

Prosumer vs. Professional Digital Cameras

Prosumer digital cameras are those cameras with a megapixel sensor (2.1 to 5.0 megapixels) and relatively sophisticated electronics that do not have interchangeable lenses. Professional digital cameras have removable interchangeable lens and are similar to conventional 35mm cameras. Both types of cameras can be used with a microscope but the equipment requirements are different.

Prosumer Camera – Nikon Coolpix, Olympus C, Canon G2 series cameras

Because the lens cannot be removed from these cameras, the mount connecting them to the scope must compensate for the optical problems this creates. This compensation produces an image that has the potential for slight vignetting. The scope light is generally used for illumination. Because of the high light transmission of the X-mount, the shutter speeds are usually high enough for microscope use. External flashes are generally not used with these camera/mount combinations. Most, but not all, of these cameras can use a remote release which helps alleviate the vibration problem inherent in microscope imaging. A 50/50 beamsplitter is required since the “virtual beamsplitter” will not work with prosumer cameras.

There are two ways of mounting these cameras. The first is a proprietary mount, which includes all the necessary optics to focus the image as well as a prism to bring the image to the correct orientation. This is the most elegant solution to mount the cameras and is the recommended way to do it. The X-mount is such a mount and is designed to maximize optical resolution, camera stability, camera interchangeability and light transmission. In our opinion, the X-mount is the best product of this type on the market.

The other way of mounting this camera is to use a transfer lens to mount the camera on a conventional camera mount. This method has the disadvantage of using multiple parts, is larger and transmits less light. These lens system are made by the manufactures of the cameras and as aftermarket items.

Professional digital cameras – Canon D30, EOS 1D, Fuji S1 Pro, Nikon D1

Since the lenses can be removed from these cameras, they have a simpler optical system. The microscope acts as the lens system for the camera. This is accomplished with a camera attachment and camera adapter. The size of the viewed image, compared to the size of the camera image, varies with the focal length of the camera adapter used. Vignetting is less of a problem and they are potentially sharper.

The latest models of these camera are 6 megapixel, have better chips, higher bit counts and better computer algorithms. These cameras are more sensitive than the prosumer cameras, many going as high as a 1600 ISO. The higher the ISO, the higher the shutter speed, and the less the vibration problem. Photographers

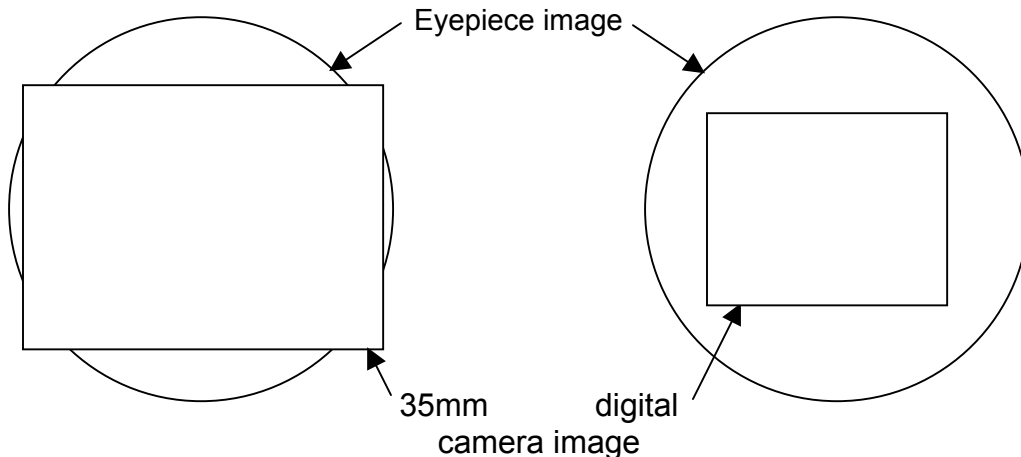
agree that, in general use, these camera produce higher quality images than prosumer cameras.

While not necessary, it is possible to use a flash with these cameras. This setup would give the highest quality images for the following reasons: 1) The camera can be used at a low, and therefore less noisy, and 2) The ISO setting and the flash effectively stops vibration because of the very short duration of the flash.

A removable lens camera can be used with either a 50/50 beamsplitter or a virtual beamsplitter. The virtual beamsplitter has improved light transmission and increased depth of field compared to a 50-50 beam splitter.

These cameras have significant disadvantages in that they are much more expensive, bulkier and heavier. The combined weight of the camera and mounts will usually require a heavy-duty arm for the microscope. The prosumer camera on an X-mount usually doesn't increase the weight enough to require modifying the scope arm.

The real question; is the image quality of a removable lens camera enough better to warrant spending the effort and money to mount one on a scope?. For almost all clinician(s) it is not. The quality differences are minimal at best. If a clinician already has a scope equipped for a 35 mm camera, it might be worth looking into one of these cameras. However, there is one issue to watch out for in considering one of these cameras. Since the chip in the camera is smaller than a piece of 35mm film, the image size will be smaller than with film. The relative size of the image through the eyepiece may be radically different than the camera image. This may or may not require a different focal length camera mount.



Comparison of camera image sizes between film cameras and digital professional cameras with the same photo mounts.

For almost all clinicians, the X-mount and a good prosumer camera is the recommended combination.