

Preparing simple pictures for children's multimedia

This text was written by Conrad Taylor in May 1999, for a guide for teachers and schoolchildren using Fabula multimedia software to make interactive storybooks (see www.fabula-eu.org). It has been lightly revised in 2002 to be of more general use: the advice here is relevant for a range of multimedia authoring situations.

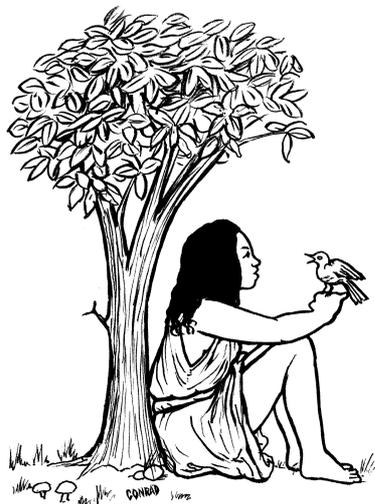
Where do pictures come from?

Scanned drawings

One way in which a group of children could illustrate a multimedia story is to make drawings or paintings on paper, and then use a desktop scanner to bring these pictures into the computer. It may also be a good idea to give the students sheets of paper that have been marked with guidelines so that the resulting pictures will have the correct proportions to fit the picture boxes in the program.

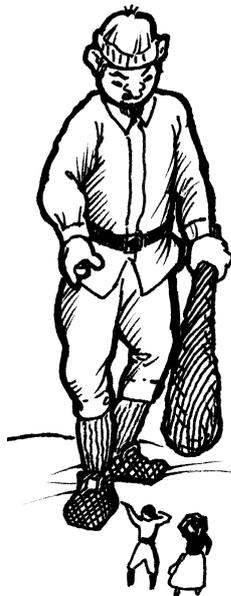
This does not mean that you have to make your drawings at the same size at which they will appear on screen. In fact, most professional cartoonists and illustrators make their drawings larger than they will appear finally, because then any mistakes they make will get smaller too!

Pictures can be wider than they are tall ('landscape'), or taller than they are wide ('portrait'). For Fabula storybooks, no picture should be too extreme in its proportions because it would not fit into the Fabula picture frame properly. As an approximate guide, the proportions of your pictures should be similar to standard photographic prints. Below are some good examples:



These two pictures are the right sort of shape to fit into a Fabula page. The one on the left is a little taller than it is wide, and the one on the right is a little wider than it is tall.

The picture of the dragon chasing the knight is not such a good shape for a Fabula storybook page: it is too wide. And the picture of the giant is too tall. But if you added more landscape, the shape could be made more suitable.



Maybe you will find pictures in books or magazines that you would like to use in a multimedia storybook. But please remember that these pictures are protected by copyright law, which means that in most cases you are supposed to ask the publisher of the book for permission to use pictures in this way. There are some companies which publish books of 'royalty-free' images, which means that by buying the book you are given permission to copy the pictures in the book for your own publishing projects.

It is also possible to cut pictures out of magazines or catalogues and paste them together to make new images: these are called 'collages'. Just make sure that the glue is dry before you put your collage in the scanner!

Using photographs

Some kinds of story can best be illustrated using photographs: for instance, if your class has been on a day-trip or visit, you could make a storybook about the what happened during the day. Remember when you are planning your next trip to bring a camera – and to check the film and batteries.

You can also illustrate a made-up story with photographs. It's like putting on a play: you organise a team to dress up as the characters in the story, and then they stand in poses that illustrate each page of your intended story (that means that you will have to have decided on the text already). Each pose is carefully photographed, and when the prints are developed you should have all the pictures you need.



Using a digital camera on a copy-stand to photograph Fabula scenes using cardboard puppets.

It's best to make sure that you have plenty of light but with no strong shadows to get the best quality photographs. And you might want to put the camera on a tripod for steadiness – although that might make it more difficult to use unusual camera angles creatively.

Here's another idea: you can use puppets or dolls to act out your story on a miniature stage which you have created on a table-top, and photograph them. Or, if you have a copy-stand so that you can mount a camera pointing down at a flat surface, you can act out a story with flat cardboard puppets against a painted background scene.

Here's another tip. The way most cameras are designed, they feel most comfortable 'the right way up' so that you are taking a picture that is wider than it is tall. But sometimes you will get a better picture if you turn the camera sideways so that the picture is taller than it is wide. It all depends on the subject matter.

Digital cameras: Instead of using an ordinary film camera and scanning the prints, you could use a digital camera instead. This way you will get your pictures faster and cheaper, and you won't need to use a scanner. Also, in many models of digital camera you can check the results instantly using a small built-in screen or a video cable connection to a television, so if the picture is disappointing in some way you can try again immediately.

