the lens and your subjects.


ft
m
15 5 3 2 1.5 1.25 1
∞ 2 1 0.7 0.5 0.4 0.35 0.3
22 16 11 8 5.6 4 2.8

Nikon Nikkor 28mm f/2.8

Focal Length: 28mm
Widest Aperture: f/2.8
Narrowest Aperture: f/22
Aperture Blades: 7
Filter Size: 52mm
Hood: HN-2
Close Focus Distance: 0.2m (8")
Reproduction Ratio: 1:3.9
Focus Throw: 170º
Weight: 8.81849 oz. (250 grams)

Pros: Very sharp lens, fast lens, 7 blades, close focus, light.

Cons: No 1:1, very short focus throw.

This is another of Nikon's classic primes. It is still available new and turns up on Ebay used as well. It is fast, wide, has great bokeh, lightweight, and has a close near focus. It has however, an extremely short focus throw so stacking photos must be done with care. However, wide angle lenses don't lend themselves to focus stacking and this is a very handy lens to throw in the bag or stick in a pocket so that you have wide-angle coverage when you need it. I use it for mini- landscapes and any larger-than-macro objects.


M A
Nikon
AF MICRO
60mm
1:2.8 D
32 16 16 32
32 22 16 11 8 5.6 4 2.8

Micro-Nikkor 60mm f/2.8 D Lens

Focal Length: 60mm
Widest Aperture: f/2.8
Narrowest Aperture: 32
Aperture Blades: 7
Filter Size: 62mm
Hood: H2.22
Close Focus Distance: 8.66 inches (22 centimeters)
Reproduction Ratio: 1:1
Focus Throw: 120º
Weight: 15.52 ounces (440 grams)

Pros: Fast lens, 7 blades, close focus, very sharp, goes to 1:1.

Cons: Short focus throw.

This is a real workhorse of a macro lens, especially for copy work. I shot over 30,000 concert posters with this lens and it worked better than any other lens I could put my hands on.If I had the Coastal Optics 60mm at the time, perhaps only that would have been a better lens for copy work.

The 60mm Nikon macro is not what the 105 focal range can provide and most macro photographers want that extra distance between them and their subjects. The 60mm does not provide that and I never use it for that ultra-close work that the 100mm or 200mm macro lenses provide. Instead, 60mm macros are for larger subjects, what I call dioramas or mini-landscapes such as a close-up of a flower and as much of the bush it is on also in the same frame, and so on.

If you are thinking of macro as the eye of the dragonfly or the bee's knees, this lens is not that. But the more I learn about close-up photography, the more the 60mm focal length is becoming useful to me. This lens is all about context and story. Wider-angle lenses allow us to tell more of a story than do the longer focal lengths.

However, the 120º focus throw is too short and makes focusing a real problem, especially if you want to stack photos. The 1:1 image frame is a real plus and makes this lens very attractive. And it is light and can slip into a pocket. That being said, if you don't own one already, get the new Nikon 60mm G version of this lens. I find it much sharper.


20 10 7 5 4 3 2.5 2 1.7 1.5
∞ 5 3 2 1.5 1.2 1 0.8 0.7 0.6 0.5 0.45
22 16 11 8 5.6 4 2.8 1.8
22 16 11 8 5.6 4 2.8 1.8

Nikon Nikkor 50mm f/1.8 AIS

Focal Length: 50MM
Widest Aperture: f/1.8
Narrowest Aperture: 22
Aperture Blades: 7
Filter Size: 52mm
Hood: HS-11, HR-1
Close Focus Distance: 17.71 inches (45 centimeters)
Reproduction Ratio: 1:6.6
Focus Throw: 130º
Weight: 5.64 ounces (160 grams)

Pros: Very fast lens, sharp, 7 blades, light

Cons: No close near focus, no 1;1, very short focus throw.

This classic Nikon 50mm f/1.8 lens does not really belong here since it is neither a macro nor a wide-angle lens. However, it is very, very sharp and lightweight as well. If you are shooting mini-landscapes, bushes, gardens, dioramas, there is not reason to ignore this lens, especially if you already have it.

RVink: Not a macro lens, but it can perform quite well on extension tubes.


∞ 2 5 3 2 1.5 1.25 1
1 0.7 0.5 0.4 0.35 0.3
22 16 11 8 5.6 4 2.8

Nikon Nikkor 24mm f/2.8

Focal Length: 24mm
Widest Aperture: f/2.8
Narrowest Aperture: f/22
Aperture Blades: 7
Filter Size: 52mm
Hood: HN-1
Close Focus Distance: 12 inches (30 centimeters)
Reproduction Ratio: 1:8.8
Focus Throw: 80º
Weight: 9.52 (270 grams)

Pros: Very sharp lens, fast lens, 7 blades, close focus, light.

Cons: No 1:1, very short focus throw.

This is another of Nikon's classic primes. It is still available new and turns up on Ebay used as well. It is fast, wide, has great bokeh, lightweight, and has a close near focus. It has however, an extremely short focus throw so stacking photos must be done with care. However, wide angle lenses don't lend themselves to focus stacking and this is a very handy lens to throw in the bag or stick in a pocket so that you have wide-angle coverage when you need it. I use it for mini- landscapes and any larger-than-macro objects.


40
m
ft
N/Ai-S
FOR 40mm F2

Voigtlander 40mm Ultron f/2.0 SL II

Focal Length: 40mm
Widest Aperture: f/2
Narrowest Aperture: 22
Aperture Blades: 9
Filter Size: 52mm
Hood: A dome-shaped aperture ring is included, but it is very shallow. I use a Pearstone 52mm snap-on Tulip hood.
Close Focus Distance: 17.716 inches (45 centimeters), 9.84 inches (25 centimeters) with close-up lens.
Reproduction Ratio: 1:7/1:4
Focus Throw: 160º
Weight: 7 ounces (200 grams) Price 2011: $409 at B&H.

Pros: Very fast, very sharp lens, 9 blades, light. Close focus with close-up lens.

Cons: No 1:1, short focus throw.

This little pancake lens is solid metal with a hard-rubber focus ring. It is less than one inch (24mm) long. The front element is non-rotational, but the lens does extend just a bit while focusing. This is a manual focus less but it does contain a CPU, so the Nikon matrix metering system works fine with it. There is a traditional aperture ring which you set to automatic aperture.

The lens is sharp wide open and very sharp at f/4 and f/5.6, but this is not APO and does show some chromatic aberration. The lens comes with a separate (and smaller) close-up lens that mounts via a dome-

shaped step-down ring. On this ring sits a tiny lens cap. You may wish to keep the ring and lens cap together and get a standard 52mm rubber hood.

Because of its small size and weight, this lens is easy to carry in a pocket add to your bag. This is a high quality lens at a relatively low price.


125
0.4
0.35
1
0.3
22 16 11 8 5.6 4 2.8

Nikon Nikkor 35mm f/2.8 AI K-Series

Focal Length: 35mm
Widest Aperture: f/2.8
Narrowest Aperture: 22
Aperture Blades: 6
Filter Size: 52mm
Hood: HN-3
Close Focus Distance: 11.811 inches (30 centimeters) Reproduction Ratio: 1:5.7
Focus Throw: 195º
Weight: 8.302 ounces (235 grams)

Pros: Fast lens, sharp, good close focus, light. Cons: Short focus throw, no 1:1.

35mm is a classic-sized focal length. Here is a fast 35mm lens that can be picked up for very little money. If you don't have a 35, here is one worth picking up.


Nikon
AF NIKKOR
28-105mm
1:3.5-4.5 D
M
85
70
50
35
28
22 16 11 8 5.6 3.5

Nikon Nikkor 28mm-105mm 1:35/4.5mm D Zoom

Lens 62mm
Focal Length: 28mm-105mm
Widest Aperture: f/3.5-4.5
Narrowest Aperture: 22
Aperture Blades: 9
Filter Size: 62mm
Hood: HB-18, HB-23
Close Focus Distance: 8.66 inches (22 centimeters)
Reproduction Ratio: 1:2
Focus Throw: 45º
Weight: 17 ounces (482 grams)

Pros: Versatile, close focus, 9 blades.

Cons: Slow, short focus throw, 1:2 reproduction ratio

Not a macro lens, but it does have a macro mode and focuses to less than 9 inches. A once-common lens, professionals are finding this lens of higher quality than once thought and are beginning to collect it and add it to their bags. A nice compromise for a zoom.


Micro-NIKKOR 105mm 1:4
PN
ft
m

Micro-Nikkor 105mm P f/4 Macro Lens

Focal Length: 105mm
Widest Aperture: f/4
Narrowest Aperture: 32
Aperture Blades: 7
Filter Size: 52mm
Hood: HN-8,HS-4
Close Focus Distance: 18.5 inches (47 centimeters)
Reproduction Ratio: 1:2
Focus Throw: 320º
Weight: 17.63 ounces (500 grams)

Pros: Very sharp lens, good focus throw, inexpensive

Cons: Slow lens, long near focus, no 1:1.

This classic lens has the same optics as the 105mm f/4 bellows lens. This is a very sharp lens and quite inexpensive for a quality lens. usually available used on Ebay at all times. It is manual focus and its only drawback is that it is slow (f/4), so viewfinders will not be as well lit if you are photographing in shade, dawn, or dusk. If you have plenty of light, no problem.

From RVink: Same optics are found in the pre-AI, AI and AIS versions (and bellows version). The hoods you mention can be used, but the lenses all have built-in hoods (the AIS is very deep)
The lens gets to 1:2 by itself, and 1:1 can be achieved with the PN-11 extension tube. The PN-11 has a built-in tripod mount, which greatly assist handling and balance when used on a tripod. It's an excellent combination if you can work with the slow aperture - which goes down to f/8 at 1:1!


Nikon
0.35
0.2
AF-S NIKKOR 14-24mm 1:2.8G ED
24
20
18

Nikon Nikkor 14mm-24mm AF-S f/2.8 G ED

Focal Length: 14mm-24mm
Widest Aperture: f/2.8
Narrowest Aperture: 22
Aperture Blades: 9
Filter Size: 77mm
Hood: BUILT-IN
Close Focus Distance: 11.023 inches (28 centimeters) Reproduction Ratio: 1:6.7
Focus Throw: 60º
Weight: 34 ounces (964 grams)

Pros: Fast lens, very sharp lens, close focus distance, 9 blades.

Cons: No 1:1, very short focus throw, heavy, no filters.

This used to be the lens of choice in my book when it came to wide-angle zoom lenses and it pretty-much matches any primes in its range. Folks complain about its bulbous lens not taking filters and being unprotected, but that has not bothered me. Could it be that I seldom use filters? However, it might be possible for the plastic lens cap to slip off, so I have added some self-sticking velvet patches to the inside of the cap to make it fit more snugly.

Lens expert Björn Rörslett refers to this lens as “the new reference for wide-angle zoom lenses.” The close-focus distance for this lens is very short so you can pretty much stick this lens right into a flower patch and get a flower and the whole patch. I don’t have to sing the praises of this lens as they are all over the web. Check it out.

Aside from the obvious landscape uses, I used this lens for mini-landscapes, dioramas, and any small scene where I can have something in the foreground in focus and as much of everything else as is possible. Expensive lens.

However, over time, as some of the newer more-APO lenses have been issued, I no longer used this lens, and so sold it. It was another of the popular Nikon lenses that I feel is not well-enough corrected.


TIFFEN
52mm UV
Nikon
NIKKOR
0.45
16 11
11 16
50mm
1:1.4 D
16 11 8 5.6 4 2.8 2 1.4
16 11 8 5.6 4 2.8 2 1.4

Nikon Nikkor 50mm f/1.4 D

Focal Length: 50mm
Widest Aperture: f/1.4
Narrowest Aperture: 16
Aperture Blades: 7
Filter Size: 52mm
Hood: HR-2
Close Focus Distance: 17.71 inches (45 centimeters)
Reproduction Ratio: 1:6.6
Focus Throw: 140º
Weight: 8.1 ounces (230 grams)

Pros: Very fast lens, sharp, 7 blades, light

Cons: No close near focus, no 1;1, very short focus throw.

This classic Nikon 50mm f/1.4 lens does not really belong here since it is neither a macro nor a wide-angle lens. However, it is very, very sharp and lightweight as well. If you are shooting mini-landscapes, bushes, gardens, dioramas, there is not reason to ignore this lens, especially if you already have it.


Nikon
ft
m
0.5
0.45
AF-S NIKKOR 50mm 1:1.4G
M/A
M

Nikon Nikkor 50mm AF-S f/1.4 G Lens

Focal Length: 50MM
Widest Aperture: f/1.4
Narrowest Aperture: 16
Aperture Blades: 9
Filter Size: 58mm
Hood: HB-47
Close Focus Distance: 17.71 inches (45 centimeters)
Reproduction Ratio: 1:6.6
Focus Throw: 180º
Weight: 9.876 ounces (280 grams)

Pros: Very fast lens, sharp, 9 blades, light

Cons: No close near focus, no 1;1, very short focus throw.

This classic Nikon 50mm f/1.4 lens does not really belong here since it is neither a macro nor a wide-angle lens. However, it is very, very sharp and lightweight as well. If you are shooting mini-landscapes, bushes, gardens, dioramas, there is not reason to ignore this lens, especially if you already have it.

Sigma 180mm f/2.8 APO Macro EX DG OS HSM

Focal Length: 50MM

Widest Aperture: f/2.8
Narrowest Aperture: f/22
Aperture Blades: 9
Filter Size: 86mm
Hood: Included
Close Focus Distance: 18.5 inches (46.9 cm
Reproduction Ratio: 1:1
Focus Throw: 270º
Weight: 3.6 lb (1.63 kg)

Pros: Reasonably fast lens at infinity, sharp, 9 blades, nice tripod collar

Cons: Very heavy, slightly too short focus throw, not good for stacking, at close range no longer fast.

The lens is really too big and heavy for anything but a tripod, which outdoors makes things difficult. It looks to be reasonably fast (f/2.8 at infinity), but due to its “effective aperture,” at close-up or macro range (which it is designed for) the f/stop is considerably higher. I don’t need it in the studio because I have far more well-corrected lenses, and would not carry it and a tripod outdoors. I sold my copy. I want a close-up lens to have a long focus throw, faster than this lens, sharper than this lens is wide-open, and better micro-contrast. To me, it is not well-corrected enough to be an APO lens.


OPTICAL STABILIZER
SIGMA
APO MACRO DG HSM

The Exotic Nikkors and Other Industrial Lenses

This little known (to photographers) genre of lenses is like the proverbial tar baby in Uncle Remus stories, the more you struggle with them, the deeper you are attached to them. Why have we heard so little about them? For one, most of them don't attach easily to Nikon DSLRs, but demand one or even a small series of adapters to even mount them. Then there is the factor that many of them (like some of the Printing Nikkors) originally cost $12,000 or more per copy, and came in high-end scanners costing hundreds of thousands of dollars.

For example, the Printing Nikkors were used to scan 35mm color film to make perfect copies. Or they were used to create ultra-fine masks for computer chips. Are they highly corrected, as in "apochromatic?" You bet they are, most have almost no distortion of any kind. Then there is the issue that many of them were made for one and only one aperture or exactly one reproduction ratio, while others are at their best on a rail with about two feet of extension. The list goes on.

And I am only talking here about the ones we know about. There are literally hundreds of models of photographic enlarger lenses that seemingly have never been tested on modern DSLR cameras. Many of them are also highly corrected, so we have only really seen the tip of the iceberg, when it comes to highly-corrected and sharp industrial lenses. There must be real bargains out there.

The Exotic Nikkors

The exotic Macro-Nikkors and other industrial Nikkors don't usually show up on the radar screen of most Nikon users. I ignored them for years. For one, what could I do with them? Many have such a narrow Depth-of-Field (DOF) that a shot taken with these lenses captures the eyebrow of a gnat and the rest is bokeh. Or some of these exotic lenses are designed to only be sharp at a 1:1 magnification ratio, so how many times do I need that? You get the idea. They are indeed "exotic."

