# Interchangeable Lenses

## for your 35mm Cameras

PHOTO BY JACK AND SUE DRAFAHL

*by Jack and Sue Drafahl*

Interchangeable camera lenses are some of the most creative tools a photographer can own. They control the amount of light transmitted to the film, the magnification and the angle of view. Image perspective, point of view, depth of field and selective focus are just a few of the basic controls available at your fingertips. The question is "Which lenses are right for you?"

Every photographer possesses his or her own shooting style and subject preference. Some photographers thrive on macro and others thrill on capturing distant images. What's right for you, isn't necessarily the case for another photographer. That is why it is so important to identify your creative directions, so you can match your lenses to your needs.

Not to worry though, because lens manufacturers have created a variety of lenses to satisfy just about every photographic need. Thanks to technological advancements, the computer-designed lenses today challenge the laws of physics to the maximum. Lenses focus faster, have sharper optics, and feature wider apertures for the ultimate in versatility.

### "Normal" Lenses

The 50mm lens is considered the "normal" lens for 35mm photography, because it gives us a view that approximates what the human eye sees.

**Left:** Normal lenses are called that because they reproduce a view that approximates what the human eye sees.

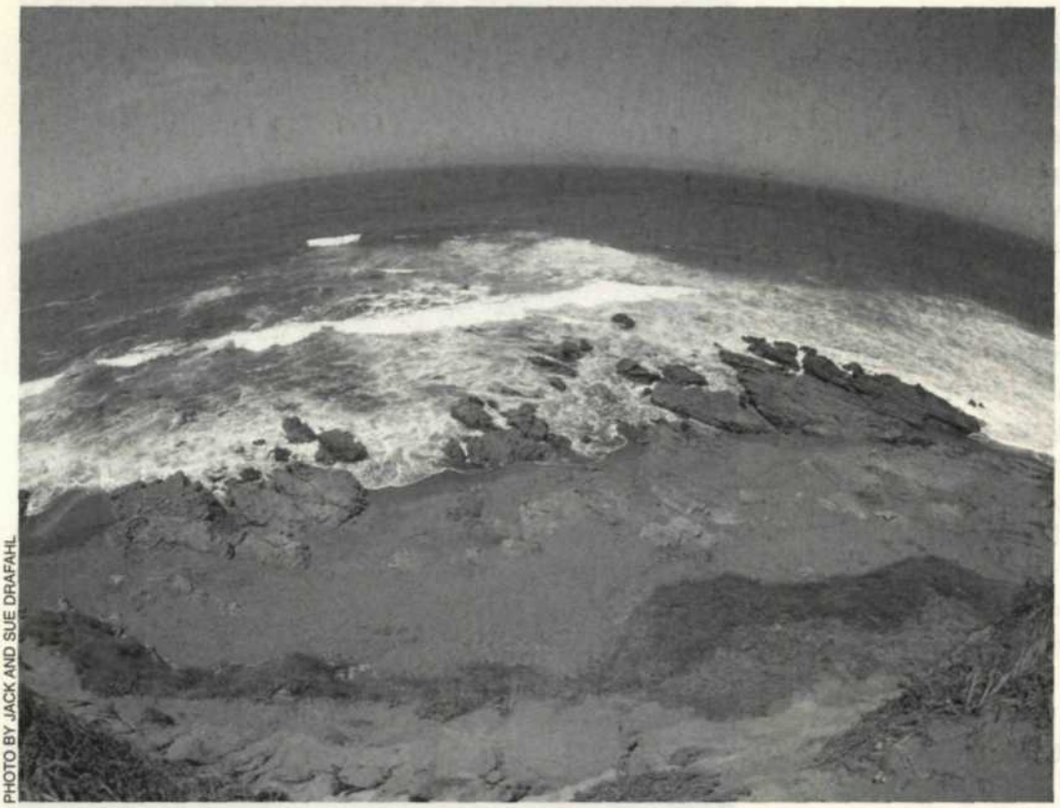

PHOTO BY JACK AND SUE DRAFAHL

Above: Full-frame fisheye lenses take in a 180° angle of view (measured diagonally), and fill the frame. Barrel distortion bows straight lines that don't go right through the center of the image.

Historically, this is the lens that usually came with a new camera, although today, more camera bodies are sold with a 35–80mm (or thereabouts) zoom lens. The normal lens will provide excellent results, but as your photographic applications expand, probably so will your ownership of lenses.