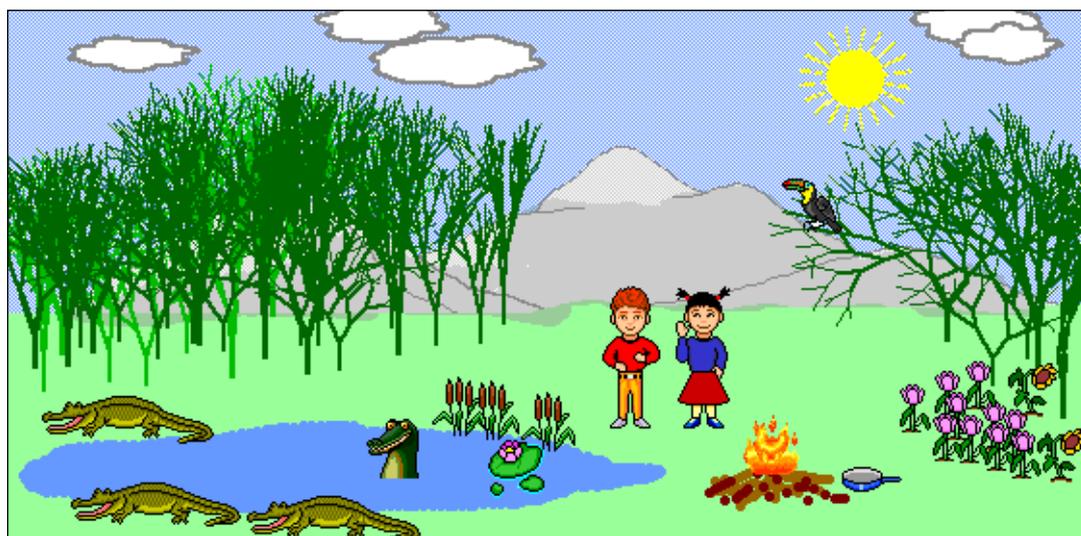
Painting with software

Finally, you could make pictures for multimedia stories in the computer itself, by using computer graphics software that simulates painting. There are a number of programs available for this purpose on most popular kinds of computer, but it has to be said that most of them are designed for use by computer graphics artists and are quite complicated.

However, note that you are almost certainly going to need to acquire and learn to use *some* graphics software in order to complete your project. This is because the Fabula software suite itself – like other multimedia packages – does not provide tools to clean up your images, to re-size and crop them to fit the Fabula pages, and to save them into an appropriate file format. The rest of this chapter explains these essential steps.

For creating original art in the computer, you may be interested in child-friendly painting programs. Brøderbund's *Kid Pix*, for example, is great fun to use. In addition to the normal painting tools such as paintbrushes and pencils, and paint buckets for filling larger areas with colours and patterns, *Kid Pix* also has 'rubber stamps' so that pictures can be built up with colourful pre-defined elements (see example below).

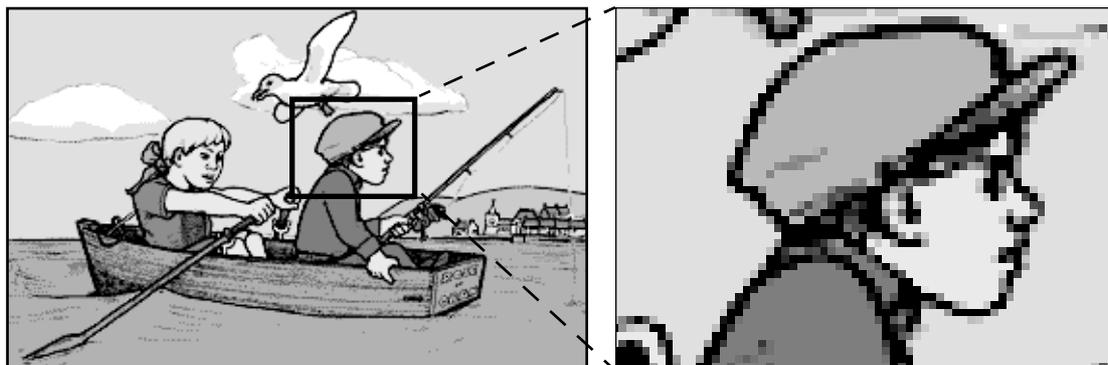
Brøderbund's painting program for children, *Kid Pix*, was used to create this scene. Magic brushes were used for the mountain, sun and clouds and fractal trees; rubber stamp tools were used to add most of the other elements. No drawing skills required!



