

Pixelda Software Ltd  
Image Resizing & Printing Pictures

[001]

*Photography Tips & Tricks*

Version 1.0 : 11-Jan-2008

# 1 Document Control

## 1.1 Change history

Version	Date	Author	Reason for new version	Sections Affected
1.0	11-Jan-2008	Stephen Byard	New Document	All

## 1.2 Amendments Made In This Version

New Document

## 1.3 References

No.	Ref.	Title
1	Adobe Photoshop CS3	On-line Manual/Help

## 2 Table of Contents

<b>1</b>	<b>DOCUMENT CONTROL</b>	<b>2</b>
1.1	CHANGE HISTORY	2
1.2	AMENDMENTS MADE IN THIS VERSION	2
1.3	REFERENCES	2
<b>2</b>	<b>TABLE OF CONTENTS</b>	<b>3</b>
<b>3</b>	<b>OVERVIEW</b>	<b>5</b>
3.1	ABOUT THIS DOCUMENT	5
3.2	COLOUR SPACES	5
3.3	IMAGE RESIZING	5
3.4	PRINTING PICTURES	5
<b>4</b>	<b>TEST IMAGE</b>	<b>6</b>
4.1	DESCRIBED	6
<b>5</b>	<b>COLOUR SPACE</b>	<b>7</b>
5.1	DESCRIBED	7
5.2	THE sRGB COLOUR SPACE	7
5.3	ADOBE RGB (1998) COLOUR SPACE	7
5.4	CONVERTING TO A COLOUR PROFILE	7
5.5	SCREEN AND PRINT COLOUR	7
<b>6</b>	<b>IMAGE SIZE</b>	<b>8</b>
6.1	OVERVIEW	8
6.2	IMAGE SIZE	8
6.3	PIXEL DIMENSIONS	8
6.4	DISPLAY DIMENSIONS	8
<b>7</b>	<b>RESIZING FOR ELECTRONIC IMAGING</b>	<b>9</b>
7.1	OVERVIEW	9
7.2	RESIZE PIXEL DIMENSIONS	9
7.3	RESIZE RESAMPLE	9
7.4	SAVING IMAGES FOR PROJECTION	9
<b>8</b>	<b>RESIZING FOR PRINTING</b>	<b>10</b>
8.1	OVERVIEW	10
8.2	RESOLUTION	10
8.3	UPSCALING AND DOWNSCALING	10
<b>9</b>	<b>PRINTING MYTHS</b>	<b>11</b>
9.1	GOSSIP AND SUCHLIKE	11
<b>10</b>	<b>RESIZING FOR PRINTING</b>	<b>12</b>
10.1	DOWNSCALING (PHOTOSHOP)	12
10.2	UPSCALING (PHOTOSHOP)	12
<b>11</b>	<b>RESIZE BY CROPPING</b>	<b>13</b>
11.1	OVERVIEW	13
11.2	EXAMPLE	13
<b>12</b>	<b>RESIZE DEFAULTS</b>	<b>14</b>
12.1	OVERVIEW	14
<b>13</b>	<b>IMPROVE YOUR PRINTING – SET-UP</b>	<b>15</b>
13.1	OVERVIEW	15
13.2	PRINT A REFERENCE IMAGE	15
13.3	CALIBRATE YOUR MONITOR	15
13.4	ARTISTIC LICENSE	15
<b>14</b>	<b>IMPROVE YOUR PRINTING – CAMERA</b>	<b>16</b>

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14.1	GIGO	16
14.2	CAMERA	16
14.3	CAMERA SET-UP	16
14.4	LENSES	16
14.5	YOU	16
<b>15</b>	<b>IMPROVE YOUR PRINTING – POST PROCESS</b>	<b>17</b>
15.1	WORK IN 16 BIT	17
15.2	CAMERA RAW	17
15.3	BEWARE OF NOISE	17
15.4	LEVELS	17
15.5	SPLIT THE IMAGE	17
15.6	HUE AND SATURATION	17
15.7	HIGHLIGHT AND SHADOW DIALOG	17
15.8	MULTIPLE LAYERS AND LAYER MIXING	17
15.9	CURVES	17
15.10	SHARPENING	17
15.11	FILES AND QUALITY	17
<b>16</b>	<b>IMPROVE YOUR PRINTING – PRINTER</b>	<b>18</b>
16.1	TYPES	18
16.2	PRINTER SET-UP	18
16.3	PRINTING	18

## 3 Overview

### 3.1 About this Document

This document describes colour spaces, how to resize images for common tasks, and how to print pictures.

### 3.2 Colour Spaces

A brief overview of colour spaces is provided, since this is important when targeting images for particular output.

### 3.3 Image Resizing

Images often require resizing for,

- Printing to Paper
- Electronic Imaging, the Internet

### 3.4 Printing Pictures

There are many applications that allow you to print pictures from your computer. This document uses Adobe CS3, but is also relevant to Adobe Elements Version 6 and lower.