I already have a bunch of these exotic macro lenses and keep telling myself that I don't intend to buy more unless one of them compels me, which has happened a lot lately. For one, they can be very expensive. Many end up on display in a museum or stored in someone's collection where they are never used and seldom even seen. I don't intend to do that.

And when I first encountered them, the photos taken with them, although interesting, did not appeal to me all 'that' much, usually a single shot with literally one point of the photo in striking focus and the rest a blur.

At best they were interesting, but more often they appeared IMO to be kind of repetitive. Also, keep in mind that they represent almost the opposite of what I have been doing for years, which is stacking focus. So please forgive my bias here please.

In focus-stacking work, almost everything in the photo can be in focus if I wish, and the tendency of my aperture use (at least in the beginning) was toward the "narrow as possible without succumbing to diffraction." I have literally spent years stacking focus at the edge of diffraction, so these exotic lenses were about the last thing I wanted to mess with. And I don't like high magnifications, either. Looking at the

compound eye of a dead fly on a pin is not my idea of nature photography, no offense intended. Again: just my bias speaking.

But then I saw some photos of flowers by NikonGear.com member Akira, using the CRT Nikkor 55mm f/1.2 lens. Now I liked these shots and the effects that Akira achieved and told him so. This rather bizarre Nikkor lens designed for viewing CRT monitors and even curved to handle those screens caught my fancy. Sure, shots taken with the lens were all blurry except for a single point or plane, a razor-sharp slice of life. But that little slice WAS very, very sharp AND the contrast between it and the general blur was also powerful. I liked the effect.

Now I have to be clear. There is something inside me that for years has strived for sharpness in a lens. And

that something was at odds with another part of me that I can only describe as the “impressionist” in me. The impressionist part of me didn’t give a damn about sharpness, but likes to paint in broad colorful strokes. Well, those two parts of me came together in this Nikkor CRT lens, except that I was not happy with that single point/plane of sharpness. Remember, I stack focus.

There was a desire inside me that wanted to paint with sharpness like this Nikkor CRT lens painted with blur. Then, somewhere along in here I had what was (for me, mind you) a significant insight. Since I loved the broad strokes of blur of the CRT Nikkor, but was less than satisfied with the pinpoint of sharpness it provided, why not stack the sharpness just enough to create a real plane or section of the image that is set off from the background blur or bokeh. Aha!

It was not long before my whole shelf of sharp, sharper, and sharpest lenses, the ones I used to push aperture as high (narrow) as possible were set aside. And in their place, I began to use the complete other end of the lens, the end where it is wide open. By being wide open (and fast!), I was assured of throwing as much of the image as possible into blur, leaving only what I chose to have sharp.

And by stacking sharpness, I moved beyond using these exotic lenses like the Nikkor-CRT with their (for me) small slice of focus, into images with a clear layer or section of sharpness contrasted with a wide areas of bokeh. I could point out by focus stacking layers what I wanted the eye to jump at and at the same time treat the rest of the image like an impressionistic painting.

In that move, I satisfied two opposite desires within me in a single image. I was really satisfied with the potential of this technique and it did not take me long to prove this to myself.

After all, it is only myself I have been trying to please with my photography all these years. It is only recently that I even began finishing any image beyond minimal adjustments in post processing. I had never found what I was looking for. Perhaps now I have, although I was just at the beginning of using this (for me) new medium.

And my interest in lenses changed as well. Instead of thinking of sharpness as pushing apertures higher to the edge of diffraction, I began to yearn for wide-open lenses that blurred everything except for the narrow depth of field which they featured. All I had to do is stack that narrow depth of field, and let the lack of DOF give me a bokeh-covered canvas upon which I could paint some focus. I liked that. I still like it.

Exotic Lenses

With that insight, suddenly all of the exotic macro lenses (that held little interest for me) appeared in a different light. Some of them were very, very sharp, even though that sharpness only appeared in a razor-thin layer. I didn't want lenses that were not-fast because they gave me too much DOF and I lost the impressionistic sense of blur that formed the bokeh.

The really fast AND sharp lenses allow me to punctuate the blur of the background with sharply defined focused signatures that complement the bokeh. I like the idea of a piece of the image in focus

and the rest just an impression, like you see in some of the great draughtsman in history: pencil in something clearly and leave the rest as a sketch. This appeals to me somehow, not that I compare myself to these artists.

So, my mantra became: find lenses that were fast wide open AND also sharp. And, as it turns out there is a whole genre or two of lenses that fit this description in the industrial and Macro-Nikkors. However, they are expensive. I am not sure why, but probably because they are better corrected than most. Ouch! I can't believe they are that useful except to the extreme micro photographers or to be used as museum specimens. Whatever the reason, they can be hard to find and cost a lot of money. Oh well, it was time to sell off what I can bear to part with. And I did.

So that is the state of the union of myself and this (new to me) technique. I am by now somewhere in the middle of the learning curve but am very hopeful. I have done enough testing to know that the technique works. All I have to do now is work it.

Lens expert Bjørn Rørslett had written (that oh-so-fierce bear of the north) long ago. Perhaps no one has tried to stack these lenses as much as I intend to, but the footprints were there for me to follow.

I feel that I have, after many years of searching, found something of what I was looking for, scratched an itch, gained some satisfaction, and am coming closer to expressing in photography what I see in my mind.

Industrial Macro and Close-Up Lens for Stacking

The world of industrial macro and ultra-close-up lenses is especially fascinating to the focus stacker. These very sharp and often highly-corrected lenses, some of which are very fast, can have a very narrow depth-of-field. Most are industrial or process lenses used in scanners, enlargers, copy cameras, and other dedicated tasks.

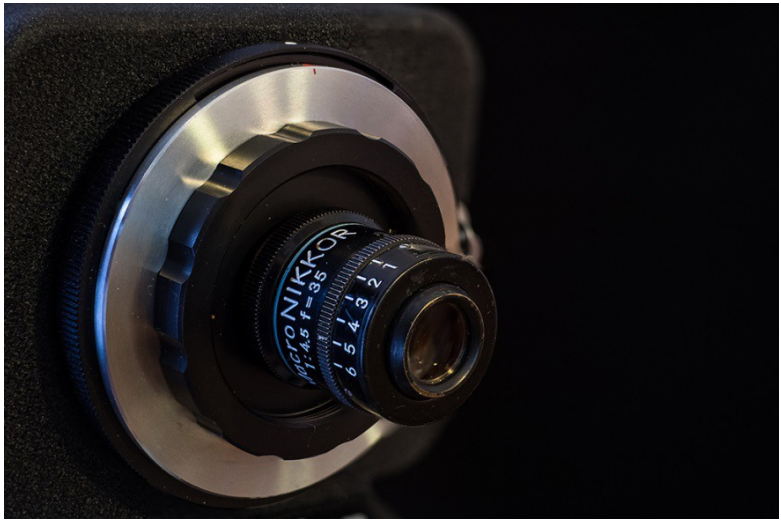
For example, ultra-sharp industrial lenses are used to project the photomasks on mass-produced silicon wafers from which the final computer chips are made. Other uses include the lenses used in very expensive high-tech color scanners, where in addition to ultra-resolving power, the lens also has be highly corrected (APO) to handle subtleties of color. Use of these lenses in enlargers and other process photography is worldwide and scores of such lenses exist.

Process lenses with very small apertures do not tend to provide high resolution, so some of these exotic Nikkors tend to be very fast (like f/1.0 and f/ 1.2), and at the same time are very sharp wide open. In fact some industrial Nikkors record diffraction even wide open and certainly do so if stopped down at all. Others have only the single aperture. Many can be stopped down, but not to good effect.

It is important to point out that these industrial lenses differ in quality from the lenses we commonly mount on our DSLRs in that many of them have been produced to a much higher standard of quality than an ordinary camera lens. They can be faster, sharper, and more highly corrected than the F-mount lenses

we are used to buying. And there are many industrial lenses on the used market waiting for people like us to determine how useful they are for our work.

Most industrial lenses do not have a convenient F-mount adapter to fit our DSLRs. Instead, they have RMS (microscope), M39 (Leica), and M42 (Zeiss), and still other non-standard mounts. Some are even threaded for microscope use. Others have tubes and built-in extension that have to be factored into whatever mount we devise. Many shine on bellows or when we mount them on a DSLR with an added helicoid. Fortunately Ebay is full of relatively inexpensive adapters to convert most of these various threads to Nikon F-mounts.



The upshot is that today many of these rare macro lenses function as collector’s items, rather than be used for photography. They are also popular among coin collectors and related hobbies where very exact (flat) close-up photos are required. Many of these

lenses, because of their very narrow depth of field, are not attractive to the typical nature photographer. Also, some are so slow as to make focusing through a viewfinder difficult to impossible at low light levels.

Narrow depth-of-field does not deter focus stackers, because we simply stack that narrow depth-of-field as deep as we wish. These exotic industrial lenses can be very fast or very slow. I like the very fast lenses because they tend to give good bokeh, and I can stack as much narrow depth-of-field as I wish.

On the other extreme are the very slow industrial lenses. Their bokeh is not going to be much, but some of them are extremely sharp and/or well color-corrected. Color correction is a big issue. Some of these exotics are true APO (or nearly so), while others have earlier coatings and/or are not color corrected to the degree I would wish.

You are correct if you get the idea that these exotic industrials are an area not well plumbed by focus stackers, but one with great promise. Unfortunately, these lenses are not inexpensive, mostly because they are sought by collectors as copy lenses or just to place in a display case, I guess. The best of the rare industrials make even the Voigtlander 125mm APO-Lanthar look inexpensive by comparison, prices in the range of $8,000-$10,000 a copy. Ouch!

However, putting the best-known and most prized industrial lenses aside, there are numerous industrial lenses out there that seemingly (to my knowledge) have never been checked-out and put to use in general macro photography. Ebay is filled with used enlarger lenses and the like. I guess we are waiting from some lens expert to tell us which ones are exceptional, but since they are not expensive, we should check these out for ourselves.

And we focus stackers are kind of on our own as for guidance in these areas. The fact is that although some few photographers comment on them, even fewer seem to use them to any great extent as far as I can see; at least not many photos are out there to view, except of the compound eye of a bee or dragonfly. Most of the discussions I have found for these lenses are by coin collectors or microscope fans. Nature buffs like me seldom talk about them.

Part of my own interest in the exotic Nikkors was the natural result of exploring lenses, but the advent of

the Nikon D800E was another really big factor. The

increased resolution of the D800E (36 Mpx) propelled me to break out of the box of the standard macro lenses and wander into the field of the exotics. And it has been a learning experience.

There is a multitude of enlarger, copier, scanner, and other types of industrial lenses. Many can be had for almost nothing and it is anyone's guess how good they are. These lenses don't go to infinity; they are close-focus-only lenses. And for the most part they don't have a Nikon F-mount, but rather a variety of threads, some very obscure. So finding and using these lenses is no waltz.

These are not walk-around lenses and many require special handling, mounts, have a limited focal range (or just one!), are or are-not color collected, and on and on. In other words, they can be a hassle, but if you are already focus stacking, you are used to taking your time and threading through various hassles.

Why should we use these industrial lenses and how? What can they do for us?

The answer is: for several reasons. One of my favorites is bokeh, bokeh, bokeh. Since many of these exotic macro lenses are very, very fast and also very, very sharp, you can be sure that your background is isolated into nice bokeh. Fast lenses bring a very narrow depth-of-field, which is perhaps why they have not been used more by general photographers.

But we focus stackers don't care about a narrow depth-of-field. We can carefully stack that very narrow, yet very sharp, depth-of-field until we have created as much of the subject in focus as we wish, leaving the background nicely blurred. Using these lenses, I like to highlight some very detailed part of the subject to make clear to the viewer that we have that sharpness, and perhaps sharper than they could imagine. And then, I like to let the surrounding background bokeh just run wild and do crazy things not only with blur, but with color. The CRT Nikkor 55mm Oscilloscope lens is very good at producing bokeh with Zen-like lumps of color.

And good bokeh and blur is not the end of it. Many, but not all, of these industrial Nikkors are very highly corrected, in fact, true APO lenses, or about as near as we are going to get. So not only are they very sharp, produce fine bokeh, but their color IQ is subtle and fine. So the best industrials are fast, wide, sharp, and APO corrected. It is this color correction that most fascinates me.

To repeat, perhaps the only reason these industrial lenses have not been more utilized until now is that who out there wants great bokeh, fine color, but only a very narrow slice of focus. But with focus stacking, it

is up to us how much of the subject we want in focus. Therefore, I suggest these exotic industrials will only go up in price, not come down, as more of us find out their special qualities and learn to use them. This leaves the uncorrected industrials.

First, they are very few. There are some lenses that are very sharp, but not well corrected or perhaps have earlier single coatings, etc. These lenses are still very useful where refined color is not demanded, or where blocks of color have little micro-contrast and can be controlled in post. Most industrial lenses are, by definition, manufactured to a high standard.

As for myself, I dove in head first and have a small collection of these industrials, including some classics. Have I mastered them? Nope, but at least I got my feet wet and am in the midst of a broad (but not exponential) learning curve. I very much like what I am finding, although much of what I am finding is my own inexperience and lack of technique with this particular group of lenses. This only makes it more fun.

These industrial lenses I consider as a palette that I can hopefully learn to paint with. I am now acquainted with the palette. It is time to be more creative.

Of course, I tend to view my own work as an endless Odyssey through lens-land that has no goal other than the learning process itself. I have never reached that pot-of-gold at the end of the rainbow and, over time, have stopped even considering it. That being said, I have progressed on my journey, which originally was one for greater depth-of-field, greater resolution and sharpness, but which now has morphed into the realization that sharpness ultimately (at least for me) depends on color and color

correction, including other distortion, as in APO lenses.

I'd like to believe that I have all the lenses I could possibly need, but am afraid that every next day brings new ideas to check out, and that, as often as not, this dictates new lenses. And while I try to resist buying any more, the day usually comes when I stop resisting and just buy the damn thing.

I do feel that I have completed my initial testing of the Nikon 36 Mpx camers, plus taken at least a brief tour through industrial lenses, and am ready now to settle in for some more creative work.

Using the Exotic Industrial Nikkors

These exotic industrials are not only rare and expensive, but there is not really that much written about them, at least from close-up and macro nature photographers. Most comments on these lenses takes place on the coin-collector (and related collectables) sites. These guys are serious about testing and using these lenses because they want to properly photograph their coins to show and sell them to other collectors.

One exception to that rule is the Macrolens Collection Database, put together by Klaus D. Schmitt, who is active in macro lenses and IR/UV photography.

http://www.macrolenses.de/

By the way, there are scads of industrial lenses out there that are never tested or used by photographers, lenses for 3CCD, Projection, scanner, Microheads, TV, and so on. Some of them are advertised only by the number of megapixels (1-2 megapixel, 5 megapixel, 10 megapixel, etc.) they handle. In other words, someday… some photographer will figure out if any of these lenses are also useful for close-up and macro work.

The world of true macro and ultra-close-up lenses is especially fascinating to the focus stacker. These very sharp and often highly-corrected lenses, some of which are very fast, have a very narrow depth-of-field. Most are industrial lenses used in scanners, enlargers, copy cameras, and other dedicated tasks. Some are even threaded for microscope use. The upshot is that these rare macro lenses main function

is as collector's items, rather than photography. They are popular among coin collectors and related hobbies where very exact close-up photos are required. Many, because of their very narrow depth of field, are not attractive to the typical nature photographer. Also, some are so slow as to make focusing through a viewfinder difficult to impossible at low light levels.

Narrow depth-of-field does not deter focus stackers, because we simply stack that narrow depth-of-field as deep as we wish. These exotic industrial lenses can be very fast or very slow. I like the very fast lenses because they tend to give good bokeh, and I stack as much narrow depth-of-field as I wish.

On the other extreme are the very slow industrial lenses. Their bokeh is not going to be something, but some of them are extremely sharp and well color-corrected. Color correction is a big issue. Some of these exotics are true APO (or nearly so), while others have old coatings and are not color corrected to the degree I would wish.