## Fisheyes

The lenses with the widest angles of view—180° or more—are the fisheyes. Fisheyes have focal lengths of 6–16mm, and come in in two varieties—circular and full-frame. The circular fisheye covers an angle of view of 180° (or more) and creates a very distorted circular image on the 24x36mm film frame. The full-frame fisheye is more popular as it costs a lot less, and takes a rectangular section out of the fisheye image to fill the entire 35mm frame. The primary characteristic of fisheye lenses is lots of barrel distortion: any straight lines in the picture that don't go right through the center of the image will be bowed outward.

LENS SUPPLIERS

### CAMBRON

Cambridge Camera Exchange's economical Cambron lenses cover a wide gamut of zoom and fixed focal lengths designed to accommodate most SLR cameras. You can take your pick from fisheye, macro, standard, telephoto, superwide, mirrors, and a large selection of zoom lenses. The zooms cover just about every combination of focal length possible and include 24–70mm, 35–300mm, 80–200mm, and even a 75–300mm lens with macro capability. Their most recent APO zoom lens introduction has an incredible range of 650–1300mm. Prime lenses range from a 20mm f/2.8 wide-angle to a 1200 f/6.8 lens and most every possibility in between.

CAMBRON LENSES

Cambron even has a Mighty Midget 300mm Mirror and a 500mm f/8 MiniMirror that fits in the palm of your hand and can magnify images 10X greater than a normal lens. If you really want to reach out and capture someone, you can step up to the 2500mm f/10 mirror lens that magnifies images 50X greater than a normal lens. They even feature unique lenses like the 500–800 f/8 Mirror Zoom.

Cambron also offers a full line of teleconverters from 1.4X to 3X to expand the capability of their lenses.

### CANON

Canon is a name renowned for their reliability and silent, fast, precision-crafted autofocus lenses. Each Canon EF lens has its own microprocessor-controlled focusing motor for optimum performance. Many lenses also feature Canon's exclusive Ultrasonic Motor technology.

Latest introductions include three zoom lenses for EOS cameras, bringing the total of autofocus lenses to over 50. The new 28–90mm f/4.0–5.6 USM provides an extended telephoto range with virtually no increase in size, weight or cost. The 28–105mm f/3.5–4.5 II USM replaces the lens with the same name that was originally marketed in 1992. The new lens sports a new exterior finish and zoom ring to match the current EF lenses. The 28–200mm f/3.5–5.6 USM provides versatility and creative latitude, so that one lens will satisfy most focal length needs.

CANON MP-E65 F/2.8 MACRO PHOTO LENS 1X–5X

Canon also features a vast assortment of focal lengths, ranging from 14mm fisheye up to 600mm telephoto. In between, they feature an array of macro lenses, tilt-shift lenses, fast low-light lenses, and zoom lenses from 17–35mm to 35–350mm and 100–400mm with built-in image stabilizer. Their MP-E 65mm 1-5x macro starts at 1:1 macro and explores the world of the very small with an incredible 5:1 magnification.

## Wide-Angles

When you need to get more in the picture than possible with your normal lens, but don't want fisheye barrel distortion, then a conventional wide-angle lens is the ticket. Wide-angles (with focal lengths from 14mm to 35mm) are also the answer if you are confined and can't move back far enough to capture the entire scene. A wide-angle lens might also be your lens of choice when you want a different perspective. Wide-angle lenses allow you to move in close to your subject, because of their extreme angle of view. Your perspective expands due to the very close shooting distance, exaggerating the apparent size relationship so small objects close to the lens look as large as big objects in the distance. This perspective "distortion" can give tremendous depth to an otherwise bland photo. As your focal length shortens, your depth of field increases; the increased depth of field and close focusing distance give you a creative point of view not possible with normal or telephoto lenses.

## Telephotos

The purpose of telephoto lenses is to bring the subject closer to the camera without the photographer physically moving. Telephotos are virtual necessities for sports and

PHOTO BY JACK AND SUE DRAFAHL

**Right:** Wide-angle lenses take in a wider angle of view, handy when you want to get a lot into the picture.

LENS SUPPLIERS

Canon also offers a series of telephoto lenses that feature Image Stabilization to compensate for camera shake, allowing you to utilize two shutter speeds slower than the 1/focal length rule. Just think, you can shoot hand-held at 1/125 with a 500mm IS lens! Currently there are five telephoto and three zoom lenses offering the IS capability. All share lightweight, weather-resistant construction, superb AF speed and quality optics.

