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Tips and
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We
speak
Geek,
so you
don't
have to.

# The Picture Paradox

An apology. . .

This is a subject that I have avoided bringing up even though it is an important one. I've avoided it because I haven't yet found a perfectly clear way to explain it. So, please bear with me as I address this issue as best I can. Thank you for your indulgence.

What happened to my photo?

Just like every other proud grandparent, you've just taken a 4" x 6" photo of your new grandchild with the goal of emailing it to everyone in the universe. You check the scan or digital picture by opening it and it's huge! The picture fills your whole screen and then some. You *can't* send that huge picture to your friends, they won't be able to view it!

You've just run up against the most difficult concept to deal with when using a computer with pictures. This problem affects both scanned and digital camera pictures.

Firstly, despite what you see on screen, the picture is still, really 4" x 6". The size that you see on screen is almost never the actual size because, with a computer, you can change the screen presentation at will. You can magnify or shrink the picture on screen, but doing so does not change the picture in any way, only how the computer shows it. As with a real magnifying glass looking at a real photograph, in the real world, magnifying only makes the picture look bigger, magnifying does not change its true size.

Try these experiments to understand how your Mac's monitor shows your pictures:

Experiment number 1: Use a real magnifying glass to look at your monitor screen. You will see that the image on screen is composed of tiny dots. Your monitor can only create the images that you see by projecting tiny dots onto its screen. To create the entire image, the monitor uses a finite number of dots. This finite number is expressed in computer terms as so many dots across the screen by so many dots down the screen. This is also known as the monitor's resolution. This resolution can be changed at any time that you like.

Experiment number 2: OS 9: Open the *Monitors* control panel, OS X: Open *System Preferences* and click on the *Displays* icon. Note the resolutions in the list. Each resolution expresses how many dots will be used to display the screen image. The smaller the numbers, the bigger the individual screen dots must be to cover the same physical area. So, if you choose 800 x 600, the monitor will use 480,000 (800 X 600=480,000) dots to cover the screen, but if you choose 1024 x 768, the monitor will use 786,432 (1024 X 768=786,432) dots to cover the same area. Roughly speaking, at 1024 x 768 resolution the dots will be 1/2 the size of the dots at 800 x 600. This means that if a picture appears to be 4" X 6" on screen at 800X600 resolution, the same picture will appear as 2.4" X 3.6" at 1024 x 768.

From this you might conclude that the picture viewed at 800 x 600 is larger than the picture viewed at 1024 x 768, but that is not true. In actuality, the picture is the same size in both cases (and neither resolution is showing the actual size). When you view a picture on screen, it is as though you are always looking through magnifying lenses of different powers with no clue as to what powers are being used.

Changing from the monitor's to the picture's point of view shows us that the picture doesn't know or care about the resolution used by the monitor to display it. When the picture was created, it was created with its own, independent resolution. Most scanners and many digital cameras use 300 dpi (dots per inch) unless you specify differently. This resolution is all that the picture cares about.

As an example, if you were to scan a 4" x 6" photograph at 300dpi , you would form a picture that was 1200 (4 X 300=1200) dots wide and 1800 (6 X 300=1800) dots high. Now, view that scanned picture on a screen set to 800X600 resolution. The picture is bigger in dots than the screen can show! The screen needs 1200 dots across, but only has 800. 400 dots of picture width will slop off the edge. To see this 4" x 6" picture on screen in its actual size, you would need a monitor that could display 300 dots in an inch of screen space. A 15" monitor, at 800 x 600 resolution, can show only 78 dots in an inch of space. That 15" monitor would need a resolution of 3225 x 2400, and no monitor made can do this. Therefore, the picture's image on screen appears huge because an inch on screen now equals 3.9 inches!

It is possible to create a picture at a resolution that would match your screen's resolution, (say 78dpi), but the resulting picture would be very crude in appearance as many details would be too small to represent with so few and such big dots. 300dpi is a good compromise between image quality and screen size, that is why 300dpi is the usual default setting for scanners and digital cameras.

The picture, however, knows its real size. When you print the picture, it tells the printer what its real size is, and the printer prints it accordingly. Printers, unlike monitors, have very high resolutions. The average inkjet printer can print 1200 dots in an inch and many can print 2400 dots in an inch, far more than the 300dpi image needs. Printers are also aware of the needs of the physical world as they must use paper of specific sizes. Therefore, a printer knows how to interpret a picture's size information in real world terms instead of arbitrary screen dots.

Most picture editing software can show you the size of a picture in inches by choosing the *Image Size* command. This command is in different places in different applications, so it is necessary to hunt for it. Remember that the size that the picture appears on screen has nothing to do with its real size, so when the image editing software tells you the picture's size, do believe the dialog box and not your eyes.

Using picture editing software, it is possible to change a picture's size, but this ability contains a trap. To change a picture's size harms its quality. Reducing the size of a picture harms quality in subtle ways, but you can usually get away with it. Increasing the size of a picture will ruin it if the picture size is increased more than about 15%. If you want to increase a 4" x 6" photo to 10" x 14", the 300dpi image will become 120dpi and lose its crisp detail and good colors. This happens because you are using the same number of dots but you are spreading them over a larger area. The resulting larger and less numerous dots cannot show the same quality of detail or color.

Enlightened or confused? If your pictures remain unruly, please contact me for more information. Thanks!

## October Tip—

Mac OS X 10.2 (Jaguar) is great!

## BUT—

Before you install it be quite certain that your Mac's firmware is up to date or seriously bad things may result! If you don't know if your Mac's firmware is up to date, please contact me: 800-540-8989. Thanks.

Firmware: Halfway between hardware and software, firmware is hardware that can be modified physically by software. Your Mac's firmware contains much of your Mac's most basic instructions.

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Like an auto club for your computer.