You are correct if you get the idea that these exotic industrials are an area not well plumbed by focus stackers, but one with great promise. Unfortunately, these lenses are not inexpensive, mostly because they are sought by collectors to place in a display case, I guess. The best of the rare industrials make even the Voigtlander 125mm APO-Lanthar look inexpensive by comparison.

And we focus stackers are kind of on our own as for guidance in these areas. The fact is that although some few photographers comment on them, fewer seem to use them to any great extent as far as I can see; at least there are not many photos are out there. Most of the discussion I have found for these lenses are by coin collectors or microscope fans.

Nature buffs like me seldom use them.

Part of my own interest in the exotic Nikkors was the natural result of exploring lenses, but the advent of the Nikon D800E was another really big factor. The increased resolution of the D800E propelled me to break out of the box of the standard macro lenses and wander into the field of the exotics. And it is a learning experience. And the Nikon D810 and D850 only make it easier.

There is a multitude of enlarger, copier, scanner, and other types of industrial lenses. Many can be had for almost nothing and it is anyone’s guess how good they are. These lenses don’t go to infinity; they are close-focus-only lenses. And for the most part they don’t have a Nikon F-mount, but rather a variety of threads, some very obscure. So finding and using these lenses is no waltz.

However, certain industrial lenses have been tested and are prized.

The Exotic Macro Nikkors: An Update

Coming into it I thought that getting to know this group of very exotic Nikon close-up and macro lenses would be an experience, but I assumed I would get a pretty good handle on it fairly quickly. As it turns out, these lenses are much more versatile than I imagined. When you factor in different extensions and helicoids, what appears as a simple task becomes much more complex, if not somewhat infinite in possibilities, not that I am complaining.

I am loving these lenses and my faithful Cosina-Voigtlander 125mm f/2.5 APO-Lanthar sits on the shelf gathering dust these days. That ought to tell you something right there, because I love that lens.

As of now, I have six of these rare Nikon lenses, and I don't plan on getting any more. Of course I was not planning to get a second one, a third one, and so on. It just kind of happened. Klaus Schmitt is partially to blame. He pointed out the sweet points of these lenses to me, and that was all it took. Here is what I am now using:

Multiphot Macro-Nikkor 19mm f/4.5
Multiphot Macro-Nikkor 65mm f/4.5
Printing Nikkor 95mm f/2.8 1:2
Printing Nikkor 105mm f/2.8 1:1
CRT Nikkor-O 55mm f/1.2 1:2
Repro Nikkor 85mm F/1.0 1:1

I must say that these lenses are challenging, but most of all interesting and fraught with possibilities. I have yet to find any one of them that I don't like, or one that I like above all the others. Each one is so good at what it does. I sure don't want to take the whole set of

them into the field, but I do wish I had them all with me.

The mounts for them alone are something to behold and some of them have mounts that are interchangeable. Also, some of them have extensions and all could take extensions. One even has two helicoids, so the range of magnification is great. And all of these lenses, I imagine, can be placed on a bellows, although I have not had time (or interest) to try that out just yet. There is too much going on with them just the way they are now.

And sharp? These lenses are way sharp. For years I have whined about trying to find some sharp lenses, and I consider the CV-125, the Leica 100mm Elmarit R, and the Coastal Optics 60mm sharp lenses. But these exotic industrial Nikkors are a whole other kind of sharp. I can't really say how sharp, because they are so different that I have not really finished evaluating them. Let's just say they are sharp enough to shut me up, at least for a while. And I am eagerly waiting for my copy of the Nikon D800E.

And at least two of these lenses are way fast, f/1.0 and f/1.2, a couple are f/2.8, and the other two are a dim f/4.5.

I have mentioned this before, but up until now I had no interest in these exotic Nikkors. After all, I could not push them for greater depth of field because they are not built for that. And some of them are so fast that you only get a razor's-edge slice of your subject. Of course, that was a hangover from my years before stacking focus, years when all I could think to do was push aperture high and narrow, and try to battle diffraction.

But of course I now know that you can stack razor-sharp slices of DOF until you accumulate whatever mass of focus you care to have. I missed that concept until recently. And some of these exotic Nikkors are both fast and sharp. And the “fast” quality provide something I can only call “beyond bokeh” as I knew it, more like a complete wipeout of the background, if you wish.

With this technique, you could run the line of sharp focus right up to anywhere you want and just stop cold. Not sure how much I want to do that, but it is nice to be able to do that if I wish.

For the most part, I have used these lenses in the studio, mounted on a very solid head (Swiss-Arca C1 Cube) on a very solid tripod (RRS). There is no reason you could not take all this outside on a very calm day, if you did not have to hike too far. Because they tend to require more stacked layers, the least breeze would be a problem, and for at least a couple of these lenses, you need lots of light. In fact, with the two Multiphots I tend to focus using the LCD rather than the viewfinder, because in minimal light (which I like) it is hard to see the subject through the viewfinder. But the CRT Nikkor and Repro Nikkor are just the opposite. They are totally bright in the viewfinder, at least wide open.

I should stop writing about these little puppies because I have posted plenty about them already. I guess I am either just talking to myself or to those few here who are interested in the same approach. To me this is very fascinating stuff.

Here are a couple recent explorations, the first with the Repro 85mm and the second with the Multiphot 65mm. As you can see, very different takes. This is

what is so much fun. I am nowhere near done playing with these things.

The Nikkor Multiphot Machine

Lens: Macro-Nikkor 19mm, f/2.8, Multiphot

Focal Length: 19mm
Widest Aperture: f/2.8
Narrowest Aperture: Six rings.
Aperture Blades: none
Filter Size: Hood:
Close Focus Distance:
Reproduction Ratio: 15x-40x (20x on barrel)
Focus Throw: none **Color:** Mostly uncorrected. **Rear Mount:** RMS **Weight:**

This is one of four lenses designed to be used (i.e. optimum sharpness) on the Multiphot bellows, which is 60 cm, which is much larger than either the Nikon PB-4 or PB-6. The PB-6 with a second bellows extension comes closer, but probably will not interest close-up fans. Those of us who want to use it with less extension

are probably not getting the most out of it, but still it can produce remarkable photos.
Because the image circle on these lenses was originally designed for 4x5” film, and is roughly 3x that needed to cover a 24x36mm DSLR sensor. Because of this fact, this lens can be used at lower magnifications.

This is a macro not a close-up lens. It can be used on a camera with or without extension, but is happier on a bellows, and really happy on a very long (double) bellows. The lens has little distortion, and requires a tripod for use. It is too high-powered for anything I am interested in shooting. This lens uses a RMS

microscope thread, so an adapter is required to convert to a Nikon F-mount, or to Leica, or Zeiss.

Lens: Macro-Nikkor 35mm, f/4.5, Multiphot

Focal Length: 35mm
Widest Aperture: f/4.5
Narrowest Aperture: Six rings
Aperture Blades: none
Filter Size: none
Hood:
Close Focus Distance:
Reproduction Ratio: 8x-20x (12x on barrel)
Focus Throw: none
Weight:
Color: Little lateral aberration Rear Mount: RMS

This is one of four lenses designed to be used (i.e. optimum sharpness) on the Multiphot bellows, which is 60 cm, which is much larger than either the Nikon PB-4 or PB-6. The PB-6 with a second bellows extension comes closer, but probably will not interest close-up fans. Those of us who want to use it with less extension are probably not getting the most out of it, but still it can produce remarkable photos. Because the image circle on these lenses was originally designed for 4x5” film, and is roughly 3x that needed to cover a 24x36mm DSLR sensor. Because of this fact, this lens can be used at lower magnifications.

This lens, even when fully open, is already recording diffraction. This is a macro not a close-up lens. It can be used on a camera with or without extension, but is happier on a bellows, and really happy on a very long (double) bellows. I have been amazed by its sharpness, but not its color, and it is slow so can be difficult to see through the viewfinder. This lens uses a RMS microscope thread, so an adapter is required to convert to a Nikon F-mount, or to Leica, or Zeiss.

Lens: Macro-Nikkor 65mm, f/4.5, Multiphot

Focal Length: 65mm
Widest Aperture: f/4.5
Narrowest Aperture: f/28 (six rings)
Aperture Blades: none
Filter Size: Hood:
Close Focus Distance:
Reproduction Ratio: 3.5x-10x (5x on barrel)
Focus Throw: none
Weight: Color:
Rear Mount: M39

This is one of four lenses designed to be used (i.e. optimum sharpness) on the Multiphot bellows, which is 60 cm, which is much larger than either the Nikon PB-4 or PB-6. The PB-6 with a second bellows extension comes closer, but probably will not interest close-up fans. Those of us who want to use it with less extension are probably not getting the most out of it, but still it can produce remarkable photos. Because the image circle on these lenses was originally designed for 4x5” film, and is roughly 3x that needed to cover a 24x36mm DSLR sensor. Because of this fact, this lens can be used at lower magnifications.

The 65 Multiphot is more forgiving than the two smaller ones, but still very much a macro lens. It has a Leica mount so can be adapted to camera and rail using extensions, helicoids, etc., or just mounted on, a bellow, short or long. This too is a very sharp lens, but good for only very, very close (as in macro) work. I like the sharpness, but find the color a little harsh, so I avoid using it if subtle coloring is an issue. It comes with the M39 Leica thread, so needs an adapter for Nikon-F mount. Enrico Savazzi claims it can be stopped down to the 2nd stop.

Lens: Macro-Nikkor 120mm, f/6.3, Multiphot

Focal Length: 120mm
Widest Aperture: f/6.3
Narrowest Aperture: seven rings
Aperture Blades: none
Filter Size: Hood:
Close Focus Distance:
Reproduction Ratio: 1.2x-4x on barrel
Focus Throw: none
Weight: Color:
Rear Mount: M39

This is one of four lenses designed to be used (i.e. optimum sharpness) on the Multiphot bellows, which is 60 cm, which is much larger than either the Nikon PB-4 or PB-6. The PB-6 with a second bellows extension comes closer, but probably will not interest close-up fans. Those of us who want to use it with less extension are probably not getting the most out of it, but still it can produce remarkable photos. Because the image circle on these lenses was originally designed for 4x5” film, and is roughly 3x that needed to cover a 24x36mm DSLR sensor. Because of this fact, this lens can be used at lower magnifications.

The120mm Multiphot lens is the most useful lens IMO for close-up work and the only one of the four that is said to be limited by sensor resolution, rather than refraction. Enrico Savazzi claims it can be stopped down to as much as f/11 (the 3rd stop) at 1.3x.

Although these Multiphot lenses are not well color-corrected, I find the 120mm Multiphot a very nice lens to use.

The Printing Nikkors

There are four Printing Nikkors. These are probably the sharpest, fastest, true APO lenses that you can find, if you can find one. And they are very expensive. They have weird rear mounts that require special adaptors, but they have 52mm front threads and the lenses can be reverse-mounted using the Nikon BR2 adapter, etc. Coin collectors, who are complete fanatics on sharpness, prize them and often have them on the top of their “want lists” to own. That should tell you something.

Lens: Printing Nikkor 75mm, f/2.8

Focal Length: 75mm
Widest Aperture: f/2.8
Narrowest Aperture: f/11
Aperture Blades: 12
Filter Size: 43mm
Hood:
Close Focus Distance: 18.11” at 1/4x
Reproduction Ratio:1/4x
Focus Throw: none
Weight: 240g
Color: 400 ~800nm APO
Rear Mount: M45 Resolution:
Image Size: 16 mm
Color: APO
Rear Mount: M45

Lens: Printing Nikkor 95mm, f/2.8

Focal Length: 95mm
Widest Aperture: f/2.8
Narrowest Aperture: f/11
Aperture Blades: 12
Filter Size: 43mm
Hood:
Close Focus Distance: 16.77” at 1/2x
Reproduction Ratio: 1/2x
Focus Throw: none
Weight: 320g
Color: 400 ~800nm
APO Rear Mount: M45
Resolution: 320 lines/nm

Image Size: 30mm
Rear Mount: M45

Lens: Printing Nikkor 105mm, f/2.8

Focal Length: 105mm
Widest Aperture: f/2.8
Narrowest Aperture: f/11
Aperture Blades: 12
Filter Size: 43mm
Hood:
Close Focus Distance: 15.94” at 1x
Reproduction Ratio: 1x
Focus Throw: none
Weight: 360g
Color: 400 ~800nm
APO Rear Mount: M45
Resolution: 240 lines/nm

Image Size: 54 mm
Sharpest Aperture: f/3.3 to f/4.7

This lens is sharp wide open and can be stopped down to f/5.6 without too much degradation. This lens is designed for 1:1, at which the center and corners are tack sharp. It is a true apochromatic, with virtually no chromatic aberration. Also no distortion or flare. This lens is designed to be used wide open, and does not improve on stopping down.

One way to mount the 105PN is to find a Rodenstock Modular Focus Unit (RMF) kit, which has some accessories to make this happen. The camera-side of the RMF has a Nikon F-mount, which can be used with the Nikon PN-11 extension ring with its rotatable tripod ring, which offers magnification adjustable from 0.7.1 to 1.1.

Lens: Printing Nikkor 150mm, f/2.8

Focal Length: 150mm
Widest Aperture: f/2.8
Narrowest Aperture: f/11
Aperture Blades: none
Filter Size: 62mm
Hood:
Close Focus Distance: 22.5” at 1x
Reproduction Ratio: 1x
Focus Throw: none
Weight: 1,020g
Color: 400 ~800nm APO
Rear Mount: M70

Resolution: 240 lines/nm
Image Size: 30mm
Sharpest Aperture: f/3.3 to f/5.6

The 150mm Printing Nikkor has front threads that can be attached to the camera, which have M58x0.75 threads. Since the lens is built symmetrically, it does not matter which way the lens is mounted. This lens is heavy and long, so keep that in mind. It wants to be mounted on a bellows, so that you can find the right length for what you are doing.

Lens: Nikkor “O” 55mm, f/1.2 CRT Oscilloscope

Focal Length: 55mm
Widest Aperture: f/1.2
Narrowest Aperture: f/11
Aperture Blades: 12
Filter Size:
Hood:
Close Focus Distance: 417.1mm overall working distance
Reproduction Ratio: 1/5x
Focus Throw:
Weight: 385g
Color: Not corrected, 0%
Vignetting, 1.14% distortion
Rear Mount: M39

Resolution: 250 lines/mm
Image Area: 24x36
Standard wavelength: 400 - 650 milli-micron

The Nikkor “O” (for oscilloscope) or CRT-Nikkor as it is called is perhaps the most “different” lens that I own. This lens was made for monitoring CRTs and has trouble with daylight, which is part of its charm, since all kinds of wonderful color variations can be expected. This is not an APO lens or anything close to it because it has been corrected to render phosphorus colors, and is said to be optimum at f/4 and f/5.6. However, I always shoot it wide-open and paint in areas I want in focus by stacking focus.

It is listed as having f/1.2, but remember, all ratings are for a lens at infinity, and this lens is designed for close-up range, so the f/stop would be more like f/1.4.

As for bokeh, the CRT-Nikkor is over the top, bokeh on LSD, which I particularly love. The CRT Nikkor can help you get out of the box and become more creative. At least that has been my experience.

I just had to take it out yesterday and shoot a few. Here is one with the Nikon D800E, the CRT Nikkor 55mm f/1.2, and Zerene Stacker.

This was a lens built to photograph computer monitors (CRT), the old ones with a curved face. The lens also has a corresponding curve, and so this is anything but a flat copy lens. In this way it distinguishes itself from almost all other industrial lenses. At f/1.2, it is fast and allows plenty of light in the viewfinder. It has a narrow depth of field at its sharpest and I consider it a specialty lens, although its specialty is very “special”, that of allowing for

sharp resolution in parts of the frame, but a Zen-like blur instead of standard bokeh, that and the ability to make whole areas of color just go wild, well beyond a gradual decline.

It was the use of this lens by another photographer that launched me into my journey into the industrial Nikkors and related process lenses. At least for me, this lens is very much hit or miss, meaning that sometimes the results are miraculous, while at other times, only too average. In other words, this is lens is a little bit difficult to predict or control. We have to learn how to use it.