## 4 Test Image

### 4.1 Described

A test image is required as an example for the resizing and printing exercise. A RAW image was selected for this purpose at random, which was converted to a JPG file without any processing for display here. In the actual resizing and printing demonstrations, the RAW file is used directly.



## 5 Colour Space

### 5.1 Described

A colour space is a mathematical description of all of the possible colours (the gamut) in a particular set. Examples are,

- sRGB
- Adobe RGB 1998
- CMYK
- Pantone

### 5.2 The sRGB Colour Space

The colour space generally used in electronic devices such as monitors, projectors, the internet, and low-end printers is sRGB. Many cameras also default to sRGB, although Adobe RGB 1998 is sometimes an option.

The sRGB colour space was originally used on broadcast monitors. It is recommended to use sRGB when uploading pictures to internet applications (rather than just copying files), as colour changes might occur when a server applies the sRGB colour profile over some other, uploaded image profile.

### 5.3 Adobe RGB (1998) Colour Space

This is a larger colour space than sRGB and one often used within Photoshop.

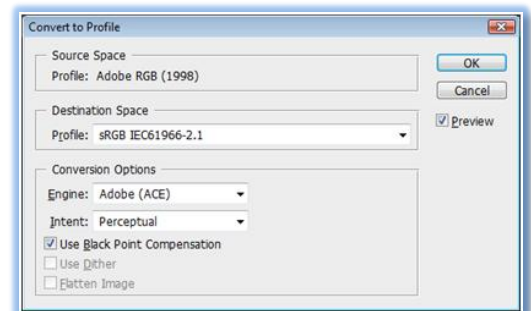
### 5.4 Converting to a Colour Profile

In CS3, you can convert an image at any time using the menu option [Edit],[Convert to Profile]. In most cases, simply use the default conversion options. The current source colour space is displayed followed by the desired colour space.

In Adobe Elements, you have to select the colour profile on opening. To change a colour space, save and close a file, then open again.

Note that there might be changes of colours when moving between two different profiles.

When you save a file to another format such as JPG or TIFF, ensure that you have the “save profile” ticked in the save dialog, so that the profile is added to the image.



### 5.5 Screen and Print Colour

The colour space of any domestic printer and monitor is usually different, with the printer colour space usually smaller. It is not possible for a home printer to achieve an exact match to what you see on your monitor, so be prepared to compromise. The differences are usually quite small, and not worth trying to match, unless you really are pedantic.

## 6 Image Size

### 6.1 Overview

Images consist of pixels – we need to understand how images are displayed in terms of pixels and their size.

### 6.2 Image Size

Open the sizing dialog in CS3 by selecting the menu option [Image], [Image Size].

The example (right) shows the dialog opened for the test image, a 13 MegaPixel Canon-RAW file using the sRGB colour space.

Concentrate on the Pixel Dimensions only when resizing for digital imaging.

### 6.3 Pixel Dimensions

The photographic image is made up of a number of pixels. In this case, the test image is 4368 pixels wide and 2912 pixels high. This is 12,719,616 pixels to be exact. The size of the file should I save the image as a PSD file is 72.8 Mbytes (shown at the top).

The size of the originating pixel is very small – on my Canon 5D camera, about 8 Microns in diameter. Some cameras are 4 microns or less, but note that larger pixels sizes produce less noise – so here, bigger really is better.

If we display the image the same size as the original sensor, it is only 35.8mm wide and 23.9mm tall (It is the same as looking at a 35mm film). You would need a powerful magnifying glass to make out any detail!

Instead, we use a computer monitor or projector. Each of these display devices contains a grid of display pixels, and is a number of pixels wide and tall.

### 6.4 Display Dimensions

An image view/edit application can display a picture on a monitor or projector. If we assume the application initially uses a 1:1 zoom ratio, then, one pixel in the image file is displayed to one pixel on the screen.

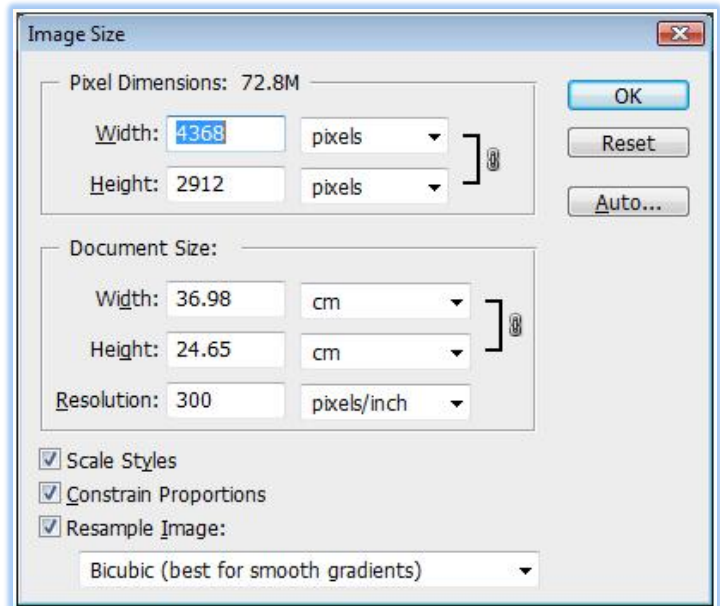
Let's say we have two monitors, one, a 17 inch, and the other 30 inch. Both have the dimensions of 1024 x 768 pixels. If we display an image, also 1024 x 768 pixels, the image will exactly fill each monitor. Clearly, the image will appear much larger on the 30 inch monitor. It's display pixels are physically larger than the smaller monitor. In reality however, we sit further away from the large monitor, so the image won't actually appear larger when we do this. You can type in the actual pixels per inch of the monitor, to see the size of the image in real life on the screen – a technical is somewhat pointless exercise!