Understanding pixels

If you take a very close look at a colour computer monitor with a magnifying glass, while it is switched on, you will see a repeated pattern of red, green and blue dots that are illuminated from within the tube. Each group of three dots together makes up a single **screen pixel**. The computer can create the illusion of many different colours by varying the strength of red and green and blue inside each pixel.

When you capture a picture using a scanner, or take a picture with a digital camera, the result is also a pattern of cells – rather like a mosaic floor made up of tiny colourful squares. These squares are called **image pixels**, and you can see them more clearly when a scanned image is magnified, as below:



You could have an image made up of pure black and pure white pixels only, rather like a fax message; or only grey pixels, as in the picture above. But most of the time you will want to use very colourful images in your Fabula storybooks.

How many pixels do you need?

In Fabula software, this question is the same as asking, ‘How big will our picture be?’ In Fabula, a picture always displays so that **each image pixel occupies one screen pixel**. This is similar in most multimedia programs and the Web – but different from in a desktop publishing program, where you can enlarge and reduce the size of images on a page.

It is very likely that when you first scan your pictures to put into Fabula, or retrieve them from a digital camera, you will have far too many pixels in your image and it will not fit onto a multimedia storybook page. For example, many digital cameras take a picture that is 1280 pixels wide × 1024 pixels high, which is approximately nine times more than can fit into the Fabula picture frame. (A Fabula picture frame is 320 × 475 pixels.)

To prepare the image to fit into a Fabula picture frame, you will need to process it using **image editing software**. The following sections are written to help you through this process.

Overview: the role of image editing software

1: Where do you get it?

Fabula does not include image-editing capabilities. As in other multimedia production programs, you need to look elsewhere for the software which prepares sounds and pictures for use in your project.

- Firstly, you will have to acquire an image editing program. Some of these are commercial and quite expensive, others are distributed on the 'shareware' principle and require the payment of a modest licensing fee. There is even one extremely good program (GIMP) which is free!
- Secondly, since we don't know what image editing program you will be using, we can't guarantee to take you 'step by step' through the processes, and will have to describe them in rather general terms. However, we will use one program as an example: Adobe Photoshop. This is a commercial program used by image editing professionals.

2: What are we going to do with it?

These are the things which you might typically do in image editing software to get an image ready for use in a Fabula storybook:

- a. You may need to **run your scanner** or **acquire the image** from a digital camera from within the image editing software. Also, once you have acquired the image you may need to **rotate** it the right way up.
- b. You could use retouching tools in the software to **clean up** an image – removing accidental spots of paint, for example – and you could **adjust** the balance of colours, brightness and contrast.
- c. Most importantly, you will **crop** the image (removing bits around the edges which you don't want), and also **resize/resample** the image so that the number of pixels is reduced to a size that will fit the image frame on a Fabula page.
- d. You may wish to **sharpen** the image so that it looks more crisp.
- e. You will need to **choose a file format** from amongst the formats supported by your multimedia authoring software, and there are some sub-choices also to be made for each of these.
- f. Finally, you will need to **save** the image in that file format, with a name that will allow the image to be picked up and imported by your multimedia authoring software.

Step by step: a typical image

To illustrate the process, we shall take an example: a pencil drawing which is to become one picture in a story. It's not in colour, but otherwise it is a fairly typical case.

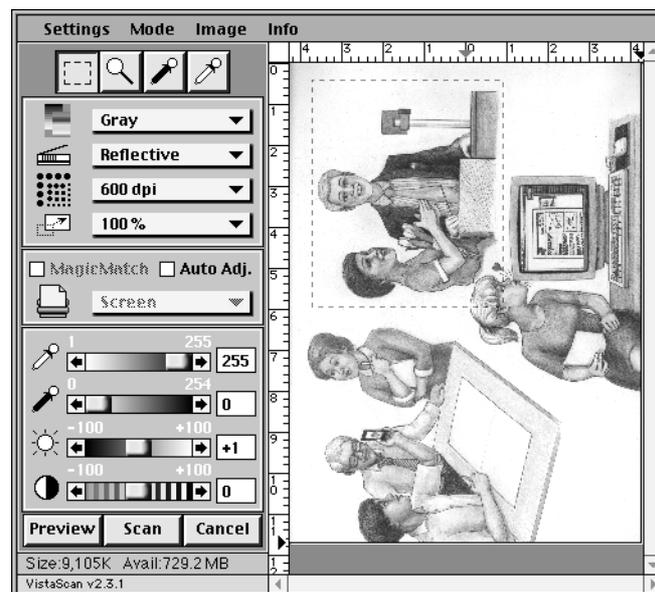
Scanning

The first stage is to scan the image. Here we are using VistaScan scanning software, for the Umax range of scanners. The software has been written as a 'plug-in' for Adobe Photoshop, which means that we can run the scanning software from inside Photoshop; the result is an unsaved Photoshop file.