And there are two variants and I have had both, with the newer version having (engraved in RED) “M=1/5.” Some say that the later version has a different coating and some say a “better” coating, but I don’t really see much difference.

As for using the lens, I almost always use it wide open in order to get the wild bokeh it is famous for. I see little point in stopping it down. As for mounting it, the rear mount is an M39 thread, with a locker-screw to make sure you do NOT allow the long M39 thread to stick into your camera and break the mirror, so take note.

Since the lens has no helicoid, no way to focus. What I do is mount the lens on my Nikons and mount that Nikon and lens on a focus rail and use that. Be prepared for a large stack of image-layers, since most focus rail’s incremental stepping tends to be find. Of course, you can take single shots with this lend, but to get the bokeh of wide-open gives a very narrow field of focus.

Lens: Repro Nikkor 85mm

Focal Length: 85mm Widest
Aperture: f/1.0
Narrowest Aperture: f/8
Aperture Blades:
Filter Size: 52mm
Hood:
Close Focus Distance: 407mm
Reproduction Ratio: 0.9x-1.1x
Focus Throw:
Weight: 2,320g (1 lb., 8 oz)
Color: 400-650nm
Resolution: 200 lines/mm
Image Circle: 43.2mm
Optimum Resolution: f/5.6

The Repro Nikkor is long and quite heavy. You have to be very careful that the adapters you use to reach the F-mount are VERY sturdy. This weighty lens wants to fall off, otherwise. It I listed as f/1.0, but commenters seem to suggest it really is more like f/2.0 at 1:1 reproduction ration. The entrance pupils are located quite far behind the lens, so that rays passing through the center of each pupil run pretty-much parallel to the optical axis. Can be used as a relay lens.

I can't speak to that, but I do know it is very bright in the viewfinder, and sharp, sharp. As far as I can tell, this is not an APO corrected lens.

The Repro Nikkor is designed for one thing, 1:1 work in 35mm format. Said to be fully corrected. Vignetting is 0%, Distortion is 0%. There is no field curvature.

These details have been listed for this lens:

Construction: 12 elements in 8 groups
Picture angle: 14°
Standard magnification: 1 X
Working distance: 224mm
Image area: 24mm x 36mm
Corr. wavelength range: 400-650nm
Vignetting: 0 % at f/2.3
Resolution: 200 lines/mm
Distortion: 0.0 %
Aperture scale: 1.0 - 8
Mount: d = 53mm / p = 0.75mm
Dimensions diameter: 57.5mm
Dimensions length: 107mm
Weight: 640 g

Lens: Zeiss 74mm S-Planar f/4

Focal Length: 74mm
Widest Aperture: **f/4**
Narrowest Aperture: 8/11/16/22/32/45/64
Aperture Blades:
Filter Size:
Hood:
Close Focus Distance: 276mm
Reproduction Ratio: 1:1
Focus Throw: Weight: Color:
Rear Mount: M32

Lens: Rodenstock Scitex-S3 89mm

Focal Length: 89mm
Widest Aperture: f/5
Narrowest Aperture:
Aperture Blades:
Filter Size:
Hood:
Close Focus Distance:
Reproduction Ratio:
Focus Throw:
Weight: Color:
Mount: Rear, M39x1

This Rodenstock lens is labeled Scitex, made for the Scitex (later CREO and ultimately bought from Kodak) high-end Supreme/Supreme II scanners), costing about $45,000, and very high quality.

They have a rear M39x1 thread and must be color corrected because they are used in high-end color reproduction. Also very sharp.

Lens: APO El-Nikkor 105mm f/5.6 APO

Focal Length: 105mm
Widest Aperture: f/5.6
Narrowest Aperture: f/45
Aperture Blades: 8 blades
Filter Size: 40.5mm
Lens Mount: 39mm
Hood:
Close Focus Distance:
Reproduction Ratio: 10x (5x – 20x)
Focus Throw:
Weight: 315g
Color: APO
Rear Mount Sixe: 39mm
Front Mount Sixe: 39mm

This lens is sharpest and has the most resolving power at f/5.6, although f/6.3 and f/7.1 are almost as good. Corner sharpness is good by f/8. There is minimal lateral CA at all apertures. Above 1:1, the lens is often reversed to improve corner sharpness.

This is my must-used lens and I consider it my most valuable lens. I use it on a bellows, usually the Cambo Actus system. It is very highly corrected and sharp. It is not a fast lens, but the rest of its qualities overpower that fact that it is not fast. And it is rare and expensive.

Lens: APO El-Nikkor 210mm f/5.6 APO

Focal Length: 210mm
Widest Aperture: f/5.6
Narrowest Aperture: f/45
Aperture Blades:
Filter Size: 77mm
Hood:
Close Focus Distance:
Reproduction Ratio: 10x (5x – 20x)
Format: 4x5”
Weight: 1220g
Rear/Front Mount Size: 82mm
Color: APO

The 105mm version of this lens is my must-used lens and I consider it my most valuable lens. I use it on a bellows, usually the Cambo Actus system. It is very highly corrected and sharp. It is not a fast lens, but the rest of its qualities overpower that fact that it is not fast. And it is rare and expensive.

I also had its big sister the APO El Nikkor 210mm f/5.6 shown here which is very heavy. Since its “draw” or style was no better than the smaller 105mm, I did not need both lens, so I sold the 210mm version.

-


NIKKOR-AM * ED 120mm 1:5.5
T B 1 2 4
5.6 8 11 16 22

Lens: Nikon Macro 120mm f/5.6 AM-ED lens

Focal Length: 120mm
Widest Aperture: f/5.6
Narrowest Aperture: f/45
Aperture Blades:
Filter Size: 52mm
Covering Power: 55 degrees @ f/22
Covering Power: 47 degrees @ f/5.6
Image Circle: 210mm f/5.6, 250 mm, f/22
Shutter: Copal #0
Flange Attachment: 32.5mm dia. X .05m (Copal #0)
Flange Focal Distance: 11.9.mm @ infinity
Close Focus Distance:
Reproduction Ratio: 10x (5x – 20x)
Focus Throw:
Weight: 10.4 oz (295g)
Color: APO
Maximum Format Size: 5x7”
Slip-on Caps: 54mm front, 42mm rear

This lens is designed for 1:1 reproduction, but it can be pushed this way and that, which is what I usually do. I am told the “AM” stands for “APO” and “Macro.” “ED” stands for Extra-low Dispersion glass, which reduces chromatic aberration. Is said to be 100% free of distortion and lateral chromatic aberration at 1:1 magnification.


MADE IN JAPAN
5.6 8 11 16 22 32
T B 1
NIKKOR-AM * ED 210mm

Lens: Nikon Macro 210mm f/5.6 AM-ED lens

Focal Length: 120mm
Widest Aperture: f/5.6
Narrowest Aperture: f/64
Aperture Blades:
Filter Size: 67mm
Covering Power: 51 degrees @ f/22
Covering Power: 41 degrees @ f/5.6
Image Circle: 310mm f/5.6, 400 mm, f/22
Shutter: Copal #1
Flange Attachment: 39mm x 0.75mm
Flange Focal Distance: 202.7mm @ infinity
Close Focus Distance:
Reproduction Ratio: 10x (5x – 20x)
Focus Throw: None
Weight: 30 oz (850g)
Color: APO
Maximum Format Size: 10x12”
Slip-on Caps: 70mm front, 70mm rear

This lens is designed for 1:1 reproduction, but it can be pushed this way and that, which is what I usually do. I am told the “AM” stands for “APO” and “Macro.” “ED” stands for Extra-low Dispersion glass, which reduces chromatic aberration. Is said to be 100% free of distortion and lateral chromatic aberration at 1:1 magnification.

Lens: Schneider APO-Digitar 120mm M-26° MC

Focal Length: 120mm
Widest Aperture: f/5.6
Narrowest Aperture: f/45
Aperture Blades:
Filter Size: 40.5
Covering Power: 30 degrees
Image Circle: 110mm @ f/11
Shutter: Copal #0
Focus Throw: None
Weight: 8.82 oz (250g)

I am still getting to know the various (and there are man) Large Format lenses. However, almost all of the large-format lenses I have are very sharp, not very fast, but otherwise similar in many ways and fairly easy to use.

They each have their own style, but these are more similar IMO than different.


COMPONON-S
4/80

Lens: Schneider Componon-S 80mm f/4

Focal Length: 120mm
Widest Aperture: f/4
Narrowest Aperture: f22
Filter Size: 43mm
Magnification Range 2x-20x

Weight: 4.9 oz (140g)

I am still getting to know the various (and there are man) Large Format lenses. However, almost all of the large-format lenses I have are very sharp, not very fast, but otherwise similar in many ways and fairly easy to use. They each have their own style, but these are more similar IMO than different.

The two AM-ED Nikkors that I have (120 and 210) are great lenses and have their own style, but to me it is more utilitarian and less arty in style. All of the LF lenses I have are IMO good.

I use them on various bellows of which I have a bunch, but mostly on the Cambo Actus Mini system, using Tilt to tie the near and the far ends of a subject together through a plane of focus... so that I can stack with less artifacts. I do this all in LiveView and by eye, not by any measurements or diagrams. I tilt or shift a lens until I like what I see in LiveView and take photographs. Simple.

FOCUS STACKING COMMENTS

Photographers have been trying since the photograph first began to fight the natural law of diffraction and achieve greater depth-of-field with clarity and resolution. Caught between the devil and the deep blue sea with too shallow a depth-of-field on one hand (low apertures) and inexorable diffraction (high apertures) on the other. There are various theoretical ways to improve the situation in development, but none of them has yet trickled down to popular cameras.

One ray of hope and help comes from the increasing interest in stacking focus, which with the advent of the Nikon D850 actually has now been implemented within the camera itself. Internal focus stacking, termed “Focus Shift Mode” by Nikon allows certain autofocus lenses to automatically stack focus. Unfortunately, for my work, very few (to none) of Nikon’s autofocus lenses are fast enough, sharp enough, and well-corrected enough to bring to this feature the quality of lenses like the Zeiss Otus series of lenses.

With that in mind, in this article I want to look at different ways to stack focus or manipulate images that can result in the appearance of greater depth-of-field, including the good, the bad, and the ugly. I don’t (or seldom) use some of these methods, but I feel it is good to lay them out on the table, so at least you understand what some of your possibilities include.

FASTER GLASS

To sum up what works for is:

Faster glass in a lens means great bokeh, but for my work it also has to be very sharp wide-open and very well corrected at well. That’s the glass that I seek and sometimes find. With fast glass as described above,

even though wide open the DOF is razor thin, I can literally paint in focus over a sea of bokeh and be quite satisfied with the results.

Things that also help are a lens with a long focus throw or using the tilt features of a bellows, thus forcing the plane of the focus to compress near and far, making it much easier to stack with fewer artifacts. In the process of searching out lenses, along the way I have tried all kinds of lenses to see if I could squeeze from them something useful for close-up shooting.

BASIC FOCUS STACKING

Classic focus stacking is simple. Start at the front of your subject, focus, exactly, and take an image. Then, very slightly, turn your lens barrel and focus a little closer; take an image. And keep going like that until you reach the end of the subject or as far as you want focus to go. That's it. Then process that stack of image using one of several software that stacks focus. Retouch, if needed and you are done except for whatever post-processing you might want to do.

I have tried many different focus-stacking software and I'm not going to compare all of them here. I have done that in other. IMO (having stacked hundreds of thousands of layers), Zerene Stacker is the best focusing stacking software I know of. I suggest you start there.

SHORT STACKS

A "short stack" does not simply mean few frames or layers, but rather a few shots carefully chosen that highlight the parts of the subject you would like in focus. For example, you might have for a subject a bouquet with three central flowers. You might make a 3-layer stack with a layer devoted to focusing on the center of

each of those flowers. And the rest of the shot can be what it is, bokeh or no. Then, the resulting photo will have those three flowers in exact focus. That's what I call a short stack.

LONG STACKS

A "long stack" is everything longer than a short stack, obviously. It could be 10 layers or 110 layers. It's up to you. However, much greater care needs to be taken to move through 110 layers without moving the camera, the tripod, much less being aware of changing light conditions, vibrations, and whatever will disturb your still-life photography.

STACKING AT THE NARROW END

Some photographers like to stack photos setting the lens to the higher or narrow f/stops, so that each shot has as much depth-of-field as possible, perhaps with the theory that the greater depth-of-field in the layers will merge and somehow amount to better micro-contrast. I used to try this, but diffraction destroyed contrast so that ultimately I gave up on this method. I never use it anymore.

STACKING AT THE OPTIMUM APERTURE

Most lenses have an optimum aperture (often around f/5.6) when there lens is at its sharpest. Most focus-stacking fans tend to use this optimum aperture when they stack focus. This is what I do, although I tend to prefer lenses that are sharp wide-open. Yet, fast, sharp lenses wide-open are expensive, so take note. Therefore, finding the sweet spot for clarity/sharpness for each lens is an important consideration for stacking photos.

STACKING AT THE WIDE END

My favorite approach is similar to the above paragraph of selecting the lens aperture at the f/stop where it is the sharpest. However, I seek out lenses (and they are hard to find) where the lens is most perfectly sharp wide-open, and “wide-open” to me has to be faster than f/2.8, preferable at f/1.4 or better. This allows me to very carefully paint in focus as much as I like, while leaving everything else with a soft bokeh, which is what you get from very fast lenses. They have a very narrow depth-of-field, yet still are very sharp. And I should add: for my work the lenses must be very well corrected or what are called APO (apochromatic) lenses. Color that is not corrected destroys sharpness as much as lack of acutance does, IMO. So, I stack at the wide end, using very fast and well corrected lenses like the Zeiss Otus APO series.

FAST, SHARP, AND CORRECTED

So, what I like to use for stacking photos are lenses that are fast, sharp wide-open and highly corrected. All of the Zeiss Otus series fit this description as does, of course, the Voigtlander 125mm f/2.5 APO-Lanthar, which I consider the best all-around lens for close-up or macro work.

FEATHERING BACKGROUNDS

STYLE ONE

This is a technique I don’t generally use, but on occasion it can be helpful. Some lenses are not sharp wide open. Instead, we have to use higher f/stops to get sharpness. Still, we would like to have a softer bokeh in the background. So, we can take a background photo, wide open (say f/1.4), which will not be sharp, but have good bokeh. Then we can do our stacking at the higher

apertures where there is sharpness (say f/5.6). And in post, after we stack the images, we can add-in that one frame taken at f/1.4 and combine the two images.

This only works on certain photos, those where we can feather-in by using the Cloning Tool in Photoshop, so that our f/5.6 stack subject has a soft background bokeh. It can be hard to make this look natural, which is why I don't like to do it. But sometimes it is worthwhile.

STYLE TWO

Another approach is to stack the subject at, say, f/5.6, which can result with a background that is too much in focus (has no good bokeh) and then use various Photoshop tools to blur the background (Gaussian blur). This is not hard to do, but again we come up against making the edges of the sharp subject feather in with the blurred background. If you heavy a steady hand, this technique can be quite effective.

PARTIAL STACKS AND SINGLE-FRAMES

Just because you created a long stack does not mean you have to use the whole stack. Often a part of the stack is enough to make the impression you are looking for. Truncating a stack is the most obvious, but not the only approach. You can start anywhere in the stack and go any number of frames, including a single frame. I have been amazed at how beautiful one frame of a stack can be, no thanks to me. It's just there, often abstract or all blurred, but lovely nevertheless.

BELLOWS AND TILT

Early on in my focus-stacking career, so to speak, the idea of fiddling with lenses and camera on a bellows did not appeal to me. For one, it usually takes special lenses, ones made for use on a bellows and I didn't have any.

But there was a love affair with the bellows (and what

they can do) in my future. I now have all kinds of bellows sitting around here, and I've moved beyond simple bellows to technical cameras large and small. Most technical cameras (and some bellows) include the ability to tilt and shift. Shifting is often used to create panoramas and I do that once in a while.

