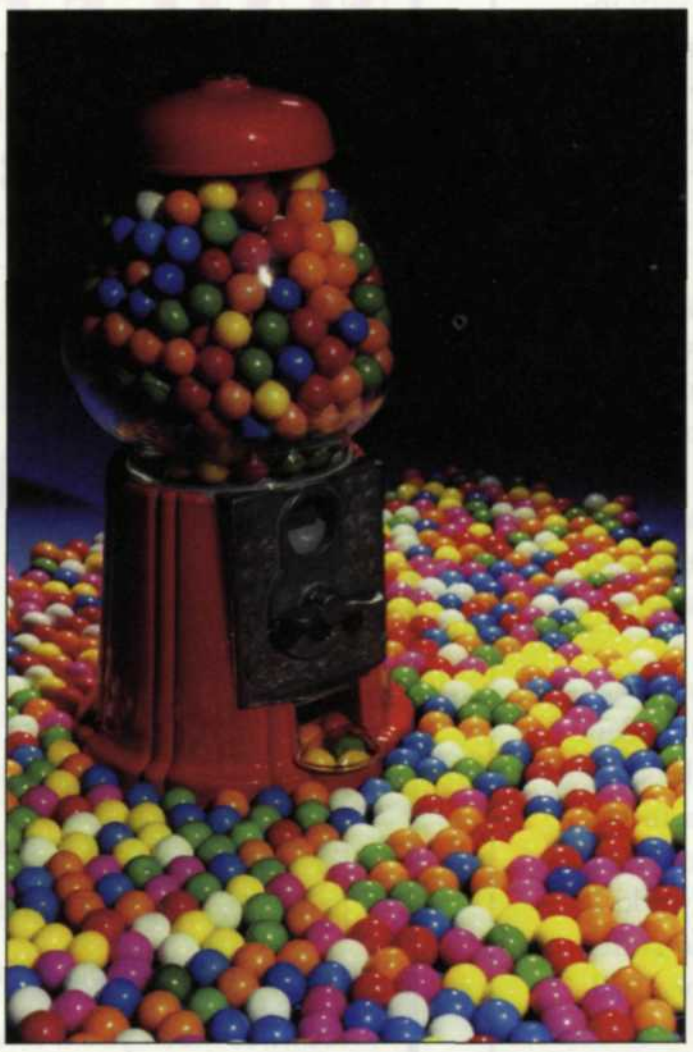
UNDERSTANDING and *APPLYING* Digital Resolution



Zoom-in of individual images scanned at 1000, 2000, 30000 and 4000 line resolution

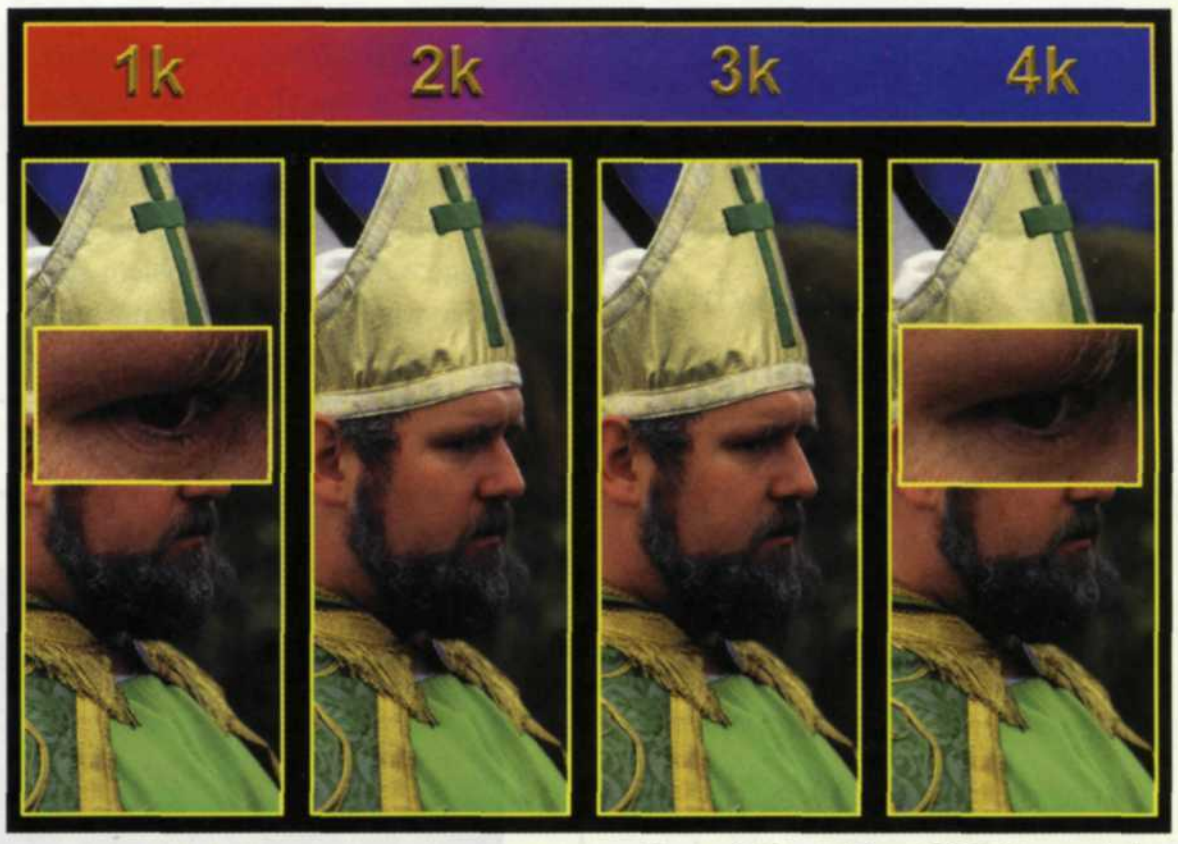
Tighter shot of individual scans above.