The view/edit application often allows you to zoom in and out of the image. When zooming in, several pixels on the screen are used to display one pixel from the image. When zooming out, a pixel on the screen might have a colour value calculated from many pixels in the image. You may sometimes notice pattern effects (moiré) at different zoom levels.

In general, monitors have about 72 pixels per inch, so a 1024 x 768 pixel image is displayed about 14 inches wide and 10 inches tall on such a monitor.

Different monitors and projectors (depending on price) have not only different pixel sizes, but also different numbers of pixels, and in general, the best image is seen when 1 pixel in the image is displayed in 1 pixel in the display. If we resize an image to 1024 x 768 pixels and display on a monitor also 1024 x 768, we are displaying at the monitors native resolution. On a larger monitor (1920 x 1600) the image is displayed on part of the screen. On a smaller monitor (800 x 600), only part of the image is displayed.

For digital imaging, you can ignore all of the values in the document size section.



## 7 Resizing for Electronic Imaging

### 7.1 Overview

Resizing for electronic imaging or the internet usually implies resizing the image smaller. Let us take the test image and resize it to fit onto a 1024 x 768 monitor (or projector)

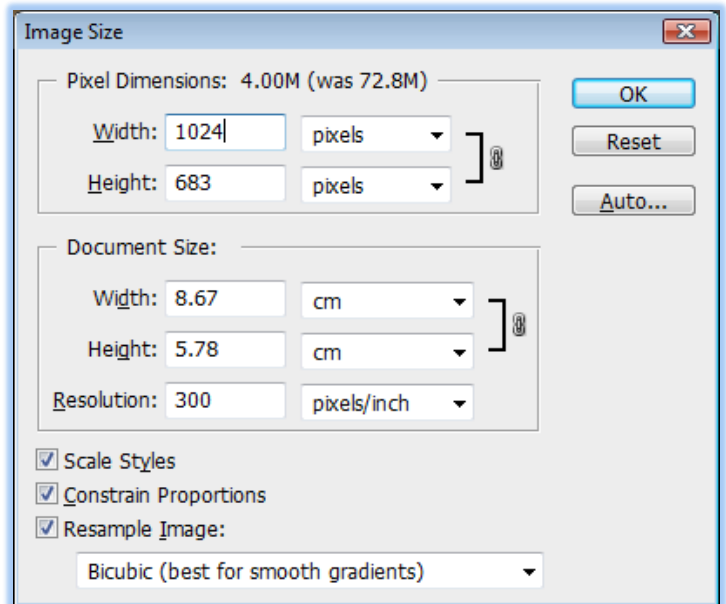
### 7.2 Resize Pixel Dimensions

For a landscape image (width greater than height), set the width to 1024. For a portrait image (height greater than or same as width), set the height to 768. The test image is landscape format (width greater than height) so type 1024 into the width box. Note that the height automatically adjusts to 683 because by default, the little chain to the right is displayed (the tick box “Constrain Proportions” is ticked).

Since the aspect ratio of the image is not the same as the monitor 1024/768 (or 5:3 ratio), the height of the image when the width is set to 1024, is 683. This is less than the height of the display, but is acceptable. Displaying tall narrow or wide thin shots on monitors or projectors almost never looks right.

You can also rescale the image to a 5:3 ratio in order to fill the screen. To do this, un-tick the [Constrain Proportions] tick-box, and type in 1024 and 768 in the pixel dimensions.

Beware that this is likely to distort the image in terms of round objects will no longer appear round, but stretched – as will people, and this will look unnatural. A better solution is to crop the image at 5:3 ratio (see later).



### 7.3 Resize Resample

Before you click “OK” to resize, use the drop-down at the bottom of the dialog to tell Photoshop how you want the image resized. To resize smaller, use either the [Bicubic], or [Bicubic Sharper].

Note that the final PSD file size is now 4MegaBytes, rather than the original 72. If we change the RAW image to 8 bits and save as a JPEG file, the final file size is just 450kBytes.