Yet, mostly I'm in love with the tilt feature, bending the lens this way or that to change the focal plane so that it includes (or does not) certain areas of the subject. Tilt is especially useful in focus stacking to more easily include the front and the back of a subject in the same plane. By doing this, we take less layers of photos and best of all avoid many of the artifacts that appear when stacking the near and the far in the photo.

I routinely use the tilt feature in my favorite little technical camera the Cambo Actus Mini, which is a marvelous piece of machinery all in itself.

As for learning to use the Tilt feature, a few words: there are endless diagrams, articles, and videos about how to use the tilt feature in photography. IMO, they all make it sound very difficult. I gave up on the diagrams and instead just, using LiveView, just move the bellows and tilt around until the photo looks good. Then I take a photo. It is so much easier. Our eyes can see what it takes volumes to describe.

Start out by just tilting the lens up and down and watch how things come in or go out of focus. That's what I do. I may not know why the tilt does what it does, but my eyes understand it perfectly.

DSLR OR TECHNICAL CAMERA?

I don't really have to choose because my DSLR is part of my technical camera. I used them together. As for using my Nikon D850 on its own or as part of one of the bellows systems (like the Cambo Actus), that two is fifty/fifty, although I probably lean a little more toward

using the bellows system these days. As mentioned, earlier, I like the tilt feature.

MY FAVORITE CLOSE-UP LENSES

Although I have scores of lenses, I am gradually selling off the ones I never use. I decided I am not a lens museum. When it comes right down to it, I mostly do close-up photography and, unless its summer, I work in a tiny studio indoors. I have had a large studio for decades, but it is a whole block from my home and I find I just don't go there. LOL. I am going to sell it too!

Lenses that I dearly love and use all the time, in order of frequency used would include these:

Main Lenses I use

First Tier Lenses
APO El Nikkor 105mm f/5.6
Voigtlander 125mm f/1.4 APO-Lanthar
Nikkor "O" CRT 55mm f/1.2
Zeiss Otus 55mm f/1.4 APO
Zeis135mm f/2.0 APO Sonnar

Second Tier
Zeiss Otus 85mm f/1.4 APO
Zeiss Otus 28mm f/1.4 APO
Zeiss Milvus 35mm f/1.4 G
Nikkor Printing Nikkor 150mm APO f/2.8
Nikkor Printing Nikkor 105mm APO f/2.8
Nikkor Printing Nikkor 95mm APO f/2.8
Leica Macro Elmarit-R 60mm f/2/8
Leica Macro Elmarit-R 100mm f/2/8

Third Tier
NOCT Nikkor 58mm f/1.2
Nikkor 16mm Fisheye f/3.5
Voigtlander 180mm f/1.4 APO-Lanthar
Voigtlander APO-Lanthar 90mm f/3.5 SL

Family/Community
Nikon AF-S NIKKOR 70-200mm f/2.8E FL ED VR Lens

Nikon AF Nikkor 300mm f/4 ED Lens

PROCESS AND RESULT

If you wish to know what I consider important in my photography work, that would be “process.” Process and result go together like hand and glove. In my work extreme attention to process has always produced good results, while concentrating on the result at the expense of process has produced mediocre results. It’s that simple.

So, I’m not in a hurry and focus stacking requires and teaches patience.

STACKING SOFTWARE

I have used most of the stacking software on the market, if not all. I use and recommend Zerene Stacker because of its ability to stack fine-subjects and its incredibly good retouching features. You can read about or purchase Zerene Stacker here. I am not affiliated with this company in any way.

https://zerenesystems.com/cms/stacker/docs/purchasing

RETOUCHING TIPS

PMAX AND DMAP

Zerene Stacker has two stacking modes. I always run both of them, not just one or the other. To get the best results, I always work with DMAP and if I want to merge the two, I copy from PMAX onto DMAP and NOT vice versa. DMAP best preserves the original color, while PMAX handles finer details. Together, they work best as described. PMAX is best in filigree-type subjects, ones with lots of fine hairs, etc., but at the expense of color modification. DMAP is not so good with the filigree, but great with wide expanses of color and less fine detail. Together, they work perfectly.

USING PHOTOSHOP

I know both Photoshop and Lightroom quite well. I have used both for years. IMO, Photoshop is superior in almost every way to Lightroom. And Lightroom has the very bad habit of messing up its catalog file and losing all my data, keywords, etc. Unforgiveable. I have twice lost immense amounts of data through Lightroom crashes, so I have abandoned it in favor of the following process.

First I store each day's shoot in a folder with a date in the format 2017-11-12, which reads "2017, November, twelfth." I store it sequentially by date on a hard drive. And I keep track of the hard drive by using Adobe Bridge, which as long as you are careful in saving each edited image, is non-destructive.

I have no affiliation with Adobe.

I then do all the photo work in post with Photoshop, which of course involves Camera Raw. This is all I use, aside from a plug-in of the Nik Collection.

If you want a good overall way to process images in post, I suggest the course by photographer Ming Thein at this link:

A3: Photoshop, ACR, & Lightroom

http://mingtheinstore.outthink.us/6-photoshop-videos

The cost is $80, but it is well worth the money if you really want to know and easy post-processing flow. I have no affiliation with Ming Thein.

The Voigtlander 125mm f/2.5 APO-Lanthar (CV-125)

When all is said and done, IMO, the CV-125 APO Lanthar is the best all-around lens for close-up work I know of. This may be sad and IT points out the need today for a really, really good macro lens for the Nikon mount. Nikon is, IMO, years behind offering one. And I do not understand why Voigtlander did not offer their new 65mm Macro in Nikon format. It has a lot in common with the CV-125. Or, for that matter, they could re-issue the CV-125.

I have the various Zeiss Otus series (and the Zeiss 135mm Sonar that I consider Otus), and the Zeiss lenses are better corrected and sharper, but they are not meant for close-up work. When it comes right down to where the rubber meets the road, I can always reach for my CV-125.

There is a special quality to the CV-125, call it draw or style or whatever....anyway you want to spell it; the look of images shot with the CV-125 have a special quality. If we move to bellows-based work, then IMO the APO El Nikkor 105mm has the same special qualities and is even more useful (to me) than the CV-125. In my experience sheer "sharpness," correction, and so on without some special qualities, even if they are caused by defects (photographically) like the Nikkor "O" CRT lens, which may not be made for "white " light and it is curved, etc. But its style is almost unique and very lovely.

I don't use the CV-125 for 1:1 macro work, but rather for general close-up work, which IMO is where it shines. Folks can do tests and more tests of the CV125, but in the end it is not the sharpest, not the best corrected, etc. However, I would sell my Otus lenses before I would sell the CV-125.

And I would sell ALL of my lenses before I sold the APO El Nikkor 105. That's my view.

THE SONY A7R3

There are a number of threads out there on the new Sony A7r3 mirrorless camera, and I even started one myself. What I would like to discuss is why the A7R3 may be particularly useful to me and the reasons I feel this way. And, of course, I am trolling here for more information on this topic and other photographers with a similar bent.

The first “major” DSLR that I had was the Nikon D1X, sometime in 2001. And I have had almost all of the DSLRs from Nikon since then, at least of the landscape variety. Since I shoot close-up nature photos, I never cared about sports-related cameras, high ISOs, and autofocus.

Anyway, for me, there have been a string of cameras all the way up to Nikon’s recent release of the D850. In my case, it’s always been onward and upward, onward to more and better features and upward toward sensors with ever greater megapixels. And the last couple of years have been kind of a climax of sorts, at least a branching out of options. And of course, I was swept up in it all, especially the seeming-endless waiting, etc. I marched through buying (and returning) three medium-format cameras, a long time ago the Mamiya RZ67 (with eleven lenses) and more recently the Hasselblad X1D and the Fujifilm GFX.

And along in there I also bought and tested out the Pentax K3 and K1, mostly because of their pixel-shift technology. And I had the Sony A7S and A7R. I bought the A7R2, sold it, bought it again and sold it yesterday. I also ordered a copy of the A7R3 yesterday, mainly because of the pixel-shift feature, which brings me to my point in writing this.

Of course, like many of us I am in the habit of getting cameras with more and better pixels, and without really thinking about it I imagined I would like a 100 Mpx camera

or even greater. However, I have been recently having doubts about this after getting the Nikon D850 camera, with its 45.7 Mpx.

I have a very big and fast PC, one with two GPUs, eight cores, a fast processor, 128 GB of RAM, etc. However, I did notice with the new Nikon D850, which has only a modest increase in megapixels, a difference in the computing power required. Keep in mind, that I stack focus, so I often have to process 100 or more large TIF files in the same batch. This takes time, and with the D850 it takes a little MORE time. Not that much, actually.

However, I can see that when we get 100 Mpx sensors, it will increasingly take more time (and storage). I keep all my stacked layers, so I have many hundreds of thousands of images by now. And this set me to thinking.

Of course, I have wanted larger sensors, but not just for more megapixels, but for larger-sized photosites that collect more light. That is why I originally purchased a Sony A7s, for more light and larger photosites or whatever we call them.

By using the Pentax K3 and K1, both of which have pixel-shifting technology in them, I could see that they provided superior color and better resulting resolution, but I was not happy the way Pentax handled non-native lenses (of which I have a lot), so eventually it was more trouble than it was worth and the Pentax lenses did not make me happy. I like APO lenses.

So, my point and perhaps question here to those “tech-sperts” out there is: can we have a discussion here about perhaps not yearning for ever greater-sized sensors and concentrate more on improving the color and resolution in smaller-sized sensors, the ones we already are using.

I am happy with about 50 Mpx in sensor size, not less please, but perhaps I don't need more. Since I don't make prints of my images (never have), I only need a size to display on the web or place in an e-book format. Typically, I used images that are 2048 pixels on the long side for what I post, depending on where I post of course.

So, I'm wondering if my Nikon D850, which is great by the way (much nicer than I had imagined), along with the new Sony A7R3 (if it works as advertised) might be all that I need? At 42 Mpx, the A7R3 is not much different than the 45.7 Mpx of the D850, and that may be as much as I need.

I am wondering, since I ONLY do still photography on a tripod, whether the pixel-shift technology of the A7R3 may give me the color (most important to me) and the enhanced resolution (however that works), so that instead of having to forever project myself forward to larger and larger sensors, I might (at least for a time) be happy with what I have (or will soon have with the A7R3)?

I am sure some of you here will have more technical thoughts about this conundrum I am in, either agreeing with me or pointing out something I have not thought of.

NIKON D810 AND D850

Most folks who know my work know I am interested in focus stacking and have been for years. In the course of the last year and a half I have been through (IMO) a little photography hell, trying to find a camera to work with (or replace) my Nikon D810. This involved ordering and waiting for months and months for a copy of the Hasselblad X1D and then the Fuji GFX, both of which did not work out (for my purposes) as I had hoped they would and they cost a bundle, once you started adding lenses to the mix.

And of course, Nikon was conspicuous by its absence all that time, so much so that I kind of began to give up on them, although I am a confirmed Nikon user and have way too many lenses for that mount.

Then the Nikon D850 arrived and was delivered relatively quickly. But the question remained, aside from its many new features, most of which I will not use much (like high ISOs and fast autofocus), how does it work for what I really care about, which is working with LiveView and low ISOs... and especially focus stacking?

Well, the verdict is in (for me anyway); it works well for everything I need it to. for starters, the new LiveView screen is considerably better than the D810. And marvel of marvels, I was surprised to find how much I love the ability to run silent with Electronic-First-Curtain and no mirror slap. Wow!

As they say, “Silence is golden,” and it really is when stacking 100 layers for one photo. And it is very much faster because I’m no longer doing mirror-up and waiting for the vibration to die down. Without the sound of shutter

activation, I just watch the LiveView screen update the screen with each press of the remote. And everything proceeds so quickly and easily.

I have not tried the automatic focus-stacking feature because I like to march around objects (especially round or spherical subjects) when focus stacking, and even increments defeat that. And I have few lenses with auto-focus and they are not well corrected. I find the whole process of stacking focus something I mostly enjoy doing by myself.

So, anyway, for those who wonder how the D850 takes to focus-stacking, my answer is better than I could have ever expected. I'm still working on the processing in post and, although the color of the D850 is different (to my eyes) than the D810, with not too much adjustment in my process, the results are what I am used to. I can't say (or yet tell) if they are better or worse.

I can say that Nikon D850 has killed my interest in medium-format cameras, especially in terms of computer-post. I have a very fast (and expensive) computer, custom made. Even so, I can feel the difference in processing moving to 47 Mpx as compared to 36 Mpx. It's OK, but I could see that moving to 75m or 100 Mpx could seriously impact my patience. At least for now, 47 Mpx does all I need, and I very much notice that small difference in sensor size between the D810 and the D850. For me it is just enough to push me over the edge into what I have been looking for.

NOTES ON THE Nikon D850

Starting to get more of a handle on the Nikon D850. I like it! I can see I will learn to even love it.

Turning off all sound in the camera as part of LiveView is way more wonderful than I would have imagined. Silence. Great for stacking photos and progress is as easy as watching the Live View screen visibly changing. I will use it ALL the time.

The tilt-able screen in LiveView is helpful, but would be more helpful if it moved four ways instead of two, but not any real worry.

To me, it looks like Nikon came out of the closet and threw everything they had this baby in an attempt to reinstate themselves. IMO, it works. I have (at least for now) lost ALL interest in medium-format cameras and ALL need for the mirrorless cameras with their EVFs. The improved LiveView of the D850 is enough EVF to allow me to do what I need to do until.... someday... something much superior comes along.

And what an incredible bargain in price! Compared to the 15-20 thousand dollars to properly tool up for Hasselblad X1D or the Fuji GFX, spending about $3400 for the D850 (with a couple of extra batteries) is a steal. And have not even begun to explore this camera's use in sports or nightclubs, which I will use for music acts, since I am around them a lot.

Not owning many AF lenses, the little focus-stacking option (which I think just produces JPGs!) is a non-starter for me. I like to roll my own stacks, thank you, and use the best lenses I have, many of which are not Nikkors. And without

a raw option for this, I would never use this feature. But some I imagine will.

The D850 seems a tad heavier than the D810, but not enough to consider. The new more deeply-indented grip is nice, but I am always on a tripod, so not important to me. The batteries are said to last longer than those for the D810, but even these empty too fast for my taste. They are good enough.

I have an L-Bracket from RRS and that is nicely made. I never used the on-board flash on the D810, so would much prefer to have the larger OVF viewfinder, but will never use that... Well, maybe sometimes.

There are a great many features I have yet to try out, but my bread & butter settings are all there. The additional joystick I have no use for, already using the multi-selector button to move around. And, of course, setting my multi-selector-center button to magnify is the first thing I did. Works fine.

I’m sure readers know all of this, so I’ am just confessing my Yes for this camera.

MORE ON THE NIKON D850

It's been since about June of 2016 when I ordered the new Hasselblad X1D and waited. Then I ordered the Fuji GFX... and waited. I sent both of those back for various reasons along with a lot of lenses, etc.

Then I ordered the Nikon D850 and waited just a little.

I received my copy today and have only had a couple of hours of time in on it. There may be some deep-dark flaw, but I have not seen it yet. Some of our techsperts will have to check that out. My initial impressions, so far, are:

(1) The ISO 64 seems to be there.

(2) The extra Mpx are definitely worth it. Very much a difference that counts.

(3) The new LiveView screen is better than the D810 by a lot, but also perhaps a little more difficult to focus, not to see, but to adjust focus.

(4) The sharpness of older lenses like the photo here taken with the Voigtlander 125mm APO-Lanthar push this lens to a higher state of us. The camera makes sharpness... sharper, IMO.

(5) The color on the LiveView screen looks different than the D810, but the end result (color-wise) is excellent. No complaints.

I don't use auto-focus and I still have not got the camera set up properly, but I'm working on it. So my initial impression is that this camera is as good or even better than I had hoped and at a HUGE savings in cost, not to mention that I have so many great lenses in the Nikon F-

mount. If I have a single doubt, and I am not done checking this out, the highlights may clip... slightly more easily than the D810, but I will wait for gear guys to test this.

So far, so good.