Your scanning software may look a little different from this, but basically all scanning programs have a similar job to do and tend to look quite similar. (For details of the features of your scanning software, you should read the manual which came with it.)

Note: we have chosen to scan this image at the natural resolution of the scanner, which is 600 pixels per inch. This gives a very detailed scan with many times more pixels than we want to have in the final Fabula image. As a result, the file size will be enormous: over 8 megabytes.

However, this does result in a very high quality original. Later we will reduce the number of pixels, and save the result as a new file. We'll keep the high-resolution original just in case we change our mind about cropping: that way we won't have to scan the image again.



All scanning software lets you scan a fast preview image first, so that you can make a selection of only part of the entire scanning area. In the case above, there were three drawings on a wide sheet of card, so after we have made our scan we need to use the image editing software to rotate the image the right way round. (If we wanted to, we could also flip it over so that the lady would be standing on the right.)

If your software for scanning or retrieving images from a digital camera is a 'stand-alone' program, you will need to save the scans to your hard disk, start the image editing software and open the files again from inside it.

We are now ready to inspect the image and clean it up if necessary.



SPOT THE DIFFERENCES — A scanned pencil drawing before and after adjustment in an image editing program.

Cleaning up the image

You may be lucky and have an image which looks perfect. In this case study, the background was smudged with pencil dust and part of another drawing intruded into the frame at bottom left.

At the top of this page you can see a ‘before and after’ showing an example of the sort of improvements which can be made to a picture at this stage:

- The entire background area was carefully selected – including the bit of the other picture at bottom right – and filled with pure white. (Alternatively, it could have been filled with some other shade or colour.)
- A ‘cloning’ tool was used to patch up some spots on the drawings, and also to extend the lady’s dress.
- An ‘airbrush’ tool was used to soften the edges of the characters’ hair; the lady even had her hair slightly remodelled.
- Some slight adjustment was made to the brightness and contrast of the picture, making it easier to see detail in the shadows.
- Also, the drawing looked a bit tall and thin, so we reduced the height while keeping the width the same.

Most image editing programs will give you the facility to make these sorts of changes. Often there is a great similarity between the tools in different image editing programs, but you will still need to study your own choice of software to know exactly how it works.

Cropping and resampling the image

What follows next is probably the most important stage in the process, when we get our image ready to fit into the image frame of a storybook page. The size of the Fabula image frame is 320 pixels by 465 pixels, oriented either horizontally or vertically.

Other multimedia programs give more flexibility in the size of images used. In this case it is a good idea to do some rough sketches and calculations to figure out how big in pixels your image should finally be and how it fits into the overall frame or 'stage' that shows on screen. If you do your rough sketch on gridded paper, and for example each square of the grid represents ten pixels square, it is easy to figure out the final on-screen pixel dimensions you need to fit the image into.

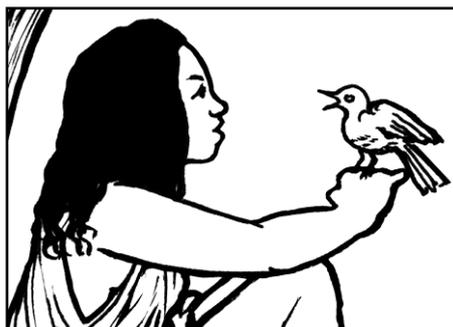
To achieve this fit, you can either **crop** the image, which cuts pixels away from the sides of the picture and removes their image content; or you can **resample** the image, so that whole picture remains but is presented on a coarser grid made up of fewer pixels; or you can use a combination of these. We hope that the image below helps you to understand the difference:



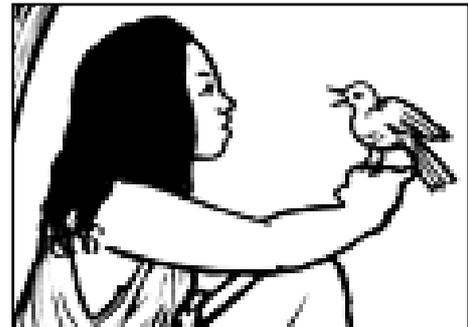
Original image: 506 × 602 pixels



Resampled image: 127 × 151 pixels



Cropped image: 469 × 338 pixels



Cropped & resampled: 118 × 85 pixels

Crop and resample: which one first?