The image is now ready for display on a screen or projector (e.g. entry into a digital imaging competition).

Note that it is worth checking which bicubic option gives you the best looking results. If this is for projection – you will probably want to check it projected, rather than on a monitor.

### 7.4 Saving Images for Projection

The following steps are the one way to move a file from Photoshop, into a TIFF or JPEG for projected electronic images.

- Convert colour profile to sRGB if not already in that profile
- Select the “Crop” tool
- For landscape images, type in the max pixel size for width (e.g. 1024px). Leave height/resolution blank
- For portrait images, type in the max pixel size for height (e.g. 768px). Leave width/resolution blank
- To create an exact size image to fill the projector, type in max projector width and height
- Drag a crop rectangle to the desired size
- Click the “tick” button to accept the crop
- Set [Image],[Mode] to 8 bits
- Save image as JPG or TIFF – note filename format specified on the competition entry form

## 8 Resizing for Printing

### 8.1 Overview

Printers are document display devices. They often have different pixel sizes (in terms of pixels per inch (ppi) and ink dots per inch (dpi)). However their output document sizes are common. E.g. A4, A3, 6 x 4 inch. Resizing for printing therefore requires us to think in terms of the document's size and how many pixels there are per inch.

A big difference with printers is that once you have the print in your hand, you cannot zoom in or out (other than move closer or further away, or break out a magnifying glass).

Without experience, it is often better to judge printed output rather than the screen – this can especially be the case for final colour, overall contrast, and sharpening images.

### 8.2 Resolution

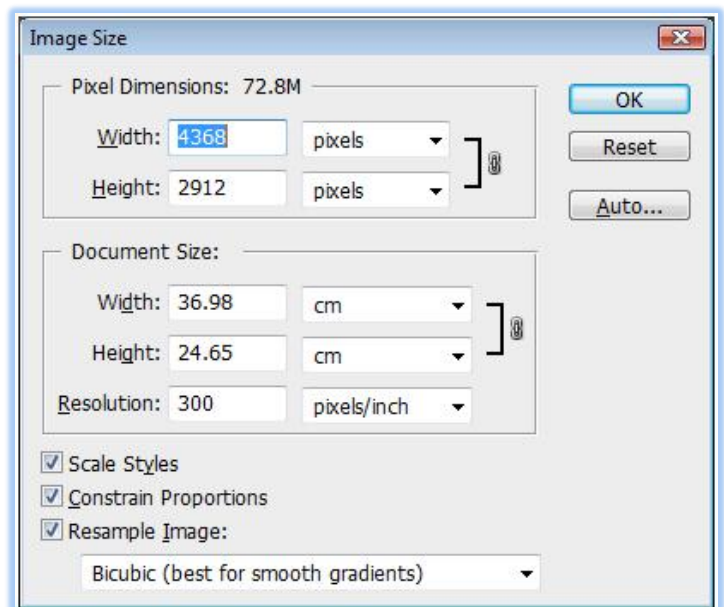
When we open an image such as a JPEG, the pixels per inch may already be set. Opening an image file in Photoshop Camera RAW allows you to set the ppi. This can also be set once in Photoshop.

An images resolution is displayed in the [Document Size] section as it relates to printed length, and is in terms of pixels per inch.

Note that dots per inch [dpi] of printers relates to how it lays down ink to create the pixels per inch dots. Some printers put the CMY and black next to each other to create the final pixel colour, some overlay transparent colour. So just be aware that for many printers, dots per inch (of ink) and pixels per inch are not the same thing.

Current inkjet printers provide up to about 250 dpi, so having an image with 500 dpi makes the file bigger without increasing how good the print looks. Resolution simply tells you how big a document will be for the number of pixels per inch you want to print. As long as your printer can handle the pixels per inch, that's what you will get.

In reality, a resolution of 150ppi is about the minimum you need to produce a reasonable print, with above 300ppi unlikely to produce any noticeable difference.



### 8.3 Upscaling and Downscaling

An image is unlikely to be in the exact size and ppi for printing. You might be printing your image smaller (e.g. to 6 x 4 inch paper), or larger (e.g. to A2 Paper). The image must be rescaled or resolution changed in order to fit the document size you want. You don't have to print right to the edge of the paper, so think about whether you need borderless prints or not when rescaling.

When you print to a different document size than specified in the image, its resizing can be performed by you in Photoshop beforehand (so that you can print 1 image pixel to 1 print pixel), or automatically within the printer driver. There is no best method, and examination of prints is the only way to be sure which method is best in any circumstance.

It is also possible to use other specialised third-party applications to resize images. This is often the case when creating poster size prints measured in metres.

## 9 Printing Myths

### 9.1 Gossip and Suchlike

When upscaling, you can just resize in one go, but some suggest only enlarging an image by 5%, then another 5% and so on, until we reach the required image size (the last resize might require 1 to 5%). There doesn't seem to be any conclusive evidence which method is best.