**CONTAX/YASHICA**

For generations, Carl Zeiss T* lenses have provided true-to-life images and outstanding color reproduction to Contax and Yashica camera users. These lenses are known world-round for their optimum performance and famous T* multi-layer antireflection coating. Contax and Yashica camera users have the luxury of selecting from a wide assortment of lenses that range from the Distagon 16mm full-frame fisheye to the Mirotar 500 f/4.5.

**CARL ZEISS T* 35–70MM F/3.5–5.6 FOR CONTAX**

With the introduction of the new Contax N1 camera comes a new breed of Carl Zeiss T* Lenses. The first four N-mount lenses include the Vario-Sonnar 24–85mm f/3.5–4.5, Vario-Sonnar 70–300mm f/4–5.6, Planar T 50mm f/1.4, and the Makro-Planar T 100mm f/2.8. These lenses provide a range of options from macro to telephoto to expand the potential of the N1 camera.

Photographers partial to zoom lenses will appreciate Contax's wide selection. They have a 28–70mm, 28–85mm, 35–70mm, 35–135mm and 80–200mm. One of the more popular zoom lenses is the 100–300mm because of its one-touch design, rapid focusing and correction for aberrations at any focal length.

Contax also offers a fast Tele-Apotessar T* 300mm f/2.8 and a 200mm f/2 lens that are ideal for wildlife or low-light sports-action photography. The PC-Distagon T* 35mm f/2.8 is the perfect lens for 35mm architectural photography.

**LEICA**

Leica offers two product lines of lenses—one for its rangefinder M-series cameras and the other for the R-series SLR models. The M-series lenses offer extremely compact design, featuring focal lengths ranging from 21mm to 135mm. Most have large maximum apertures to help you maintain extremely sharp images in low-light situations. If you want an incredibly fast lens, then you must try the superfast 50mm f/1 Noctilux-M. That's not a typo, it really is f/1. The Tri-Elmar M 28/35/50mm f/4 ASPH lens incorporates three focal lengths. This unique lens is not a zoom, since it only operates at one of the three distinct focal lengths.

**LEICA PC-SUPER-ANGULON-R 28MM F/2.8**

The R-series starts with a full-frame 16mm

PHOTO BY JACK AND SUE DRAFAHL

**Above:** Supertelephoto lenses—those with focal lengths of 300mm and longer—bring your subjects to you when you can't move close enough to them.

wildlife photographers, where getting closer may not be an option. Short telephoto lenses range from 75–135mm and are great for portraits, since they provide a good head size at a shooting distance that provides pleasing perspective.

The longer telephoto lenses, from 200–300mm on up, are great for the nature and sports photographers. Since they feature a shallow depth of field, you can easily isolate your subject against an out-of-focus background. Since they are generally heavier than 35mm camera bodies, these supertelephoto lenses usually have their own tripod mounts, so you can attach them to a tripod for added stability.

Faster telephoto lenses (those with larger maximum apertures) are much larger and more costly than slower ones. When looking at lenses longer than 300mm, the difference between a maximum aperture of f/2.8 and one of f/4 can be thousands of dollars. But you may find that if your images are twice as sharp because of the higher shutter speeds the faster lens permits, it may be worth the increased price. If you are backpacking, the increased weight of these large lenses may also be a consideration, even though there are

fisheye with a diagonal view of 180°. Fully corrected wide-angle lenses range from the 19mm f/2.8 Elmarit-R with 96° angle of coverage to a 28mm f/4.0 APO. Perspective control is possible with the 28mm f/2.8 PC Super-Angulon-R that can shift the image as much as 11mm off axis. At the far end of the lens lineup, you have the unique Leica telephoto system. It uses three special focus mounts and two front lens heads, and their combination results in six high-resolution lenses from 280mm to 800mm.

All these lenses have components protected from corrosion to guarantee reliable functioning under almost every climatic condition. This attention to quality is what makes Leica a trusted name in the industry.

## MINOLTA

Minolta offers a wide selection of autofocus lenses to complement their entire Maxxum line. Focal lengths extend from 16mm fisheye to 600mm with winners like the 100–400mm zoom lens in between.

