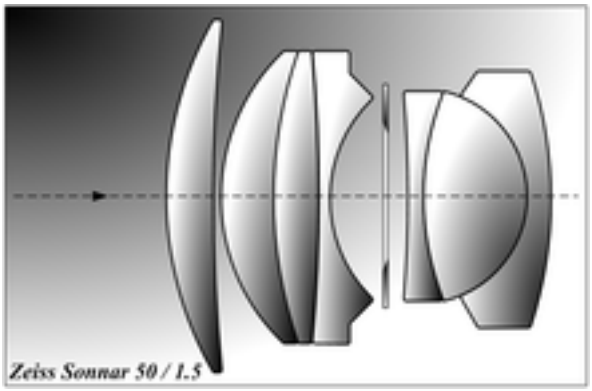
Better Query Saul: Lenses and Cameras

Most of us, I believe, use our camera's autofocus feature. The degree of 'sharpness' that is produced is a product of both the camera and the lens. The camera's autofocus procedure and equipment for achieving focus is complex and may be the subject of a future column.

The other part of the autofocus procedure is the lens. In theory, a simple pinhole or convex piece of glass could serve as a photographic lens for your camera. A small pinhole allows a minimal amount of light to enter the camera and will produce a sharp image. Unfortunately, if you needed more light, a larger pinhole is not an option since it would produce a blurry image.

A convex piece of glass can allow more light to enter and still produce a sharp image –if you ever used a Brownie or box camera, this is what you were using. But the problem with the single piece of glass is that it was frequently blurry at the edges, not critically sharp and didn't faithfully reproduce colors. To correct for these deficiencies requires that a lens have more than one optical element. In practice almost all quality photographic lenses are compound lenses – they are an assembly of optical lens elements that are the lens designer's formula for dealing with the many optical aberrations (distortion, chromatic aberration, etc.) inherent in any lens system. The choice of optical components, the number of such elements and their assembly are all part of a lens designer's approach to achieving technical goals subject to necessary compromises that reduce optical aberrations. In other words, lenses are complex pieces of equipment. A diagram that illustrates this construction is given below:



This diagram of the Zeiss Sonnar 50mm f1.5 has 7 optical elements in 3 groups. The Sonnar was first introduced in the 1930s and was known for its sharpness and light weight. Some variable focal length lenses have as many as 20 elements!

The issue with complex lenses and camera are their variability. All of today's popular lenses and cameras are mass-produced and subject to quality controls that insure manufacturer-specified tolerances are met. However, even within these

statistical limits variability can produce noticeable differences in your photographs. Variability in the lens added to variability in the camera can compound the problem! What is the manifestation of this variability -- autofocusing that produces 'soft' images. How do I know if this is a problem? Put your camera on a tripod and take a photo of something that is relatively simple and somewhat contrasty. Blow the photo up to about 10x its size. If the focus looks soft or if you think you could improve on the focus by manual adjustment, then you have an issue that needs correction. If the autofocus appears to be in front of the object that you selected, you are said to have a front-focusing problem. If the focus is to the rear of your object, you have a back-focusing problem.

Canon, Nikon, Sony and Pentax [1]all have included in their menus for some of their cameras, a feature for correcting this autofocusing problem – its called AF micro adjustment. If you look at this menu item, you can counter both front and back focusing by increasing or decreasing this item. How much should you increase or decrease the AF micro adjustment? There are a number of ways to do this. Either on your own, by purchasing a micro-adjustment tool,or paying a professional.[2] [3]

Try this procedure:
1. Put your camera on a tripod
2. Focus on an object that is at least 50 times the focal length of your lens. For example, a 50mm lens should be about 2.5 meters from the object.
3.The object should be relatively simple, well-lit, facing the camera and easily discovered by the autofocus system. There are a number of focusing diagrams that are helpful. Search the web for autofocus chart or try
http://regex.info/i/JEF_024811.jpg
4 Set the lens for autofocus, ISO =100, aperture= widest, spot focus with the spot on the very center.
5. Use the self –timer, mirror up, image stabilization off.
6. Vary the microadjustment settings in your camera. For example, my Nikon 810 has settings from -20 to +20.[4] Take three sets of images at microadjustment settings E.g. on my Nikon, -10, 0 and +10, i.e, three consecutive images at -10, three consecutive images at 0, and three consecutive images at +10[5]..
7. Look at the images on your screen at 100% magnification. If the camera is focusing in front of your target, your correction should be on the positive side. By trial and error, adjust the AF microsettings to find the optimal one. If, for example, the +10 setting appears to be sharper than the rest, try +5 and +15.
8. Unfortunately, you will have to repeat this procedure for each lens!

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[1] Mostly in their newer, more costly models.
[2] LensAlign is one commercial product.
[3] There is usually a person at Nature Visions that will do this.
[4] I believe Canon has -5 to +5.
[5] Three shots just in case one or two are out of focus for a reason other than the microadjustment.