Some people will tell you that, since a printer prints at (say) 720 dpi, the ppi should be 360 to avoid moiré and other effects. However, processes do not necessarily proceed in the logical way you might think, and can be counter intuitive. If you did work at 360 dpi because it caused less issues, you might find upgrading a printer driver at a later date eliminates the original issue without you even knowing about it.

Without performing print tests with your own set-up, you your output will be a guess. Some images might print well at 150dpi, and not need a higher resolution at all.

Use the internet to get a good canvas of what other people are doing, and keep up to date with manufacturers advice.

## 10 Resizing for Printing

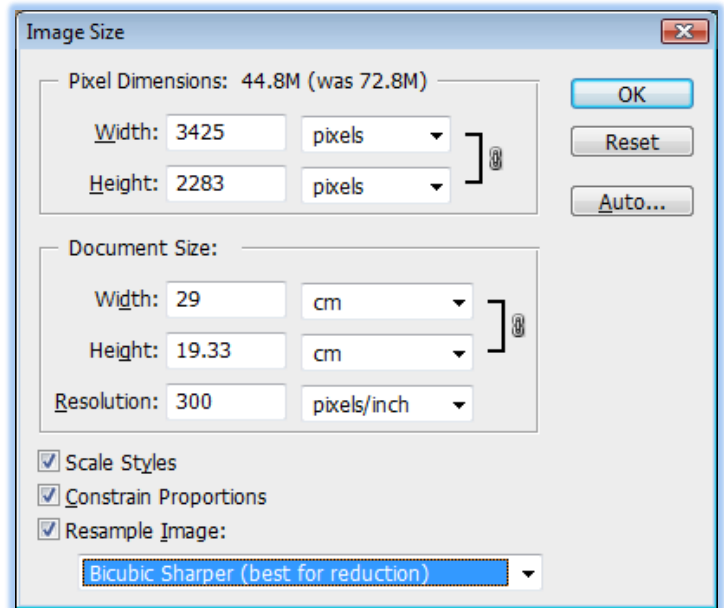
### 10.1 Downscaling (Photoshop)

Before printing to a document smaller than the current document size, you can downsize it.

To do this, open the Image Size dialog. Concentrate on the document size and ignore Pixel Dimensions. Type in the longest size for your image (Width for landscape, Height for portrait). The other dimension automatically displays the new size, and the PSD file size should be smaller (in this case 44.8M reduced from 72.8M).

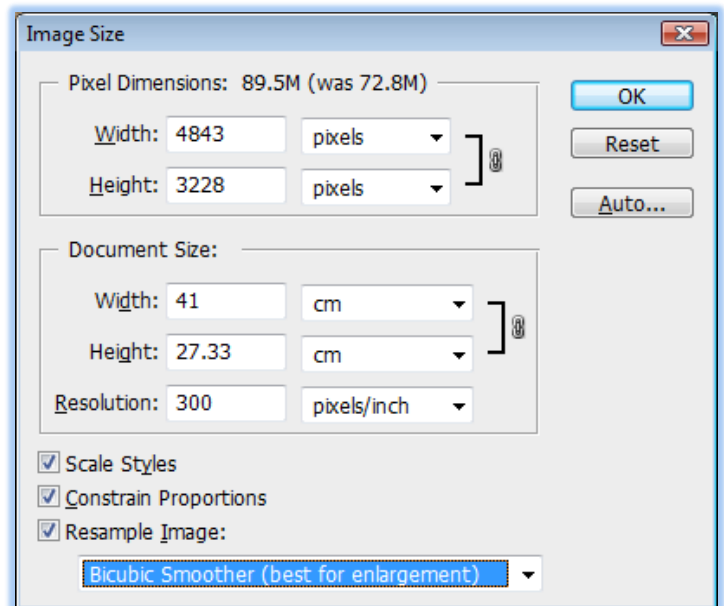
I entered 29 for the width, and the height rescaled to 19.33

You can choose to resample the image – in this case I chose “Best for Reduction”. Click “OK” to finish. The image will stay at 300ppi. Nothing happens until you click “OK”, and you can cancel at any time.



### 10.2 Upscaling (Photoshop)

To print a document larger, proceed as above, and type in the new document size. In this case, try the “Best for Enlargement” re-sampling.