New to the line are the 28–80mm f/3.5–5.6(D) and the 75–300mm f/4.5–5.6(D) lenses. The 28–80 zoom is compact and lightweight, yet incorporates three double-sided aspheric elements to provide outstanding optical quality. The 75–300mm 4x zoom is the perfect lens to capture landscapes, portraits and distant closeups.

**MINOLTA AF 75–300MM F/4.5–5.6(D)**

Recent additions include the 24–105mm f/3.5–4.5D, 100–300mm f/4.5–5.6(D) APO, 100 f/2.8 Macro D, and 85mm f/1.4(D). Each of these new lenses has a built-in distance encoder and an auto clutch mechanism to stop the rotation while in AF mode. ADI flash metering provides accurate flash exposure regardless of background conditions. These lenses are compact, which makes them easy to add to your camera bag.

## NIKON

Nikon, a well-established name in the industry, is known for its optical excellence and advanced lens technology. They have a vast collection of AF prime and zoom lenses that range from the 16mm f/2.8 full-frame fisheye to the 600mm f/4 super telephoto. Nikon offers something for everyone, with over a dozen AF Zoom-Nikkors, more than a half-dozen wide-angles, four close-up lenses, almost a dozen telephotos, and even a couple of normal lenses. Nikon even has an 85mm medium telephoto with tilt and shift capabilities, much like the 4x5 large-format camera systems.

**VR ZOOM-NIKKOR 80–400MM F/4.5–5.6D ED**

Recent Nikon introductions include a new 300mm f/2.8 telephoto that is lighter, and incorporates the Silent Wave Motor technology. A new D-type mid-range zoom from 28–80mm allows you to focus down to 1.1 feet.

special backpacks available.

Long telephoto lenses create compression, the illusion that subjects are closer together than they actually are. This is caused by the increased shooting distance. Sometimes this is a desired effect, other times it is just a side effect.

Keep in mind that as focal length increases, the effects of camera shake are magnified along with the image. You will find it necessary to use a tripod to avoid blurred images. A good rule of thumb for hand-holding your camera is to use a shutter speed no slower than the reciprocal of the focal length of your lens, such as 1/125 for a 105mm lens.

If you are on a limited budget, and still want to get a supertelephoto lens for your camera, you might consider the fast-film option. High-speed films today are of excellent quality, with fine grain and excellent color saturation. You can use a slower, less-expensive supertelephoto lens, and use high-speed film to compensate for slower lens speed.

## Zoom Lenses

Over the years, the zoom lens has become extremely popular with amateur photographers, and even among pros. The main advantage of a zoom lens is that you can quickly change from one focal length to another without changing lenses or losing a shot. When zoom lenses first appeared, they had limited range, slow maximum apertures, and poor image quality, but not so today. Today's best zooms are excellent,

PHOTO BY JACK AND SUE DRAFAHL

**Top and above:** Zoom lenses provide a whole range of focal lengths in a single lens. Just "zoom" the lens to change focal lengths.



This lens is compact and lightweight which makes it perfect for traveling. They even have a silver special-edition 45mm f/2.8, a re-release of one of the thinnest lenses in the world.

Nikon lenses incorporate the highest standards for quality, consistency and reliability. Their ED lens series uses an Extra-Low Dispersion glass to minimize chromatic aberrations. Subject-position information is sent to the camera metering system for accurate exposure with the AF D-type lenses. Other lens designs include IF (internal focus) so the lens does not change size when focused, and RF (rear focus) so that only the rear elements move when focusing. Nikon's AF-S lenses use Silent Wave motors for fast and smooth operation of the lens focus system.

Nikon offers you a choice of manual or autofocus lenses for any level of Nikon camera. In the autofocus group, the 18–35mm f/2.8 zoom uses the Silent Wave design and has Internal Focusing (IF) for smooth action. The new AF VR Zoom-Nikkor 80–400mm ED f/4.5–5.6D uses new advanced vibration-reduction technology.

### OLYMPUS

Olympus features a wide variety of Zuiko lenses for their OM series of cameras. They have centered their attention on producing prime lenses and specialized macro lenses rather than zooms. Prime lenses start with a 16mm f/2.8 fisheye and extend through the 1000mm f/11 supertelephoto, and many of the focal lengths give you the choice of two f-stop variations. For example the 24mm, 28mm, 35mm, 100mm and 180mm lenses each come in f/2.0 and f/2.8 versions.