Jack & Sue Drafahl

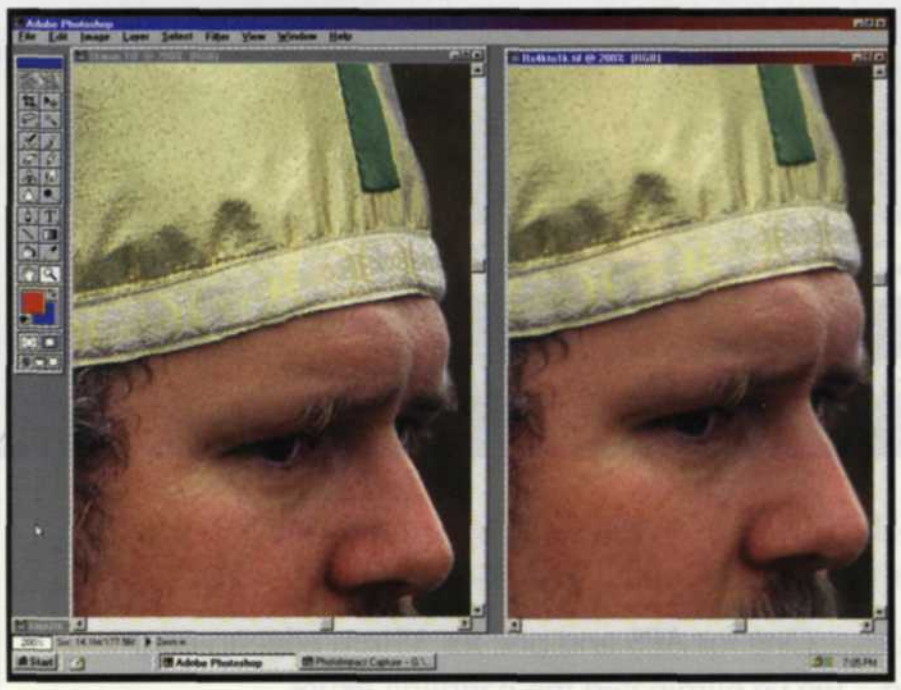
In the past few months several photographers have asked us what resolution they should use to scan their photographic images. In each case we immediately asked them what they will be doing with the images. We then gave them our resolution recommendation only to later find that they ignored our advice and scanned the image at maximum resolution. This seems to be typical of many photographers getting into digital photography. When we ask them why they scan at the highest resolution, they say that they don't want to cut corners on quality. They used the best film, so why shouldn't they use the best resolution with their scanner?

MANY PHOTOGRAPHERS don't have a true grasp of how the digital photo process works. In past articles we have touched on the importance of asking, "What are you going to do with this image scan?" but the problem still exists. So, we again return to the subject—to review some of the original concepts and add a few new ones.

Eventually, it becomes the task of the photo lab owner to educate these valued customers on digital photography resolution. It's not an easy task, as many photographers will not settle for anything less than maximum resolution no matter what the application.



Scan of 35mm slide at 2000 line resolution



Screen shot left image scan at 1k, right image is resample from 4k to 1k

Same as above except right image has had sharpen filter applied

The key is to first educate your employees so that they can deal intelligently when they attempt to educate your client base. Give them some visual tools to make the job easier. Provide samples from each of your input and output devices. Label each with resolution, image size, file size and cost. If you have your pricing structure set up correctly, the client should easily be able to balance cost vs output resolution.

Why use an image resolution less than the maximum a device can input or output? This is the key question, and if you can get this point across to your client, you are almost there. With traditional photography you can use the same standard 35mm negative to print 4x6, 5x7, or larger prints. The time it took to shoot the negative is the same for all print sizes, and the image resolution remains constant since the same negative is used.

With digital photography, an increase in image resolution will increase the time and money necessary to create the digital image. As the image resolution increases, the digital image takes longer to scan, edit, and output. Since time is money in the real world, the lab needs to charge more for each increase in image resolution.

If the output for a specific job is a 5x7 color print, it makes no sense for your client to pay for a scan that could be used to make a 16x20 color print. This is where the sample prints are critical tools. If the client can see that a lesser resolution will adequately do the job, then you have gotten your point across.