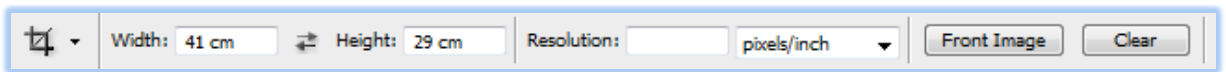
# 11 Resize by Cropping

## 11.1 Overview

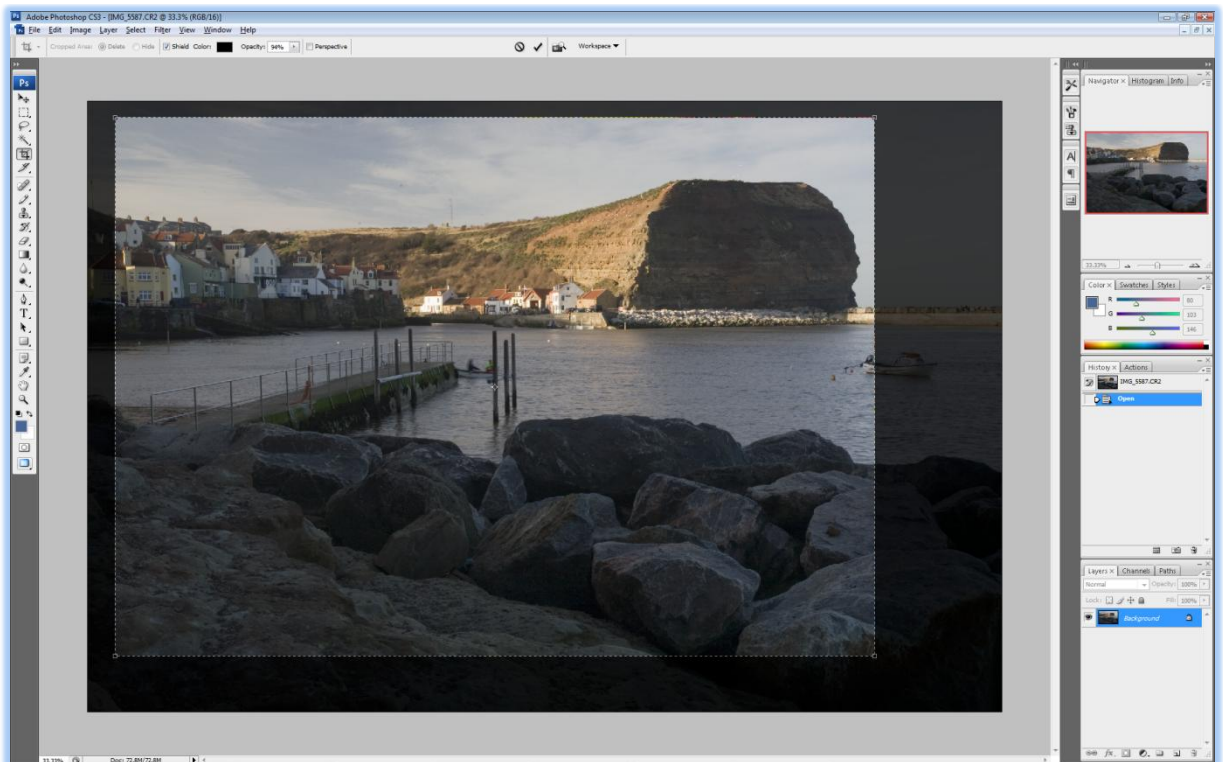
You can resize an image using the crop tool. In this way you can get an exact Width to Height Ratio of your image that matches a document. Enter none, one, two, or all three values to constrain by.

## 11.2 Example

In the example below, the width and height will be constrained to 41cm by 29cm, with the resolution allowed to be calculated from the crop. You can also enter a resolution if you want to keep to a certain ppi. Note that you can also specify pixels or inches for the final crop.

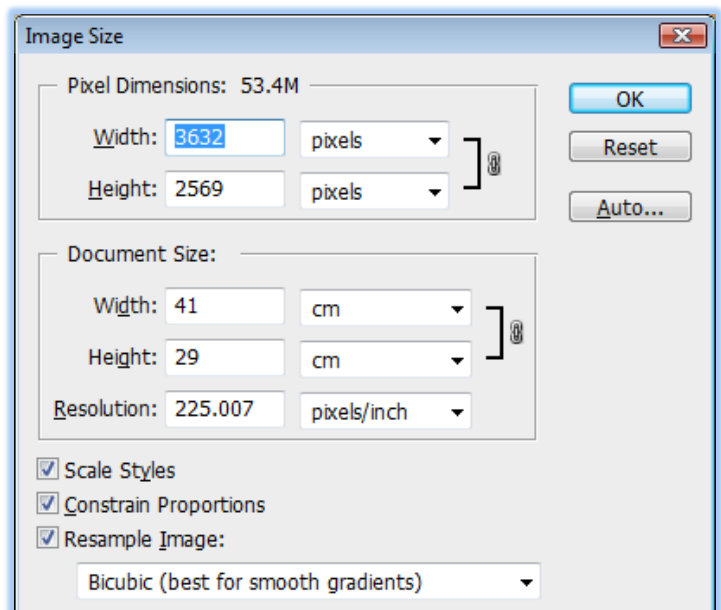


When you now drag the crop tool, the aspect ratio is kept constant (see below)



The result of the above crop (with no resolution specified) changed the resolution to 225.007 after cropping.