Architectural photographers will covet the 24mm f/3.5 shift lens that can move 10mm up and down and 8mm to the left or right for optimum correction. Wildlife photographers will love the fast 350mm f/2.8 telephoto lens which incorporates UD glass and can focus down to 9.8 feet. The 35–80mm f/2.8 zoom uses both extra-low Dispersion glass and high-refractive-index glass lenses, which puts this lens on an even quality level to their prime lenses.

If you like macro photography, the Olympus line is hard to beat. Several macro lenses from 50mm to 90mm and a special group of bellows macros from 20mm to 135mm cover just about every tiny photo situation.


**OLYMPUS ZUIKO 35–80MM F/2.8**

### PENTAX

Pentax has developed a comprehensive line-up of SLR lenses using state-of-the-art technology and manufacturing techniques. The lenses are grouped into the FA, F, and A series and cover a wide range of focal lengths. The FA autofocus lenses offer power-zoom capability with Kaf2-mount Pentax cameras, autofocusing (with Pentax AF SLRs) and access to all metering and exposure modes. High-performance FA* lenses use extra-low dispersion elements, internal focusing, and one-touch manual focus. FA lenses cover the entire focal range from 20mm super-wide to 600mm telephoto with a wide assortment of lenses in between. F-series lenses pro-

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**Above:** Macro lenses focus much closer than regular lenses–with most, close enough to record the subject life-size on the film.

and available in focal-length ranges from 17–28mm fisheye zoom tinto the supertelephoto range.

Before considering adding a zoom lens, you need to analyze the optimal range of focal lengths for your shooting needs. In most cases, a lens that covers from wide-angle to telephoto, such as a 28–200mm or one of the recent 28–300mm zooms, is a good start.

Another consideration with zoom lenses is the fixed/variable aperture. Compact zoom lenses with extreme ranges usually have a maximum aperture that gets slower as the lens focal length increases. For example, a 28–200mm zoom may have a maximum aperture of f/3.5 at 28mm, but changes to f/5.6 when the lens is zoomed to 200mm. There are zoom lenses with a constant maximum aperture, but they are considerably larger and more expensive.

Some zoom lenses offer "macro" capability. This magnification usually only goes down to 1:4, but it enables you to capture close-up subjects and telephoto images, all with only one lens. There are a few zooms that will focus close enough to produce 1:3 or larger magnifications.

## Macro Lenses

Macro lenses allow you to shoot extremely small subjects and produce life-size (1:1) images on the film (of course, these image can be blown-up even larger when printed or projected). Because depth of field at macro shooting distances is minimal, most macro lenses will stop down to f/22 or f/32 to maximize depth of field (and are sharpest at their smaller apertures). Macro lenses come in normal (50–60mm), short telephoto (90–105mm) and telephoto (180–200mm) focal lengths. The longer macro lenses allow you to capture close-up nature subjects from a greater distance so not to scare the subject away.

If you want to go beyond the 1:1 magnification, you can add extension tubes or mount the lens on a bellows. There are some very specialized macro lenses that start at 1:1 and go as high as 5:1 (5X life-size) magnification.

vides all FA features except power zooming. A-series lenses lack manual-focusing capability. All three series can be used on all K-mount Pentax SLRs, AF or manual-focus.

Zoom lenses are very popular with Pentax systems and include lenses like the AF 20–35mm, 80-320mm and new 24–90mm. F-series zooms include the extremes: a 17–28mm fisheye zoom, and a 250–600mm f/5.6 supetele zoom that comes with its very own trunk.

The A manual focus series includes a broad range of lenses that include the 15mm f/3.5, 200mm f/4 Macro, 400mm f/2.8 and 2000mm super telephotos. Traditional telephoto lenses, mirror lenses and tele-converters also offer manual-focus capability.


**SMC PENTAX-FA 24–90MM F/3.5–4.5 AL (IF)**

### PHOENIX/SAMYANG

The Phoenix Corporation offers economically priced manual and autofocus lenses for many popular 35mm SLR cameras. The manual-focus group has a couple of extreme zoom lenses like the 19–35mm f/3.5–4.5 and the 100–500mm f/5.6–8, and a sprinkling of midrange zooms. You'll find various combinations, like the 100–500, 28–210mm f/3.5–5.6 and 70–210mm f/4.5–5.6 are great nature-photography lenses.