Image resolution is determined by pixel dimension It is important to have an idea of just how large a file will be when suggesting a certain resolution.

When you look at image specifications pertaining to a digital file it may include a variety of data such as page size, pixels per inch, data type, file size, and pixel dimensions.

The two pieces of information that will give you an accurate value of an image's resolution are pixel dimensions and file size. If the photo is a grayscale photo, you can multiply the vertical and horizontal dimensions and you will get the approximate file size. Take three times that and you will be close to the RGB image size. Multiply it by four and you will have the CMYK file size.

If you only know the page size, it will be impossible to determine the final image resolution. But, if you know the page size and PPI (pixels per inch) you can use those numbers to get an approximate file size. For example, you might have a grayscale image scanned at 200 PPI for a 4x5" image. If you multiply the PPI times the page size you will get the image pixel dimensions of 800 pixels times 1000 pixels. Multiply these two numbers and you will get 800k pixels. The resulting grayscale file size will be slightly less than 800k.

Re-scan to change page size or PPI. If you need to make minor changes to page size or PPI, you can usually go to the page setup in your editing program and change the image page parameters without affecting image quality. This is especially true if you reduce the page size or PPI. If the change is considerably larger, then you may have to make a new scan.

Scanning for the Internet

Most images scanned for the Internet should be less than 640 x 480 to minimize the download time. The quality of this image size is usually acceptable for Internet image viewing. If you already have a higher resolution scan and want to use it on the Internet, you should re-sample the image to a lower resolution.

If you do re-sample an image down in size, it is critical that you use a sharpening filter to correct the effect of re-sampling. Raw re-sampled images are less sharp than the same images scanned directly in at that resolution.

Scanning Images for Film Recorders

Most desktop film recorders today can output images from 2k to 4k while some of the higher end machines will go to 8k and 16k resolution. We have found through extensive testing that photo images used for slide projection can be scanned and output at 2k. The end results look as good as traditional images projected on the same screen.

We have shown several slide shows at underwater film festivals and throughout our lecture circuit with excellent response. After some of the presentations we asked several hard-core traditional photographers what they thought. Their unanimous response was that they couldn't believe that the images they saw were digital, let alone at 2k resolution.

When we use our film recorder images for stock photography, we scan at 3k resolution and output the image at 4k on the film recorder. We use the 3k scan for several reasons. The file size is about 18 meg verses 34 meg for a 4k scan. This means that the scan time is faster, and it takes less time to load, edit, shoot, and requires less hard disk space. The 3k scan is the accepted size for Kodak CD images and seems to equal the resolution of most 35mm films.

Scanning for Inkjet Printers

Everyone has a different perception of the quality level necessary for scanning images for output on inkjet. The best way to find your own standard is to run tests with different resolutions at different print sizes. If you have not done this yet, you might try the resolution and print size that we use in our lab. Keep in mind that these are only starting points; your lab's requirements may vary.

8x10 and smaller inkjets	2k	8 meg file size RGB
11x 4 inkjet	3k	18 meg file size RGB
16x20 inkjet	4k	34 meg file size RGB
Larger than 16x20	if possible 8k or more	128 meg and more RGB

Scanning for Output to Offset Printers

The general rule of thumb is to scan the image in at 2x the offset screen used to print the image. If the printer is using a 133 line screen to print a 4x6 print, you would scan the image into your system at 266 PPI. Most scanners today will give you the projected file size as you select the scanner settings.

Resolution Problems with Computer Monitors

An interesting side effect occurs with different monitor resolutions. Generally, the image will look the same on most monitors when viewed at full screen. As you start to zoom in on a specific part to fine-tune edit, the image may look like it is falling apart. As you zoom up another level, it becomes sharp again. This effect is caused by the difference in the pixel resolution of the monitor and the image file on the screen. It is very similar to the Moire pattern caused when you scan a half-toned screen image. One way to minimize this problem is change your editing screen from 24 bit to 32 bit. The additional advantage is that you can now see how your images look in CMYK.

The 2K Barrier

The most noticeable change in image quality occurs as you approach 2000 lines pixel resolution. When you reach this 2k point, the image quality changes are more subtle. This is why most of the amateur digital camera manufacturers are competing to break the 2k barrier.

There are professional digital cameras beyond the 2k barrier, but the cost of these cameras is usually beyond most pocketbooks. Inexpensive film scanners today can easily exceed the 2k barrier, and with cost continuing to decrease, it makes scanning a very viable solution for creating digital images.

The more your lab employees know about image resolution, the better they can inform and serve your clients. Even the most stubborn client will understand that you are only trying to help them achieve the best end product.

Of course, you could scan in all their images at the highest resolution and get more money for each scan. Proceed with caution because as your client learns more about image resolution, your greedy approach may come back and bite you in the.....bank account!

Jack and Sue Drafahl own and operate a custom lab in Oregon. They are also professional photographers, specializing in underwater photography.