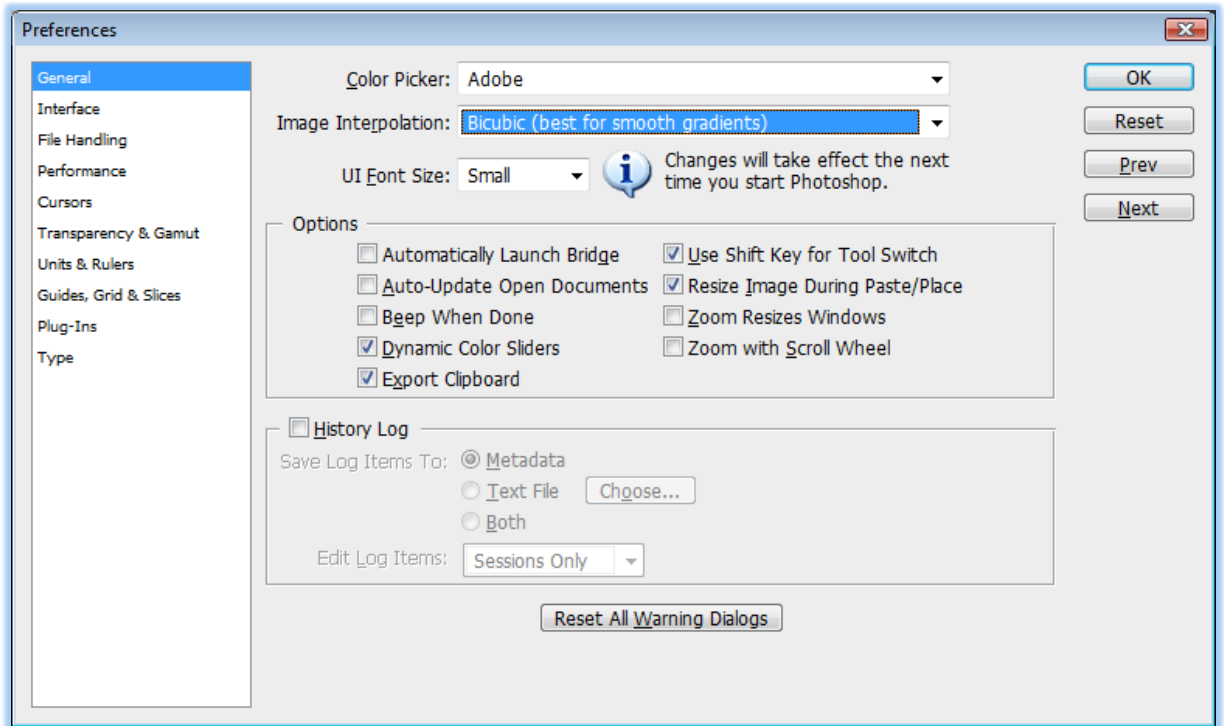
Note that the default resample option for the crop is the default sampling method defined in the preferences (see next section).



## 12 Resize Defaults

### 12.1 Overview

You set the default image interpolation in the preferences dialog.



## 13 Improve Your Printing – Set-up

### 13.1 Overview

There are a number of steps you can take to improve your printed images, as described in the next few sections.

### 13.2 Print a Reference Image

Use your normal print process to print a reference image. This must be printed “as-is”, and not rescaled, or altered in any way. Compare your print to one produced on a known good system and see if the print matches in colour, tone, sharpness, etc. If it doesn’t, you have printing issues to resolve. If the print matches but your own images are poor (bad colour, tones, etc.), the printer is probably OK, and it is your photography or post-processing that has issues.

If your monitor is not calibrated you cannot check your reference print against it. Any attempt to compare with the screen should be in daylight (not direct sunlight), and with the print to one side, not illuminated behind from the screen.

### 13.3 Calibrate your Monitor

Without a calibrated monitor, there is no way you can assess an image, or a printed result. Monitors NEVER come set up for photographic work. Ensure your PC/Monitor combination is calibrated before proceeding.

### 13.4 Artistic License

Most of the tips and tricks here assume you just want a good looking straight shot. For artistic purposes, you might want to do something outside of these “safe” parameters.

## 14 Improve Your Printing – Camera

### 14.1 GIGO

The old adage of Garbage In – Garbage Out applies here. Take poor pictures, at low resolution, be cavalier with your adjustments in Photoshop, and even the very best printer is unlikely to flatter you.

### 14.2 Camera

A good starting image is better than a poor one – Photoshop is not a substitute for recovering poor pictures, only enhancing good ones.

A good quality digital camera counts. Megapixels matter less than the size of the photo-sites. A 6 MPixel camera can outperform a 12 MPixel camera if it has a better sensor. Most common makes of dSLR such as Canon 400D, 40D, 5D, etc., at 10MPixels or more are fine. Don't get hung up about absolute pixel size. A 5MPixel bridge camera producing a JPEG can print a decent image at A3.

