

Beyond Megapixels - Part I



Written By Joe on Apr 24, 2004

This is the first of a three part series of editorial articles examining current digital photography hardware, as well as the author's views of what is to come. Keep in mind that as this is an editorial, it does contain some opinion and bias, but I have attempted to be as fair and objective as possible.



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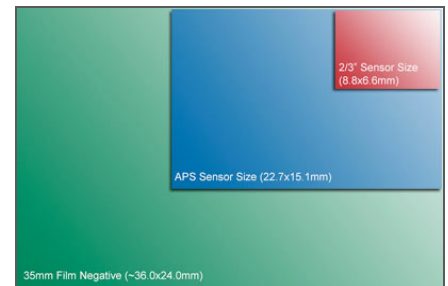
Beyond Megapixels - Part I

By Joe Marney

The Megapixel Myth

With spring has come the release of several new 8 megapixel "prosumer" digital cameras. These new "digicams" sport the latest optics, metering, focusing systems and of course, sensor resolution. I would contend, however that in many cases the limitations imposed by capturing 8 million pixels on a 2/3" size sensor negate the assumed advantages of increased pixel output. There just might be more to look for when selecting your next camera than the number of megapixels listed in the specifications.

Don't get me wrong, I find that "8.0 megapixel" stamp on the front of the camera as enticing as any other high-tech craving camera connoisseur. The problem lies not in the number of pixels recorded, but in the quality of those pixels. Now, if I am to make any sort of logical argument that labels these new cameras as having "low-quality" pixels, I must provide a concrete example of "high-quality" pixels for direct comparison. Thus, I introduce into the argument the current crop of digital single lens reflex (DSLR) cameras. Until recently, these cameras would have been labeled as "professional", but with the introduction of Canon's Digital Rebel and, more recently, Nikon's D70, DSLRs have entered the same price segment as their 8 megapixel prosumer brethren. The DSLRs in this price range are 6 megapixel variants with a sensor size that is approximately the dimensions of an APS film negative (22.7 x 15.1 mm). In contrast, the 2/3" sensor size of the 8mp digicams is dramatically smaller, about the size of the tip of your pinky (8.8 x 6.6 mm).



So what! An 8 megapixel outputs a larger, higher resolution image than the 6 megapixel cameras and is therefore superior, right? Wrong. The people that buy into that argument are the same ones that purchase a 2.4ghz Pentium 4 instead of a 2.2ghz Athlon 64. That's right fellow geeks, the "megahertz myth" is quite synonymous with what I shall refer to as the "megapixel myth."

A photosite (one of the millions of receptors on a sensor that capture each pixel) on an APS sized sensor are larger than a photosite on a 2/3" sized sensor, and due to its larger size, it can capture light more easily. This light is digitized into the information that makes up your final image. Analogously, imagine 8 million 16oz cups versus 6 million 5-gallon buckets that are all filled with water. The water is then poured into two rectangular reservoirs measuring 300 feet by 150feet. While the area of water in the two reservoirs is equal, the water collected from the 5-gallon buckets is much, much deeper. So it is with the information captured by cameras with larger photosites. The images produced from a DSLR are generally deeper, with superior dynamic range, color depth and detail resolved (albeit smaller numerical resolution).

Image Noise

The most common cause of annoyance with digital photography is image noise. When presented with a low-light or non-flash shooting situation, the camera (either automatically or by manual command) should switch to a higher ISO, or sensitivity, setting. The sensitivity of the photosites is amplified in order to achieve a shutter speed short enough to capture an acceptable

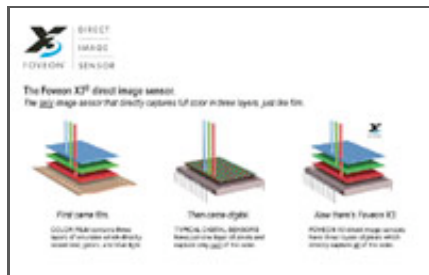
image. As many of you already know, amplifying a signal generally has a negative effect on the signal-to-noise ratio. Since the photosites on a DSLR are larger, and naturally capture more light, they do not require as much amplification of signal to increase sensitivity as digicams. While all cameras include algorithms to reduce the effect of noise on the final image, noise reduction techniques generally cause a slight amount of blurring, which, of course, reduces the amount of detail resolved.

Again, the small, densely packed photosites of an 8 megapixel digicam suffer more from the amplification of sensitivity than their 6 megapixel counterparts. And this is no small matter! Many digicams produce a greater amount of noise at ISO 200 than DSLRs do at 800 or even 1600! The ability of DSLRs to produce a usable image in low-light situations can make the difference between getting a shot or not. If you have high hopes of sneaking some shots at the next Britney Spears concert without giving away the camera you snuck in by using the flash, you'll probably need the shooting capabilities of a DSLR. (However, as you'll see in my next article, sneaking that DSLR in to the concert may prove difficult.)

Conclusion

Where am I going with all of this? From the tone of the article, you're probably guessing that I have a strong bias against the latest and greatest digicams. This is, however, not the case. At the end of each the articles in this series, I will comment on what I think camera developers have done right and wrong, and what I think is important to the photographer who wants to produce better photographs. This certainly doesn't mean the market will go in the direction I would like it to, or that my ideas are the most marketable.

My contention on this issue is that the average photographer does not need more megapixels, they need better megapixels. I would much, much rather own a 5 megapixel digicam with good resolution at high ISO sensitivities and tough shooting situations than an 8 megapixel camera with great resolution only in ideal situations. Thankfully, some manufacturers have moved beyond pushing megapixels. Cameras that utilize Foveon's X3 sensor produce smaller images, but they are much sharper, as red, blue and green color channels are captured in every photosite, as opposed to the more standard use of Bayer interpolation. Fujifilm is also taking things up a notch by adding a set of photosites just for the purpose of improving dynamic range with their SuperCCD IV SR sensors.



There is much more to a camera than the sensor it uses. In part two we'll look at camera lenses and bodies, and maybe the 8 megapixel digicams will gain back some lost ground against their DSLR counterparts. Stay tuned for parts II and III...