

# Notes from “Advanced Digital Imaging” by Jeff Colwell

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The presentation for the February 2008 main meeting of the PCUG was about a selection of procedures for enhancing the quality of digital images obtained by camera or scanner for display on screen or print, mainly by using tools provided in Corel Paint Shop Pro XI. Corresponding tools are provided in the Adobe range of Photoshop and many also in programs provided for free with cameras, printers and scanners and new Microsoft services including Windows Vista.

## *About pixels*

1. Digital images are produced by light focused on to receptors in a camera (5 million in my “5 mega pixel” camera) which translate the colour and intensity into a digital code called a pixel. Thus a pixel is a digital code value for the area of the image focused on to a receptor and as such has no physical dimensions. These pixel code provide data to computed values for the dots that produce images for a monitor or printer - for a monitor to intensities for red, green and blue (RGB) phosphors and for a printer values for ditherings or assemblages of several dots of blue, red, yellow and black (CMYK). The need is only for sufficient pixels to compute this information for each dot – more for printers than for monitor displays, and more pixels than the minimum for these sufficiencies make no contribution to the quality or definition of images. Consequently only about 4 mega pixels are required for most prints to A4 size and many fewer for a monitor display. Given sufficient pixels quality is determined by the monitor and printer. The number of pixels available to form an image is reduced by cropping so that it is nice to have an adequate reserve as provided by a 5 or 6 mega pixel camera to allow severe cropping. Otherwise, more is not better.
2. The quality of images vary with the size of the receptors so that larger numbers of receptors will require a larger camera. Otherwise smaller receptors may produce poorer pictures. For example I wonder about the quality of photographs produced by the 5 MP camera in some mobile phones or by 10 MP in a standard size camera? Do a Google for “**Deconstructing the Megapixel Myth**” for an excellent review and discussion on this subject.

## *Format*

See <http://www.impulseadventure.com/photo/> for a comprehensive review (thanks Mike D).

3. **JPEG** - For natural photos, JPEG is really the best file format to use because of its extremely effective compression techniques. However, through lossy compression comes a slight reduction in quality over uncompressed / non-lossy techniques. As a photographer, you'll have to make the tradeoff decision but fortunately the loss can be made negligible (see paragraph 9 below).
4. **BMP / TIFF** - Lacking an efficient lossy compression scheme, these file formats will consume huge amounts of disk space.  
In particular TIFF (for Tagged Image File Format) provides "tags" in the file header as required for some scanning and printing processes – but not for home printers or monitors (see 12).
5. **RAW** – The sensor in a camera can provide data at 12 to 14 bits per pixel. This is reduced to 8 bits per colour in a JPEG file (24 bits total, 8 per colour R,G and B) The complete unreduced data is stored in a raw format file. At first sight this seems a good reason for using RAW rather than the JPEG format usually provided by default with cameras and scanners. But there is a downside as described in [http://www.northlight-images.co.uk/article\\_pages/why\\_use\\_raw.html#downside](http://www.northlight-images.co.uk/article_pages/why_use_raw.html#downside)

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Also note the following from Corel and Canon in paragraphs 9 and 10.

On these bases I use the JPEG from my Canon camera provided by the camera setting for “Superfine Compression”. Then I use the Paint Shop Pro “Batch” process to convert all JPEG files convert to the recommended Paint Shop format PSPIMAGE after downloading the files into my PC before computing any enhancements. PhotoShop similarly recommends conversion of JPEG to its PSD format before enhancement.

### *Format notes (Huss & Davis 2006 and McMahon 2007).*

6. All digital cameras apply JPEG compression to the photos so they can get the maximum number of pictures into the camera’s storage media.
7. Increasing the amount of JPEG compression gives you a smaller picture file - but the quality of the picture is reduced.
8. You can copy a JPEG as many times as you want and it will not affect the quality. The exception is if photo imaging is performed on the picture before it is saved. This is why you should save pictures you are working with in a lossless format like TIF or PSP (Photo Shop Pro’s native format.)
9. Although JPEG doesn’t offer lossless compression, at low compression settings it comes pretty close. At a setting of 1 the compressed image is indistinguishable from the original, but the file size is nearly halved.

### *Notes from Camera User Guide for the G5 Canon camera*

10. With the standard JPEG file format, the camera processes images after capturing them to produce optimal results.
11. The recording file format can be switched to the RAW format before shooting the image. The RAW format records the image data as captured by the camera’s CCD without further processing.
12. Although a RAW file is larger than an equivalent JPEG file, it is still only one-quarter the size of an equivalent TIFF format file, making it relatively compact.
13. With standard uncompressed file formats, such as TIFF, images are processed in the camera and require further processing by retouching software to adjust the image parameters, which reduces image quality.
14. With the RAW format, the original data can be used in special software to adjust image parameters (white balance, contrast, sharpness and saturation) making it possible to maintain the image quality while making changes.

### *Panoramas*

I demonstrated creation of panoramas with the program provided with my HP printer, HP Image Zone>Create>Panoramas. Other panorama programs are provided with camera purchases such as Photostitch with a Canon camera. A free program Autostitch is also available from <http://www.photo-freeware.net/autostitch.php> .

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## *Recommended web sites*

[www.shortcourses.com](http://www.shortcourses.com)

[www.scantips.com/basics3b.html](http://www.scantips.com/basics3b.html)

[www.impulseadventure.com/photo/](http://www.impulseadventure.com/photo/)

<http://www.microsoft.com/windowsxp/using/digitalphotography/default.mspx> (thanks Ben Cauchi!  
Note Digital Image Suite 2006 is now superseded by Windows Vista)

Google for “**Deconstructing the Megapixel Myth**”

## *References*

“Paint Shop Pro Photo XI for Photographers”, Ken McMahon, Focal Press, 2007,

“Paint Shop Pro X, The Official Guide”, D. Huss & L. Davis, McGraw-Hill, 2006

“PowerShop G5, Camera User Guide”, Canon 2003.