If you go for a full frame sensor, it will show up poor quality lenses.

### 14.3 Camera Set-up

Generally, use the lowest ISO you can – but check your camera! Canon do offer an ISO 50, but this is a software trick and might not perform as well in high contrast situations – great for the studio though.

Some cameras have as little noise at ISO 200 as ISO 100. Above ISO 400, expect noise.

Shoot RAW if you can. JPEG uses only 8 bit, and RAW uses 12 (14 bit for top cameras). You will achieve better images at larger size.

Get your images colourful and sharp using the camera and not Photoshop. The less you have to do in Photoshop the better. Don't blow out highlights or under-expose too much, otherwise dark areas will contain a lot of colour noise. If your subject is high contrast, use neutral density filters or multiple exposures.

Use a tripod when you can. If you must hand hold, use the fastest shutter speed you can. Having said that, a 100mm image stabilised lens can produce a sharp image at  $\frac{1}{4}$  of a second if you are lucky.

### 14.4 Lenses

A prime (non-zoom) lens is likely to give you more contrast in your images than a zoom lens. You trade this for the flexibility of zoom lenses.

The best lenses (e.g. Canon "L" series) will produce the best results. Gear is expensive for a reason.

A lens is at its sharpest around f8. Wide open or stopped down below f11 is not as sharp.

### 14.5 You

Be realistic. Ditch poor images and select your keepers on the basis of good exposure (as well as composition etc.).

## 15 Improve Your Printing – Post Process

### 15.1 Work in 16 bit

Photoshop CS2/3 and Elements 6 let you work on images in 16 bit, which will allow you more resolution during post process work. Elements 5 only allows 8 bit working for most processing.

### 15.2 Camera RAW

When you open a RAW image, the Camera RAW application opens. You can make small adjustments here before opening the image fully in Photoshop, but don't try and make big adjustments as you might lose contrast. Don't sharpen much at this point – a little to overcome the lens and camera capture limitations is OK.

### 15.3 Beware of Noise

If your image was not exposed correctly and has noise, try using the [Filter],[Noise] dialog to reduce it. That said you might want noise as an artistic element! The noise filter works well on sky, and on dark areas if you select these out first into another layer.

### 15.4 Levels

If your image needs an initial use of levels, then doing so will increase contrast and subsequent operations will produce better-looking results in most cases. If you have a well-exposed image then don't fret about using levels.

### 15.5 Split the Image

You can often achieve better results if you select out different parts of the image and apply levels separately. A global levelling on the whole of the image is fine to maximise contrast, but is bit of a big stick at fine adjustment.

Colour adjustment is usually better corrected over the whole image, picking out objects for individual attention.

### 15.6 Hue and Saturation

Be careful how you push the colours, otherwise your image won't look natural. There are some more complex colouring techniques you can use, which utilise two layers to perform the adjustment. These can be less aggressive than the standard dialog.

### 15.7 Highlight and Shadow Dialog

Can be a lifesaver, but use with care as pushing it can ruin an image.

### 15.8 Multiple Layers and Layer Mixing

Try darkening light areas by masking out into another layer and using [multiply] to mix the layers together. To lighten dark areas, try using the [screen] option for mixing. In both cases, use the opacity slider for fine adjustment.

### 15.9 Curves

Use curves when you have to, often near the end of processing.

### 15.10 Sharpening

Don't over-sharpen - Judge sharpening on the print rather than the screen. Don't sharpen areas that do not need it (often the sky, which can do with a slight blur sometimes).

In Unsharp mask, avoid large Radiuses, especially on higher contrast subject with small dark elements against lighter ones.

### 15.11 Files and Quality

For maximum quality, save files as native Photoshop (PSD) files and keep a copy of your final file.

## 16 Improve Your Printing – Printer

### 16.1 Types

There are a few different types of printers using different inks. Read reviews to make your choice – clearly you want quality, and if you produce few prints, consumable (the most expensive part of printing) is less of an issue.

If you want to dispense with a printer and print online, get the paper supplier to calibrate his print process against your set-up. They should provide a profile for you to produce images for them to print with accuracy.

### 16.2 Printer Set-up

To start with, use the manufacturers recommended paper and inks. You should get a good print that is close to your screen image from the standard drivers. Use the best quality mode that the printer offers. It might mean waiting 90 minutes for an A3 print, but results are worth it.

If you want to go with third party inks or flow systems, be aware that quality is likely to be lower than the manufacturers offering.

Make sure you have the latest printer driver, not just the one that came with the printer.

If you use different paper and/or inks than the manufacturers, see if they supply ICM profiles. Use these as a first step when printing.

As a last resort, buy or borrow a print profiler (colourimeter) to precisely match the ink and paper. Also works for greyscale and Black and White too.

### 16.3 Printing

Handle paper by the edges – leaving a border helps. Allow prints to dry for 24 hours in a clean room before mounting.