In Praise of the APO-El Nikkor 105mm

I cannot say enough about the fine qualities of the APO-Nikkor 105mm enlarger lens. I would not even think of using a lens as slow as the APO-El Nikkor (f/5.6), but I have no problem using this lens and I do almost every day. It is that good. In fact, the more I use it, the more I want to use it. It has a style all its own, one that calls out for me to try this, that, and then some other thing with it.

The lens is very sharp, but in a very organic way that does not appear as cold or cut and dried. Its color is superb, perhaps because it is so very well corrected. And you don't want to confuse with its younger brother the El Nikkor 105mm lens that is not APO (apochromatic). They are not in the same ballpark.

Perhaps every photographer finds one lens that just fits them to a "T" and this may be mine. It's not that I don't have (and love!) many other lenses, but for some reason this little gem is undeniable. And I have to use it on a bellows, with what that entails, so it's not a slam-dunk.

And while I love the Zeiss Otus lenses, the Voigtlander 125mm APO-Lanthar and on and on, I've yet to find a more compelling lens than the APO-El Nikkor 105mm. And I also took the time (years) to seek out its big brother the APO-El Nikkor 210mm lens and found one. It is just a much larger and heavier version of the APO-105mm. There is nothing better about the 210 than the 105mm. I decided to sell it because of its bulk, but I wish I had a backup copy of my APO-El Nikkor 105mm.

Photographers speak of certain lenses having a unique "style." IMO, the legendary Noct Nikkor is one of those or the Voigtlander 125mm APO-Lanthar. The APO-El Nikkor 105mm is one of those special lenses. I can't put my finger

on what makes this lens's style so exceptional, but there it is. Perhaps one of you out there who have used this lens can explain it to me.

And it is so flexible. In fact, this lens caused me to get a much longer rail (and bellows) for my Cambo Mini-Actus, so that could pull back and get closer.

VOIGTLANDER 65MM MACRO APO-LANTHAR F/2

I have received my copy of the Voigtlander 65 Macro APO-Lanthar f/2 lens for the Sony E-Mount. I wish that it was also available for my Nikon F-Mount cameras, sigh. An updated CV-125mm APO-Lanthar (for Nikon) is something I have looked forward to for years, so this may be as close as I get, but on Sony rather than Nikon.

Arriving in a very attractive and form-fitting package, the lens is a solidly-built all-metal lens with a focus throw of maybe 300-degrees, just what I like for a macro lens, and that degree of focus throw reminds me of the Voigtlander 125mm f/2.5 APO Lanthar, one of the great macro lenses, which I will see how it compares to. The CV-65 is a rather pretty lens.

The f/stops go from f/2 through f/22. It has 10 diagram blades, with a minimum focus range of 12.2” (31 cm). The reproduction ration is 1:2, which I like because I seldom require 1:1, although I am sure others will complain about that. And yes, it is manual focus, with no stabilization or tripod collar. It weighs (635 g, 1.38 lb.

Although I read online that many photographers think of a 65mm Macro as a strange length and wonder how to use it, as a close-up photographer, that length is just perfect for adding context to a shot. There are very few macro lenses that I know (or use) around this size. I had the 50mm Zeiss Makro-Nikkor, but it was not corrected well enough, so I eventually sold it rather than having it sitting there on the shelf looking nice, but never used.

I also have the 50mm Leica Elmarit-R Macro that I converted to Nikon F-Mount and I use it all the time. It is a very nice lens. Yet, the idea of a wide-angle macro lens is

almost an oxymoron. There are not many of them. So, I am very happy to see this from Cosina/Voigtlander and I hope it is just the first in a line of quality APO lenses like the legendary CV-125 APO Lanthar Macro that I treasure.

So, this new 65mm Macro looks good and feels good in the hand, not too big and not too heavy, but heavy enough. How does it perform?

In a word, it performs well. It is definitely sharp enough for my work. Very sharp. The color is good and needs less correction than images from the Nikon D810. If I have any problems with it, they are same as I have with the Sony A7RII, which I am not as used to as my Nikons and IMO not as well-designed, but that is a criticism of the A7RII and not the CV-85 Macro.

If I have a single complaint, it is that there is not enough contrast to the shots, but that can, to some degree, be corrected in post, but still I am not happy about that. Perhaps some of you out there will have a different experience.

Will I keep it? Not sure yet, but perhaps not, especially with the Nikon D850 coming soon. I could use the context of a wide-angle macro, but perhaps not at the expense of having to mess with the A7RII, which while I respect that camera, I don't really like it that much. But that's my problem. However, if they offered it in a Nikon F-Mount, I would buy it in a minute.

Here are a couple shots, with the A7RII and the CV-65 APO. The Moon Flower is a single shot, the Hibiscus is a stacked shot. In general, for about $1000, I can't say where you could find a macro lens of this quality, but I look forward to hearing from others.

I compared both the Voigtlander 125mm f/2.5 APO-Lanthar to the new Voigtlander 65mm f/2 APO-Lanthar by taking shots of the same subject and found them quite similar in terms of sharpness. I see no reason to have one over the other. For me, the only reason to keep the Voigtlander 65mm f/2.5 APO-Lanthar is for the wider angle. I am keeping this new lens.

ZEISS MILVUS 35MM F/1.4

The Zeiss Milvus 35mm f/1.4 is not an Otus, but it is as close to one as I have seen a less expensive lens come. And it fills a gap in lenses that, as a close-up photographer, I need, although I have other 35mm lenses, but I don't "like" them. Is it sharp? Yes, it is sharp, not ultra-ultra sharp, but sharp enough to pass the "sharp" test with me, easily. It does not distract me for lack of sharpness.

The color is good. There is some very, very minor fringing, I believe, but not enough for me not to use the lens. I am not so concerned with traditional one-off photos, but more in how the lens will stack. It stacks well for a wide-angle. Does it take extension? Yes, it takes the K1-Ring, 5.8mm of extension... pretty well, which is good for a wider-angle lens. It has 9 rounded blades.

The close range is 11.81 inches (30 cm), which is excellent. The filter is 72 mm. It is manual focus, which is all I use anyway. It has an ample focus-throw, which is wonderful, since many wide-angle lenses have a short focus-throw. According to all sources, this is a brand-new lens design, not the warmed-over of previous Zeiss lenses, and it shows. This is something new, a high-point for Zeiss with lower-priced lenses.

The only fault I have found so far (and it can be anticipated) is that it does not do super-well with highlights and light areas. It's OK, and I can work around it, but the highlights seem to wash out a little early IMO.

Just continuing to get to know the Zeiss Milvus 35mm f/1.4, this new design. What a great compromise between the price and weight of the Otus lenses and this Milvus 35mm. This is more APO than not, and sharper than I

demand for comfort. As they say around here, “It’s all good!”

I order, but send many lenses back. I believe I will keep this one.

CLOSE-UP TECHNIQUES: CAMBO MINI-ACTUS

I get asked how I do close-up photography, so I decided to write some of this down, rather than answer the same question many times, since it is likd of long. So, this article is for those that are interested.

I thought it might be helpful to outline some the various approaches to close-up and macro photography that I regularly use. In particular, since I use a variety of different lenses (most of them are not real macro), I push them toward the kind of close-up work I enjoy.

Bellows Work

I do a lot of work with bellows and have all kinds of them around my studio. However, in recent years I mostly use the Cambo Mini-Actus, with some minor modifications. As for cameras, I am using the Nikon D810 on the rear standard, but I also sometimes use the Sony A7RII. The D810 has better low ISO performance and generally produces better results than the Sony A7RII... in my opinion.

As for lenses on the Actus rig, I'm all over the board. There is no doubt that my most-used bellows lens (and most-used lens overall) is the El Nikkor APO 105mm f/5.6 lens. Note the "APO," because the standard El Nikkor 105mm lens is quite ordinary compared to the incredible El Nikkor APO 105mm.

I also have used the larger version, the El Nikkor 210mm APO lens, which also looks good, but is very heavy and unwieldy IMO, so much so that I just sold my copy of this rare lens.

Another lens that I use on the Cambo Mini-Actus is the Nikkor AM-ED Macro 120mm f/5.6 lens and that too is a very fine lens, but just shy of the quality of the El Nikkor APO 105mm. I also have the 210mm version of the Nikkor AM-ED, which is great, but again, large and unwieldy.

Still other lenses I use with the Mini-Actus are the three Printing Nikkor lenses that I own, the 95mm, 105mm, and the incredible 150mm Printing Nikkor, and some LF Schneider lenses. These Printing Nikkors are very highly corrected APO lenses, but their coatings are not particularly modern, IMO. Great for the studio, but less useful in bright light and outdoors, but they are very, very sharp.

And there are many other lenses that I have tried on the Mini-Actus, too many to bother listing here, but they include a variety of large-format lenses, the Multiphot Macro Nikkors, and many others.

The main value to me of the Cambo Mini-Actus is its ability to tilt the front standard and compress an image front-to-back somewhat. This is particularly useful for stacking, where artifacts tend to multiply the greater the difference between the front and rear of the subject you are photographing. Using Tilt, I can telescope that down to something much more manageable in terms of generating artifacts through stacking.

When using the Cambo Mini-Actus, I tend to stack rather than take single shots. And by stacking I mean stacks from 50 to 150 layers. I have modified my Cambo Mini-Actus by purchasing a considerably longer rail and accompanying bellows. In addition I have replaced the rear standard on the Min-Actus (which has a fixed camera mount) with their new rear standard that allows me to switch camera mounts in seconds. This is very helpful.

I have also added a two-way level to the rear standard, and a focus-whip that easily attaches to the fine focus knob on the Mini-Actus. You can plug it in or take it out in second.

The Mini-Actus also allows both the front and rear standards to shift right and left, plus the rear standard can be moved up-and-down vertically. I don't shift much, but the sideways shift is good for panoramas or adjusting, etc.

Most of my Cambo Mini-Actus work is done in my small studio, but I have taken it out on many occasions and it is not clumsy or difficult to haul around. It really is small and light.

PRIME LENSES FOR CLOSE-UP WORK

Another approach I use a lot is using prime lenses, including non-macro lenses for close-up work. I do not have many macro lenses that I feel are good enough for what I am looking for, although I have owned (and still own) many macro lenses. The list of parameters that make for a really great lens are enough that most lenses fail in one way or another. I still use them, of course, but I just don't consider them "all around" lenses.

The exception would be the Voigtlander 125mm f/2.5 Apo-Lanthar macro lens from Cosina. IMO, this is the best all-around macro lens that I know of. The CV-125 is a very fast lens (f/2.5), a very sharp lens, highly corrected (APO), has nine 9 aperture blades, a close focus of 14.96 inches (38 centimeters), a 1:1 reproduction ratio, plus a long focus throw (630 degrees)

Now, prime lenses can also be used to create a long stack of many layers, just as I do on the bellows, but there is another approach, that if used carefully, also does a great job, and that is what I call "short stacks.. These are stacks of 2-6 layers, where each shot is carefully focused to capture one or another part of the main image. They are then combined as a stack. I use Zerene Stacker, and have tried (I believe) most if not all stacking software. Zerene is easily the best of the bunch.

Short stacks can save time and are very useful in the field, where wind may pick up or the sun go behind a cloud, and so on. We simply examine the frame and the subject beforehand, deciding which points of the subject we want in focus. Also, with some of the larger prime lenses, stacking does not always work so well, so very short stacks, even of one or two layers, or, of course, sometimes

no stack at all. Many times a single layer is best, using as high an f/stop as we can get away with.

Or, we can pick exactly what we want to have in focus and kind of paint in focus. For example, we may to devote a layer to each of the three flowers in a photo, and be using a fairly high f/stop like f/11 or so. And, in addition, we may want to do a refined stack of 20 or so layers just on one particular flower.

This idea of painting focus becomes the technique of choice if you are shooting a very fast lens, one with a razor-edge of focus that is sharp wide-open. In that case we literally (but slowly) paint focus exactly where we want to have it, and let the rest be the natural bokeh of a fast lens.

And quite often I use the wider well-corrected prime lenses, like the Zeiss Otus 28mm f/1.4, taking only a couple shots. I may want one shot close and a second a little farther back to get more sharpness in the background. Focus stacking does not always have to be used (or overused), but can assist in focusing just the parts where we want attention, and by using only a few layers. This is especially useful for landscape shots.

FOCUS RAILS

I must have a dozen focus rails, but I use them very little, since they are not ideal for stacking. I use the Novoflex Castel-L Focusing Rack, with the Arca quick release. To this I add the Novoflex Fine Adjustment Handle. I use racks for lenses that have no helicoid, like the CRT-Nikkor, which is one of my favorite lenses. I also mount the camera and certain other lenses, whose focus throw is too small to get fine focusing. I used to have to put the Coastal

Optics 60mm f/4 APO Macro on a rail because its focus throw was too small to do much with.

EXTENSIONS

As far as using extensions, my rule of thumb is don't. They always mess up the IQ of the lens. However, with high-quality prime lenses like the Zeiss Otus series, I regularly use Nikon's smallest extension, which is the K-1 Ring, which is 5.8 mm. This does not seriously destroy the quality of the lens it is on, but does allow me to get closer. I have, of course, all kinds and sizes of extensions, but they sit in a drawer, aside from the K-1.

CLOSE-UP LENSES

I have a lot of close-up lenses, but literally never use them. I have tried many times, but they mess up the IQ of the lens, to my eyes. I don't use them. The same with tele-adapters. A lens is a lens is a lens, and anything other or extra takes away from why we buy it. Turning a great lens into an ordinary lens makes no sense to me.

COMBINING F/STOPS

Another technique, one that has to be used sparingly and carefully, is to combine or "stack" shots at different ISOs. Let's say you want the soft mood and bokeh of f/1.4, but may not have time to paint focus, due to outside conditions. It is not difficult to take a background shot at f/1.4 and another dead-center (but at a higher f/stop, with more depth of field) on a flower.

In the final photo you don't want the background in focus, because you lose some of the mood. In post you can stack or otherwise combine different ISO layers, but they can be

very different, so feathering and touch-up is usually required.

For example, you can take a soft background of some flowers and place in the center of the flowers part of an image done at a much higher ISO. In that way, you can combine the effect of bokeh with sharp focus. You can do using this method, instead of painting in focus. As for myself, I prefer to paint in focus, but in the field there sometimes is no time to do a long stack, particularly with wind, light, etc. A couple shots at different ISOs can look pretty good. This technique, however, IMO, is moving away from my preferred methods. But, it can work and to a significant degree.

Summary

So, there are some of the main approaches I use to take close-up photos. I seldom use the macro range 1:1 (or above) anymore, because more and more I like the context I get with a wider frame. Focusing on the eye of a dragonfly or honeybee, after a short while, is just not particularly interesting to me. I want to see at least the whole head of the insect in a setting that is natural. And microphotography interests me not at all, but I can appreciate other's work in these areas, if it is superb. Those are some of the main techniques I use for close-up photography.

SOMETHING ON MY PHOTO HISTORY

I remember the Virginia Slims cigarettes advertising slogan (I didn't smoke them) "You've come a long way, baby" and I feel something similar goes with me and my photography. We can dispense with the "baby" part, because I'm all grown up and even old, like I'm 76.

But that doesn't stop me from every once in a while looking back to see how far I've come from that summer of 1956 when my amateur photographer dad loaned me his Kodak Retina 2a, a light meter, close-up lenses, and a tripod, and I then went on a 3,000 mile bus ride across America, into Mexico, and through Canada with a bunch of kids my age. I was fourteen years old.

Anyway, my dad was shocked at how good my photos were when I returned, perhaps the only time I ever really impressed him. He was a businessman, a Republican, and very conservative, while I was a Democrat, a liberal, and only later in my life any kind of a businessman.

So, from 1956 onward, I was always interested in photography, but seldom could afford the film and developing expense. More discouraging yet for me was the inability to see what I was getting until days, weeks, or months later. That was a photo-killer for me.

Of course, when digital cameras came along, I was right there and had been doing digital movies for a while before that. But I had an early Nikon Coolpix and a D1X (at $5K a pop) when they first came out. Using the D1X, I photographed more than 30,000 rare rock concert-posters and had to build my own vacuum table for that.