The bulk of the autofocus lenses are zooms. They start with a superwide 19–35mm f/3.5–4.5 and extend to the 100–400mm f/4.5-6.7 supertelephoto. The sports photographers' favorite, the 28–300mm f/4.0-6.3, combines wide-angle zoom capability with a long telephoto. The 28–210mm f/3.5–5.6 lens features internal focusing, and aspherical elements for sharp, crisp pictures. They also feature a 100mm f/3.5 macro telephoto, and autofocus tele-converters. Phoenix also produces an AF 28–80mm f/3.5–5.6, and its manual-focus cousin, which serve as a great replacements for the standard 50mm lens.

**PHOENIX AF LENSES**

Phoenix also markets the reasonably priced line of Samyang lenses. They include manual-focus 18–28mm, 35-70mm, 75-300mm, 500 mirror and 500mm preset telephoto lenses.

### SIGMA

Sigma offers lenses created using the most advanced optical technologies for all the major

## Mirror Lenses

The mirror lens contains mirrors, which bounce light back and forth , "folding" a long focal length into a short package. Mirror lenses generally have a fixed aperture, usually f/5.6 or f/8 for the 500mm lens, and slower with longer mirror lenses. Focusing is manual with most, although there is at least one AF mirror lens.

Besides being much shorter than conventional telephotos of equal focal length, mirror lenses are also much lighter than their telephoto counterparts, and cost less, but are not quite as sharp. Mirror lenses also focus closer than conventional telephotos lenses of equal focal length.

One quirk of mirror lenses is that out-of-focus highlights take on ring shape. This makes photos taken with a mirror lens easy to identify. With a normal lens, out-of-focus highlights would be in the shape of a hexagon.

## Perspective-Control Lenses

Architectural photographers don't always have the luxury of shooting buildings from a vantage point that keeps the vertical lines straight. They often have to shoot from low angles, which distorts the vertical lines and makes the buildings look like they are falling backwards. The perspective-control lens allows the photographer to shoot straight ahead and shift the lens upwards to capture the upper portion of the building with no distortion.

A new version of the perspective control lens also features the tilt function. This increases the depth of field so that both near and far objects are sharp. Previously, photographers had to rely on large-format cameras with swing and tilts to make these corrections.

PHOTO BY JACK AND SUE DRAFAHL

**Above:** Mirror lenses come in very long focal lengths—300mm and longer—and turn out-of-focus highlights into rings of light in photographs.

LENS SUPPLIERS

cameras on the market today. Whatever lens you have in mind, Sigma can meet your needs with their prime, zoom, and macro lenses.

In the prime lens group, two new fisheye lenses give you either a circular view with the AF 8mm f/4 EX, or a full-frame view with the AF 15mm f/2.8. If you want full lens correction, the new Sigma 14mm f/2.8 Aspherical lens will give you a 114.2° angle of view. At the other end of the spectrum, we have the APO 800mm f/5.6 EX lens with the HyperSonic motor that works great for nature and sports photography.

Sigma's most recent addition in the zoom lenses is the 15–30mm f/3.5–4.5, which incorporates hybrid aspherical lenses in the front lens group to minimize distortion and molded glass aspherical lens in the rear lens group to minimize spherical aberration. They also have a 20–40mm f/2.8 EX DG that is so new that we don't have any further information to share.

Numerous other zooms include a 28–300mm, 28–200mm, 28–135mm, and a 28–105mm Aspherical lens with internal focusing. You can find most everything from 17–35mm to 170–500mm zooms. Another new EX zoom that has an impressive range is the AF 50–500mm f/4–6.3 with apochromatic lenses, rear focus, and a HyperSonic motor.

Macro photographers have a wide choice of either prime or zoom macro lenses. The 50mm f/2.8 EX, 105mm f/2.8 EX, and 180mm f/3.5 EX all focus down to 1:1 reproduction ratios. Most impressive is the 70–300mm f/4.5–5.6 Macro Super zoom that can focus down to 1:2 reproduction ratio.

**SIGMA AF 50–500MM F/4–6.3 APO EX RF HSM**

### TAMRON

Tamron, known for its expertise in optical technology and manufacturing innovations, celebrated its Golden Anniversary in 2000. Their T-mount was the first interchangeable mount system for 35mm SLR cameras. Tamron's continued research and development allows them to offer a full line of AF lenses dedicated to Canon, Nikon, Minolta and Pentax camera systems.


