

AN AFFORDABLE TELEPHOTO LENS

How 17 pieces of glass create clear photographs of the moon—or a blade of grass

One of the most important parts on any camera is the lens assembly. This collection of glass pieces bends light so that the image arrives at the image sensor in sharp focus. Zoom lenses such as Tamron's SP 70-300mm give photographers the flexibility of several lens assemblies—from a wide-view to a supertelephoto—in one. Such clarity often comes at a cost: Some supertelephoto lenses go for \$10,000 or more, in part because their manufacturers use expensive fluorite lenses to correct for color aberrations. The SP 70-300's secret weapon is its extra-low-dispersion glass lens, which produces extremely sharp images at a far lower cost. Here's how that glass lens works together with the rest of the assembly to create clear pictures without breaking the bank.—AMANDA SCHUPAK

Inside the Telephoto Lens

SPECS

Focal length: 70-300 mm
Aperture range: F/4-F/45
Length: 5.9 inches
Weight: 1.7 pounds
Minimum focal distance: 4.9 feet
Price: \$450

LIGHT-GATHERING LENS

An antireflective coating—one or more layers of materials that suppress light reflections—applied to both sides of each lens ensures that more photons make it to the image sensor.

EXTRA-LOW-DISPERSION LENS

Usually glass refracts and splits white light into a spectrum, and that can result in blurred images and distorted colors. The XLD lens keeps those light rays bound more tightly.

Stator

Rotor

MASTER LENS GROUP

The final lens group relays the focused image to the image sensor.

VIBRATION-COMPENSATION UNIT

Vibration control counteracts the blurring caused by jittery hands. The VC CPU gathers pitch and yaw data from embedded gyro-sensors and, by way of three coils and two electromagnets, manipulates a vibration-compensation lens to negate the shakes.

ULTRASONIC SILENT DRIVE ASSEMBLY

To achieve autofocus, a CPU uses voltage from the camera battery to vibrate the so-called **stator** of the ultrasonic silent drive. These vibrations turn the **rotor**, which moves the XLD lens either forward or back. A sensor tracks the rotation of the focus ring and the position of the lens. The CPU compares these sensor readings with those from the autofocus sensor, nudging the lens until you get a focused shot.

LOW-DISPERSION LENS

As part of the variator group, which controls image magnification, the low-dispersion lens corrects for any additional light-bending that occurs after zoom. Without it, chromatic aberrations—in which only some of the colors remain in focus—can create purplish fringes along the edges of greens and blues, which makes subjects look fuzzy or doctored.

AUTOFOCUS

In one kind of autofocus, called active autofocus, a sensor on the camera body determines the distance to the shooting subject by bouncing light off the object, and relays that information to the lens's main CPU. In passive autofocus, the camera's image sensor analyzes the incoming image to determine if the image is in focus.

ERIC HEINTZ