But all of my early years, from around six-years old onward, I was a committed naturalist, with little better to do

(until I discovered girls in my teens) than collect and document natural history. In fact, I became so interested (and skilled) in herpetology (especially frogs and salamanders) that I was given a little office-desk in the herpetology department, way back in the stack of preserved specimens at the University of Michigan Museums building.

In those years I captured, measured, and released thousands of specimens, mainly Michigan salamanders, in which I was interested. So, when I hear about photographers who brag about their hiking and roughing it, I have to chuckle, because I did that in spades, but in the Midwest and all across Texas, suffering everything from heatstroke (in Enchanted Rock State Natural Area) to being eaten alive by mosquitoes in Michigan and Florida swamps, and so on.

When I mention that I have taken many hundreds of thousands of nature photos, I've been called a liar, but I'm not. Photography can be a lonesome thing, in that my extended family might like to see perhaps 10 or so of my photos at a time, but after that their eyes start to roll. I have stopped asking if anyone wants to see what I'm doing photographically, unless it's photos of my grandkids. That's just the way it is. I am sure other serious photographers feel the same way. Not only is there not much of a market for photos, there is not even anything but a passing interest in looking at them for most people. LOL. That's a little background and its leading up to the reason I am writing this account, which is:

I thought I would talk, not about my interest in photography per-se or techniques, but rather about how that interest has changed over the years, because I see all of the different phases I have gone through being echoed and acted out by various photographers on the online photo

forums. And they don't all get along, but I believe they will (if they live long enough) come to understand one another.

As mentioned, I was a naturalist, and a dedicated one at that. My life was filled with nature collecting, documenting, journals, measuring and, as I got older, photographing. I lived and breathed nature study and that for many years. Even after I discovered that women were as interesting as nature, I still did a lot of nature work and collecting. Did I hike? You bet and lots of it, carrying as little as I could, and going as far as I could.

As someone who was interested in bogs, there was not only carrying a tripod, camera, lenses, diffusers, and what-not, it was doing it in hip boots, and whatever protected me from the cold or sun. Bogs are also (or can be) dangerous places to be, dangers to our health due to sinking through them (not to mention poison oak, etc.), but dangerous always to the bogs themselves. Bogs are a very fragile environment.

And climbing, well I did my climbing during two trips to Tibet, so blisters I know. Living in the flatlands of Michigan, there is not much to climb, but plenty to muck around in, because it's all wetlands. It's the same with lower Florida and the Everglades, a place I have been to many times.

As for how my photography morphed, I am getting to that. Originally (and especially) I was interested in field-guide quality nature photos, perhaps at first as regards identification, but later I wanted field-guide quality photos that were good photographs technically, too. However, I did not want the artsy-fartsy, and in my photos, whatever so-called "attractive" compositions resulted from my work were more by accident than design. But this too changed.

As time went by, yes I wanted to “capture” that photo and for it to look good too, but over time I found that I also wanted the specimen to “be in context,” so I wanted more and more of the surrounding habitat to be in the photos too. Ultimately, this was just a back-door way to introduce composition and its art. It took me quite a while to admit to myself that I was starting to like not just the context of the photo, but for it to have perhaps a little mood too. And that, my friends, is a slippery slope for a naturalist.

I was getting arty, but something else happened that was even more “horrific,” and that was that I was losing my taste for hunting specimens, either critters or plants. Now this was a serious segue indeed, because it meant that instead of planning this or that nature trip to find this or that critter or plant, I was becoming more interested in what might be called “found” photos.

I never liked sneaking up on a lizard or frog all that much, but I did it with skill and consistency. I was good at it too. I was once told that I had contributed the largest collection ever given to the university museum I worked with. I have no way of knowing if that’s true, but it was large enough.

And now I was finding that I didn’t care for the “hunt” on principle. The whole idea of “gotcha” photographing was beginning to fade or to even become repulsive. That really turned me around from where I came from.

Instead, this whole idea of found photography (photographing what I found beautiful or moving) took up more and more of my time, until that is all the photographing I felt like doing. No longer did I chase a damselfly, a Giant Swallowtail, or a frog or lizard through the fields and swamps. I couldn’t do that to them, anymore than I would like to be hunted.

Instead of fielding a mini-expedition hundreds or even tens of miles away, I found myself circling ever more near where I live. Of course, I also was getting older and less happy carrying a backpack or a lot of gear. I had gotten my gear down to a 10” messenger bag in which I carried two diffusers, a tiny Flowerpod tripod, various clips, polarizers and neutral filters, a shower-cap for rain, and any other lenses I wanted to have. I always (or usually) walked with my camera/lens fixed to my tripod head, which I know is supposedly a “no-no,” but I have never had a single problem in all these years, knock-on-wood.

My lens journey would take an article in itself, but suffice it to say that I had collected well over 100 really great lenses, but after a while I began to sell off lenses, those that were perhaps considered “legendary,” keeping those that were fast, sharp, and highly-corrected for the various aberrations, etc. And I found myself getting into more and more of the so-called “exotic” lenses, enlarger lenses, scanner lenses, large and medium format lenses, and so on.

And since for a good half of the year Michigan is too cold to do much outside, I began to do more over those months in a little studio I put together right in my house. I had a large studio about one block away but, although I loved the space in the large studio, I liked better to be able to slip away in a half-a-minute to my tiny studio and photograph, especially in winter.

And I found, to my surprise, that working in the studio, more slowly and carefully, did good things to my photos and was fun. I became increasingly interested in composition and before long photographers online were telling me that they could recognize one of my photos at a glance. I didn’t realize that I had a style, but upon thinking about it, obviously what I had been trying to arrive at

myself was what other photographers were calling my style.

So, here I sit as the summer of 2017 begins to wane, looking toward winter and having to be inside. It is OK, since I seem to do more with a little than when I have a lot... of subjects. I have tried some serious hikes this summer, with boots, knee-pads, not to mention mosquitoes and horse flies. I have to say that I don't enjoy it as much as I used to, forging through waist-high grass, shrubs, shaking off bugs galore, and the like. And my eyes for distant subjects are not what they used to be.

I now enjoy more carefully setting up and taking photos, either indoors in my tiny studio or outdoors along the edge of the wilds, cemeteries, gardens, parks, trails, and so forth. And I have found that my earlier hunt-for-the-right-specimen has telescoped down to finding totally attractive ways to photograph what is right around me at the time. Imagine that!

As you can see, not only cameras and lenses change, but we change over time. Of course, I can relate to nature photos, field-guide photos, compositions, and even abstracts. I have been there, done that, or am still doing that.

Here is a photo I took this morning. I went out in the fields and took some photos, but ended up back in my tiny studio photographing some Hibiscus flowers. To me, the moral of all this is to do what completes us, what makes us happy at the time and the heck with those who don't like it or only like what they themselves do. For me, I can like many different kinds of photography (if it is good), not just my own, and I do. But of course, like all photographers, I like what I do, and to me that IS photography.

THE CAMBO ACTUS MINI

Those of you interested in the Cambo Actus Mini and want to use the Fuji GFX can order the new version, which has risers (front and back) and swappable camera boards.

However, those of us with the existing Actus Mini and cameras like the Nikon D810, the Sony A7R2, and other small cameras know that with our earlier versions we cannot swap camera boards, but rather have to (and with VERY tiny screws) mount a camera bayonet for the camera required. This is no fun.

Although not listed in the standard Cambo catalog, there is a special-order that gets you a rear-standard replacement for the Mini Actus you already have, with no riser, but with swappable boards. It is less expensive than trying to get the whole GFX-ready Cambo Mini Actus and with less weight and no riser (which makes the whole system more stable). If interested, you would want to order:

Actus EDU Multi-Mount Rear Standard ($739).

Cambo Actus Camera Bayonet Swappable Board ($214) for each board.

You can transfer your current bayonet easily and can save money (and vibrations), plus you can swap this new rear standard with your current rear standard in seconds. This version of the upgrade for the Mini is a little hard to get, but if you contact Steve Hendrix at Capture Integration and explain you want the EDU (educational) version of the swappable version, I imagine he can order if for you. That’s how I did it.

Here is a quick photo of my older Cambo Mini Actus with the new rear standard with swappable bayonets. Note: the more expensive (and higher and more weight) GFX version includes levelers and a geared rear-standard shift knob.

I don’t need the levelers or the geared knob, and would rather have the smaller size, less weight, etc. Plus, I still have my old rear-standard that swaps out with the new in seconds. Note, the photo here of my Mini Actus has a longer rail and bellows, which helps a lot. The Sony A7R2 is mounted on the Actus.

SELLING MY HASSEKBLAD X1D

After shooting some 1100 or so shots with the Hasselblad X1D system, I have decided that it is not what I need for my work. I'm sure, many will point out that I don't get it, but I am only trying to "get it" for my own work. It's embarrassing to admit this, after all my praise, but at my age, who cares? I have put my X1D system, including the 45mm and 90mm lenses, plus the lovely RSS L-Bracket and 5 batteries for sale on Ebay under my nickname ALLMUSIC.

Although there are a number of druthers and small reasons for giving up the camera, the two main reasons are:

(1) The lack of lenses I need now for the camera. I have waited months for the 30mm and, of course, probably will would have waited for the announced 120mm Macro, as well. This is summer, and now is the time I need those lenses. As a close-up photographer, neither the 45mm or 90mm can get me close enough, especially since there are no extensions available.

(2) And secondly, having very carefully done hundreds of test shots for overall sharpness, I am, despite what others say, disappointed with the degree and kind of sharpness I can attain with the X1D system and their lenses. Please don't ask me to prove this. It's just my opinion.

No one is more sorry than I am, and perhaps selling this system is a stupid thing to do. I lose a bunch of money. Or, is it that I'm hooked on the Nikon system and how the D810 works? I am not arguing that the D810 IQ is better than the X1D, but only that what I am able to get from the X1D is not worth what I have to put up with to get it. And,

of course, there are all the great lenses I have that will never work on the X1D, but that is a minor thing.

And finally, for me and the work I do, the X1D is just not ready with what I need. I should have waited for perhaps the second edition. And, I can always get another copy, should an X2D comes out. Meanwhile, I will wait for the rumored 46 Mpx D820 and have to be happy with that. I have TRIED to love this system, but I can’t get there from here.

I will say that the X1D haptics are extraordinary and that, if I wanted to afford what for me would basically be a $20k system, I would keep it. The system is easy to use and I love the touch-screen of the LiveView.

So, there you have it. I report this because I owe it to those who have read any of my other comments on this system.

C'est la vie

MORE ON THE HASSELBLAD X1D

Meanwhile, back in the jungle (so to speak), I continue to vet the Hasselblad X1D. I'm long past the time-period I could return it, so it's mine. Right now, the X1D is limited by the lenses available to me. I'm not about to buy the adapter to mount the old and too-bulky Hasselblad lenses, not to mention the T/S adapter as well. I had bought one to try out (120mm Macro), but it was HUGE, so I sold it back on Ebay.

IMO, the X1D sensor is a better sensor than my D810, but the lenses (90mm and 45mm) are not better lenses than, say, the Zeiss Otus 55mm and their APO kin. So, who wins out? Well, so far (in my use) the Otus lenses win out and that means the D810 is still the camera I am most-often reaching for. This could change if I had the XCD 30mm and especially when the XCD 120mm Macro finally shows up, if that lens is up to speed.

I find the Hasselblad X1D easier and easier to use. As for any focusing issues, I find myself not using the focus points at all, but just double-tapping the point on the LiveView screen I want and magnifying that. For me, that works great and I can drag the magnified point around with my finger to where I want it. It is so easy. However, I do find myself automatically trying to tap on the LCD screen of the D810, which tells me that I like this approach.

Right out of the chute, the color of the X1D seems better than what I can get out of my D810. The images of both cameras have to be color-tweaked, but to my eyes the X1D color is much closer (or at least somewhat closer) than that from the Nikon D810.

I'm not a techspert, but lately I have been doing my own form of testing, comparing the X1D and the D810, using

many hundreds of tests. Looking closely at the results at many f/stops, I find the quality of the Otus lenses beat out anything I can get in terms of fine detail from the X1D 90mm lens, although I am sure most folks could care less to even look. Yet, if they did, that is what they would find.

I am so used to the X1D by now that (aside from the LiveView turning itself off after 15 seconds, which should be soon fixed) I find the X1D very easy to use. In fact, anyone could use it, including more technical folks like me. Haptic-ally I like this camera. And since I finally got a bunch of extra batteries, that helped a lot. Do keep in mind that I am only using the X1D in manual focus mode. I never use autofocus or almost never.

I have yet to do any family walk-around shots or things like that. Right now, I am trying to duplicate my standard type of work, and have not come up with a match. It is getting obvious that the X1D has qualities of its own and means a shift to seeing what this camera can do outside of

TECHNIQUE UPDATE

I find it funny that I can entertain myself, year after year, trying to find a happy medium between stacking and single-shot photography, between shallow depth-of-field and lots of depth-of-field laced with diffraction, between a couple stacked layers and many, between FF cameras and medium-format, between the devil and the deep-blue sea.

And I have traced this rabbit through well over 100 hundred lenses, ending up with the most refined, sharp, fast, and highly-corrected lenses that I can afford and some I probably can't afford. Am I better off than when I began? That's hard to say; I am wiser, but have I solved the riddle? My guess would be no. So where do I stand in the spring of 2017?

There is no doubt that the traditional single-shot photo has less artifacts. Period. End of story. Yet if I have to push the aperture fairly high to get enough depth-of-field and before I am happy, diffraction rears its ugly head. And with high apertures, we lose any lovely bokeh that might be available, and that is not particularly attractive.

So, what can work and does fairly often is to make what I call a short stack, a stacked photo with 3-5 layers, with each layer zeroed in on a particular part of the photo I want to be sharp in the ultimate photos. Even these take some touching up, but usually not much retouching.

If I want to make a long stack, the lens had better be very sharp and very well corrected. I have to fine-step it or even put it on a focus rail. And many good lenses have too short a focus throw for stacking. They have to go on a rail. The Coastal Optics 60mm APO was one of those.

For example, The Nikon Noct Nikkor is useful for one-shot photos and if done carefully for what I call a short-stack, meaning, as mentioned, a few shot layers, each one of which is focused on a primary part of the subject. However, I find that doing a long stack with the Noct Nikkor is useless because a coherent image without a lot of “unfixable” artifacts does not seem to result. In other words, take a one-off photo or a short stack with the Noct. It is possible to mount the Noct Nikkor on a focus rail and micro-step it to produce a better result, but it is clear to me that this kind of process is not natural to the Noct. It is a remarkable lens, but not very useful for stacking.

For a long stack, a lens like the El Nikkor 105mm APO (note the APO, because the non-APO 105mm is not exceptional IMO) does very well, but we are probably stacking upward of 30 layers or so. And with large stacks, artifact retouching has to be included in the equation. And since I almost always push the envelope, I have a great number of failures.

Another consideration is that most of the really great well-corrected lenses are not close-up or macro lenses, and this has led me to see if any extension can work on those lenses (to get me closer) and I find that even the smallest extension (K1 Ring 5.8 mm) messes with the lens IQ.; No doubt about it. Sometimes I hazard it anyway, but if I am being honest with myself there is always a tradeoff and I know it. It shows.

So, the bottom line is that each lens is perfect just as it is and my monkeying with it never can improve it. It is easier (and wiser) to adapt my photography to the lens than vice-versa, which I am learning to do.

These days I divide my time between lenses mounted directly on the D810 (like the Otus series) and various

more exotic lenses mounted on the Cambo Actus technical camera. I am settling down into this pattern, so it seems. I tried to get into the new mirrorless medium-format world, but the Fuji lenses were not good enough and, for some reason, the IQ was not useful with lens adapters and non-Fuji lenses. I don't need that. I like the Hasselblad X1D, but for me it would just be a walk-around camera and I don't just walk around that much. I tend to go to an area and spend time. And I don't do snapshots.

So, that's roughly where I am.