**TAMRON SP AF24–135MM F/3.5–5.6 AD ASPHERICAL (IF) MACRO**

The powerhouse in the Tamron line has been the 28–200mm f/3.8-5.6 LD Aspherical IF Super II Macro zoom. In addition, they have the popular 28–300mm f/3.5-6.3 LD Aspherical IF Macro lens with its state-of-the-art optics. This lens distinguishes itself from the pack by employing Hybrid Aspherics applied to a Low-Dispersion glass element. This provides

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**Above:** Soft-focus lenses produce a soft, glowing effect that's great for portraits. The effect can also be effective with some scenic subjects.

## Soft-Focus Lenses

Soft-focus lenses are popular with portrait photographers who want to soften the effects of aging or to give the photo an ethereal dreamlike effect. With this lens, the subject remains sharp, but a soft focus overlay reduces the effects of wrinkles and complexion flaws. Soft-focus lenses generally have focus-effect rings that allow you to control the degree of image softening. Also, the aperture affects the effect—large apertures maximize it; small apertures sharpen the image.

## Tele-Converters

The tele-converter (also known as a tele-extender) fits between the camera and lens like an extension tube. Tele-converters increase the focal length of telephoto lenses by 1.4X, 2X and 3X. A 200mm lens with a 2X tele-converter is, in effect, a 400mm lens. Because converters are so compact, they extend the photographer's capabilities without cramming the camera bag with additional lenses. One added benefit of tele-converters is that they retain the prime lens' minimum focusing distance—a 200mm lens that focuses down to five feet becomes a 400mm lens that focuses down to five feet when a 2X converter is attached.

Most tele-converters now have full camera and lens communication via electronic contacts that pass through the device to the lens. Manufacturers have designed these tools to work with specific lenses or focal-length ranges, so be sure to check for compatibility before making your purchase.

Tele-converters do have a couple of drawbacks. First, they decrease sharpness (but only a little with good, matched ones), and second, they reduce lens speed—by one stop with a 1.4X converter, and two stops with a 2X converter. This means that a 2X converter turns a 100mm f/2.8 lens into a 200mm f/5.6. ■

brilliant color, great contrast and edge-to-edge sharpness.

If those two lenses weren't enough, Tamron features AF lenses including a 20–40mm wide-angle zoom, 90mm Macro, 24–135mm, 300mm telephoto lenses and a slew of zooms. They also feature an entire lineup of manual-focus lenses that use an interchangeable mount system instead of a fixed-mount.

### TOKINA

Tokina manufacturers auto- and manual-focus lenses for all major camera models and is distributed by THK Photo Products. The AT-X (Advanced Technology-Xtra) is a special group of lenses that are manufactured using the most advanced design and fabrication technology available. The AT-X Pro series is designed to meet the demands of professional photographers. Each lens wears a distinctive gold ring around the front indicating is a Pro series member. The lineup includes 28–80mm, 20–35mm, 28–70mm, 80–200mm zooms and 17mm and 300mm prime lenses.

The most recent addition to the AT-X lineup is the Tokina 24–200mm f/3.5–5.6 autofocus zoom. It uses two aspherical elements and two Super Low Dispersion glass elements to guarantee sharpness. The multi-coated elements were created by the Hoya Corporation, the world's largest manufacturer of optical glass. The lens focuses quickly with its internal focusing mechanism. The remaining lenses include the 100mm, 100–300mm and even an 80–400mm.

Tokina also makes other lens lines like the AF series, and several groups of lenses specifically designed for use with manual-focus cameras.

**TOKINA AT-X 242AF 24–200MM F/3.5–5.6**

### VIVITAR

Vivitar's Series 1 line of premium optics are fully functional with Nikon, Minolta, Canon and some Pentax cameras. All of the Series 1 lenses are autofocus zooms and their focal lengths run the gamut from a 19–35mm superwide zoom to a 100–400mm supertele zoom. Vivitar Series 1 also has three lenses that capture an extensive focal length range beginning with 28mm and extending to 105mm, 210mm and 300mm. There's also a 70–300mm zoom. The 100–400mm zoom weighs only 25.9 ounces and is just 6.3 inches long. It even features macro capability and a close focusing distance of 6.2 feet. Vivitar Series 1 also features a manual-focus 19–35mm and a 28–105mm MF lens. They also have a 2X AF teleconverter to expand the range of these zooms even further.

Vivitar also offers more than a dozen moderately priced, but excellent quality lenses for both autofocus and manual-focus cameras.

**VIVITAR SERIES 1 28–210MM F/4.2–6.5**