THE FUJIFILM GFX 50 AND CAMBO ACTUS

Well, with the Fuji GFX out of the picture for me, what else can I wait for? After all, I have been waiting for Nikon to update the D810 for a long time already, so I can continue doing that. And, of course, I can wait for Sony to come out with a more-megapixel version of the A7Rii series. That waiting alone should keep me busy.

Meanwhile, perhaps folks missed my remark that the GFX would make an excellent digital back for the various technical cameras, since we are not talking about trying to adapt Nikon-mount lenses to the GFX, but rather using large-format and the various exotic industrial lenses as they were meant to be used. So, I am busy working on that.

I have too many bellows systems floating around here, so I have sold off at least one, and am working on selling another. I guess I am tired of the 15-20 lb. technical cameras, even for studio use. However, I am very much enamored with the Cambo Actus, which (if you have not had a chance to get your hands on one) is built with the same finish and perfection (IMO) as the stuff we get from Really Right Stuff. And, I know, the Cambo Actus does not do everything its big brother and sister technical cameras do, but it does enough for what I usually need and it can go anywhere... easily.

I had bugged Cambo to provide a rear-camera plate for the Pentax K1 for their Actus and was in line to get the first copy, when my experiments with the remarkable Pentax pixel-shift technology bottomed-out and proved (for my work) nice, but not useful enough. Close, but no cigar.

And I have been clamoring for a Fuji GFX mount for the Cambo Actus, and was in line to receive that for the Actus, when I determined, as mentioned, that mounting Nikon F-Mount lenses on the GFX was not producing the quality I was looking for.

However, in supporting the Fuji GFX, Cambo redesigned their Actus camera and fixed what was for me my main complaint, that the rear-standard required you physically to unscrew (with teeny screws) the camera mount to replace it with another. This is not something I would do in the field. I can hardly see the screws.

So, they have addressed this rear-standard camera mount-exchange problem by reworking the rear standard so that we can now change camera mounts in seconds. In the process, they have also added a new geared option to control the rear-standard shift, and added a little height to the whole rig. Aside from doing excellent work, Cambo is also very responsive.

In addition to the new Cambo upgrade, I have ordered and will soon receive a long rail of 300mm, along with a matching bellows. I originally ordered their 450mm bellows/rail but was told that unless you use it vertically (or was it vice-versa) the bellows could sag, which would not be helpful. So, for now, a 300mm rail/bellows on the Cambo Actus will allow me to play with a variety of exotic industrial lenses, ones that shine with a long bellows.

I already have a good handful of easily removable lens plates for the front standard of the Actus, including Nikon F-Mount, Copal #1, Copal #1, M39, and so on, so I should be all set for some time. Now, if spring would just come around the corner.

Here is a photo that Steve Hendrix of Capture Integration sent me that shows how the Cambo Actus is being modified, for those interested. You can see where the camera plates now easily attach/detach, plus the new geared knob for controlling shift on the rear standard (the front already has one). And, I see they have added bubble-levels, which my copy does not have. And levels are mandatory, but I usually use the ones on my Arca-Swiss C1 Cube tripod head for that.

Anyway, that is what I am working with while I wait for some camera (that I like) with just a few more megapixels.

Test Results for a Few Close-Up lenses

Lenses that I tend to use for close-up photography and for stacking focus have, of course, less than a 1:1 reproduction-ratio. I sometimes shoot the larger macro (1:1), but seldom and

almost never anything above 1:1. The reason for this is that I prefer the context that using lower reproduction ratios allow and encourage.

With this is mind, lenses than work well at less than a 1:1 reproduction ratio by definition exclude a lot of worthy lenses or limit them to shooting above that standard macro reproduction ratio of 1:1. And there are several factors aside from the reproduction-ratio that I like to monitor as well.

PHYSICAL

Some limitations are just physical. A lens has to be mounted on something, like a camera, bellows, rail, or some type of technical camera. And this usually involves an adapter of one sort or another. Not all lenses fit nicely on my DSLRs. Some don't work there at all.

So, typically I mount lenses on DSLRs. Some will only really work if mounted on a bellows, while others work best if on a more technical camera, where there are bellows and also movements like Tilt and Shift, etc.

And finally, some lenses have to be mounted on a DSLR, which DSLR is then mounted (with the lens on the DSLR) on a focus rail. This is usually because the helicoid or focus ring on the lens has a focus throw that is too short for me to make the minute movements needed to properly stack focus.

And let's not forget that there are, as you might imagine, all kinds of odd arrangements, like reversed lenses, stacking lenses, diopters and close-up lenses, extensions, teleconverters, etc. and so on.

Which lenses, then, are easier to use to get the results I want? Since I stack focus a lot, there are a few rules that are best followed for optimum results. According the Rik Littlefield, the designer and implementer of Zerene Stacker software (which is my preferred stacking software) points out that the software is happiest stacking a series of layers in the following ways, with the best method listed first.

(1) BELLOWS: Best is using a bellows, with the lens fixed at front standard and camera moveable on the rear standard. Then the camera is moved forward incrementally to stack focus.

(2) HELICOID: The second best method is using a helicoid (or the standard focus ring) on a DSLR to stack focus.

(3) FOCUS RAIL: And last (and least suggested) is to mount a camera and lens on a focus rail and move the whole system forward incrementally on the rail.

I try to stack in the above order of desirability, if possible, but it's not always possible because some lenses have no helicoid AND won't work on a bellows system due to the bellows (even if fully compressed) still having too much extension for the lens. The Nikkor "O" CRT lens is one of these, IMO.

CLOSE-UP VS. MACRO

Another factor is to determine if the lens is designed for peak performance at 1:1 reproduction ratio or higher or is its optimum performance take place below 1:1 at close-up range. And very few lenses are good at both. There is no point in buying an expensive and probably fast lens for close-up work that is not sharp until f/5.6 or above, as are many Large Format lenses. By the time you get the sharpness you want, you have already lost any bokeh and may be suffering from diffraction too. And so on.

One of the most useful photography sites IMO is that of CoinImaging.COM. While a specialized form of photography (coins), this site covers a lot of what we close-up photographers need to be aware of. Here is a list of some of the things carefully documented and graphed on this site for a number of very good lenses for the kind of work I do. By all means visit this site:

http://coinimaging.com/macro_lens_tests.html?

RESOLUTION VS. APERTURE

I need to know where for a given lens the resolution (which

affects micro-contrast) is at its peak. Is that peak near where a fast lens is wide open (which is what I need) or is it only at higher apertures, which I seldom use (unless I have to) because I lose most of the bokeh.

SHARPNESS VS. APERTURE

It is the same with sharpness. I need to know where for a given lens that lens is sharpest. Is the lens sharp wide open or do we have to narrow the aperture until too much is in focus for the bokeh we want.

CORNER SHARPNESS VS. APERTURE

In a similar way, is the image just sharp in the center (and the borders less sharp or losing focus) or is the lens sharp from center to corners like a copy lens? And is there sharpness wide-open or only as we narrow the aperture. Personally, I am not so bothered by the corners not being sharp and I feel the same way about a little vignetting. Some vignette does not bother me.

LATERAL CA VS. APERTURE

Now, here is a factor that does bother me, chromatic aberration of any kind. Why? Because it affects the color of the entire image and a highly corrected (APO) lens has little aberration, which affects what we call sharpness, IMO. In other words, a lot of what I look for as sharpness is really caused by a well corrected lens. Not everyone realizes this.

SHARPNESS VS. MAGNIFICATION

Again, I need “sharp” at a low magnification (low reproduction-ratio) like less that 1:1.

RESOLUTION VS. MAGNIFICATION

Same with resolution or micro-contrast. I need it wide-open and on fast lens, if possible and not just at high magnification.

CORNER SHARPNESS VS. MAGNIFICATION

Corner sharpness, as mentioned I am not so worried about.

RESOLVING POWER VS. MAGNIFICATION

Yes, I need micro-contrast at a reproduction-ratio of less than 1:1.

CHROMATIC ABERRATION VS. MAGNIFICATION

And, I want the lens to be well corrected wide-open and for it still to be a fast lens.

LONGITUDIAL CHROMATIC ABERRATION

Same goes for any kind of aberration. I don't want it.

CONTRAST

I need a decent amount of contrast and if the image is too washed out, like with diffraction, I won't use the lens.

FLARE

Flare does not bother me, unless it is really bad.

DISTORION

As for distortion, it depends on the lens. The Nikkor "O CRT lens has all kinds of distortion and I love the lens for what it can do.

DISCUSSION

Now let's look at a few good lenses to see if they would work for the kind of close-up stacking like I enjoy:

NIKON APO-El Nikkor 105mm f/5.6

One of my favorite lenses of all time; do NOTE the "APO" because the same lens "APO-El Nikkor 105mm f/5.6" without

“APO” is quite ordinary compared to the APO version.

This lens is very sharp wide-open at f/5.6 and for a couple of stops higher, but I always use it wide-open. Also wide-open, the corners are fuzzy and slowly clear up, but not until several stops. It has very little lateral CA, but there is a small amount, but quite under control. I seldome notice it, yet it increases with magnification. This lens is sharp at a low reproduction ratio and loses sharpness at high magnification, especially above 1:1. In a similar way, the lower the magnification the better as far as resolution is concerned. With this lens, corners lack sharpness the more you magnify the image.

Contrast is good and there is little flare to worry about.

NIKON PRINTING NIKKOR 95MM F/2.8

Nikon made at least four Printing Nikkors, of which I have only three of them, the PN 95mm, PN 105mm, and PN 150mm. There is a PN 75mm, but I have never had one or seen it for sale.

Of the three I have, they are not just larger (or smaller) versions of each other. They differ in terms of what you can do with them. For example, the PN 150 is sharp at the reproduction ratio of 1:1, while the PN 95 is geared more toward the lower reproduction ratios of 0.5 and so on. So, the PN 95 is the one for me.

One trait they all share is a restricted range of use if we want them at their peak quality. As mentioned, those qualities vary from lens to lens.

In the case of the PN 95mm lens, it is very sharp and has high resolution and that is true for both center and corners of the image. And chromatic aberration is minimal across the entire f/stop range. The PN 95 is VERY sharp at lower magnifications like 0.5 and 0.75, but it falls off at 1:1, unless you reverse-mount it, where it becomes very sharp again around 2:0. It is similar with resolution, very good at lower magnification, but not at 1:1 or above, unless reversed. Corner performance is good at 0.5

magnification, but drops off very rapidly.

So, for the kind of close-up work I do, the PN 95 is the Printing Nikkor to choose over the PN 105 or PN 150. This analysis was made possible by using the very useful lens testing results at CoinImaging.com.

This photo, which is a kind of abstract, is of a Japanese Iris taken with the Nikon D850 and the PN 95, stacked. I have noticed with the D850 that the color is remarkably different that the previous model, the D810. Not sure how to describe it, other than it seems to demand less color adjustment in post than the D810. In general, the D850 is an incredible camera, especially for the money. And although, I liked the color in the Hasselblad X1D, all things considered (especially lenses), the D850 is (for me!) a better bet than either the Hasselblad X1D or the Fuji GFX, both of which I bought, tried, and returned.

Photo with the Nikon D850 and the Printing Nikkor 95mm

NIKON PRINTING NIKKOR 105mm F/2.8 (Version A)

There are two basic versions of this lens. I have the later version, which is called “Version A.” It can be distinguished from the earlier version by having a longer extension tube than the original.

This lens is very sharp and has great resolution from wide open through f/4, and then begins a gradual decline. Corner performance is not good wide open at f/2.8, but is outstanding by about f/6. Minimal lateral chromatic aberration. Very, very sharp from about 0.5 magnification and then a gradual decline. Resolution is very good to outstanding from 0.5 across the magnification range. Corner performance is not good until around 1:1. Very good to excellent resolving power. Minimal chromatic aberration. No longitudinal CA. Contrast very good. No flare problems and no significant distortion.

NIKON PRINTING NIKKOR 150 mm F/2.8 (Second Version)

There are two versions of this lens, the earlier version being more rare. I have the later version, but wish I had the earlier version. Here is the scoop on the version that I have.

This lens is very sharp and is most resolving wide open at f/2/8. Corner performance is good wide open, but reaches outstanding by f/4. Lateral chromatic aberration is minimal.

Unfortunately, this lens is not sharp at low magnifications and does not reach outstanding until about 0.8. The lens show poor resolution at lower magnification and reaches outstanding at about 1:1. Corner performance is very good at low magnification, but deteriorates by 0.6.

Poor resolving power at low magnification until 0.8. Chromatic aberration mild at low magnification, but minimal at higher magnification. Contrast is good. Flare is not a problem. No significant distortion. Slight color fringing in OOF areas.

So, unless I want to shoot macro, this is NOT the lens for me, since at low reproduction-ratios, it is nothing special.

SCHNEIDER MACRO VARON 85MM F/4.5

This is a lens that is not commonly used by any of the photographers I know. I have read about it for some time, but never could get enough information on it that I would risk buying a $4k lens. Thanks to CoinImaging.com, who has reviewed this lens, I can now see that this could well be an all-around close-up/macro lens similar to the legendary Vogtlander 125mm f/2.5 APO-Lanthar. I am going to try one out. It has a week spot, but so do all lenses that I know. Here is what I learn from studying the graphs for the lens.

It has 37mm filter threads. Its five-blade aperture may well mess with bokeh, but since it is a slower lens (f/4.5), bokeh is already somewhat in jeopardy. However, the APO El-Nikkor 105mm lens is f/5.6, and I manage to work around bokeh with that lens.

Certainly it is very sharp and resolution is adequate, perhaps a tad week due to the slowness of the lens. Corner performance is very good across the whole range of f/stops. Chromatic aberration is minimal across the entire f/stop range.

Very important to me is the fact that the Macro Varon is VERY sharp at lower magnification like .25 and .5, and goes downhill from there, but still is sharper than many macro lenses. If there is one problem, it is that due to the fact that the lens is slow, resolution in relation to magnification is less than outstanding. However, it is outstanding at .25 and .5 magnification, which is where I usually work, so it gets a pass from me. Its resolving power is good, especially at lower magnification. Lateral chromatic aberration is very good. Contrast is good, with no flare worries, and no significant distortion. Very flat field. Has an M42 mount.

This is a bellows lens, so that has to be understood. I would say from the specs that this has got to be one of the best overall macro lenses, aside from its very expensive price.

NIKON 55MM F/1.2 NIKKOR-O CRT

This lens has no helicoid and does not lend itself to being used on a bellows. I have to mount it on a DSLR and then mount the DSLR/LENS on a focus rail to stack images. It has a M39 lens mount and a 52mm filter thread. Nevertheless, it is one of my most-used lenses because it is fast and has a unique style, both related to a concave lens element and non-standard color.

Although very fast, the lens is sharpest at f/4 and the same is true for resolution. Corner performance is not very good, especially at lower f/stops. Lateral CA is minimal wide open but becomes more severe by f/3 or so. The lens is very sharp at low magnifications, but falls off rapidly down to just “good.” I always use it wide open. Resolution fairs a little better, being very good at low magnification and falling off fairly rapidly. Again, wide open is the way to go.

Corner performance is good at best in low magnification, and bad by 1:1, getting very good again at 5.0 magnification. Overall, the lens has good resolution, especially at low magnification. Lateral chromatic aberration is moderate to severe at lower magnification and off-the-charts bad by 0.5 magnification. Contrast is not good and its proneness to flare affects this. No other distortions.

So, what are we to think about a lens like this? It is so bad that it’s good. However, the combination of problems creates (at least for me) what amounts to a perfect storm for interesting images. The lens is sharp wide open, at least enough to stack against the wonderful bokeh obtained wide-open. Some of my best photos EVER have been done with this lens, so I consider it an essential lens to have around.

SUMMARY

So, in general, what is the recipe for a lens that I would use for my close-up work? Ideally it would go like this:

The lens would be fast (f/1.4 or better), sharp (and with great resolving power) wide-open, and very-highly corrected (APO). If it has a helicoid or barrel, the focus-throw must be long and not short. Ideally, it would also have JUST enough imperfections to

have a pleasing style. Of course, it has to be mountable.

If this is interesting to anyone, I may describe a few more lenses that are good for close-up work.