In most image editing applications, you will need to crop and resample your image as two separate operations. Much of the time it probably makes sense to do some cropping first, and then change the number of pixels so that the picture will fit inside the frame.

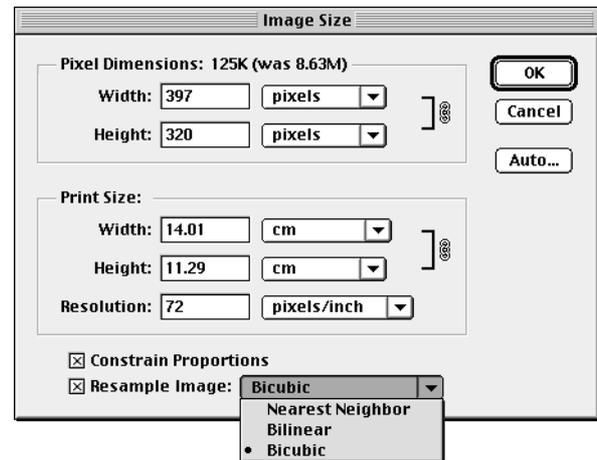


In Photoshop, cropping is something that you do to part of an image, so it requires a tool to select the part you want to keep. After you have made your selection you can adjust the area, but when you press the **Enter** key everything outside the selected area is cut away.

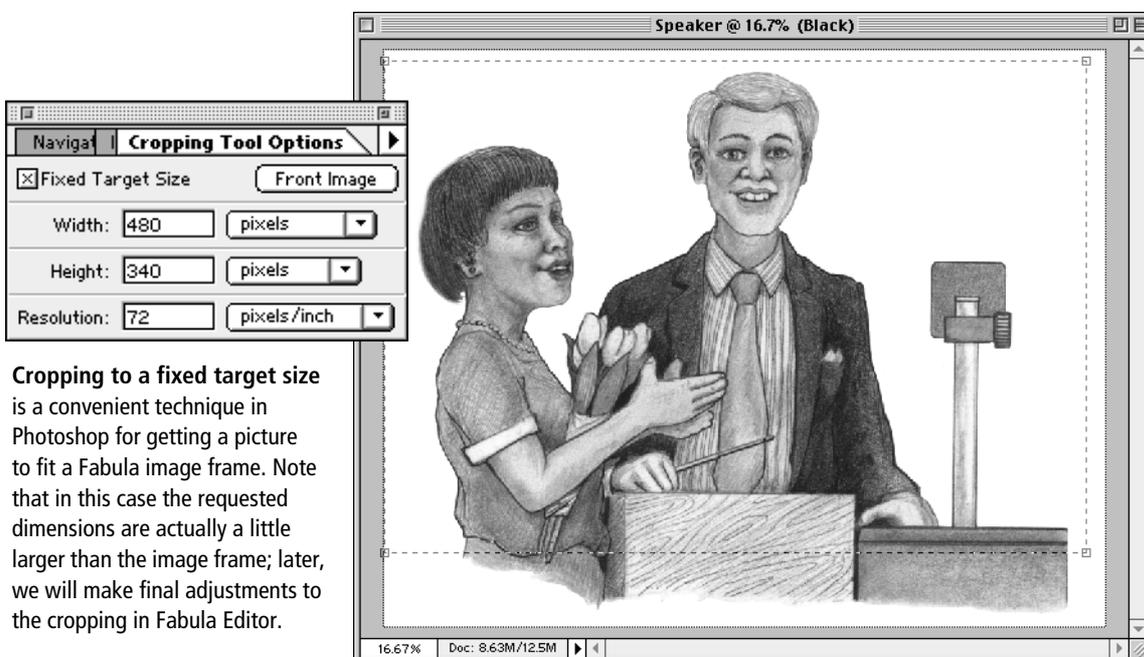
However, resampling is something that you do to the whole image using the **Image Size** dialogue box, shown right.

You should make sure that the new width and height which you specify in pixels in the uppermost zone of this box makes a good fit with the Fabula image frame.

Note that Photoshop has three methods of resampling images: for Fabula, use the **Bicubic** method for the best results.



However, if you are using Photoshop, you can crop and resample in one convenient operation. Double-click on the **Cropping Tool** button in the toolbox. The options for that tool display on screen in a palette or toolbar, and you can choose to crop to a 'fixed target size' (define this in pixels e.g. '570px'). After you have drawn the selection frame on the image, it can be moved and resized, but the proportions remain true to the required target size – and when you press Enter, the image is also resampled as it is cropped.

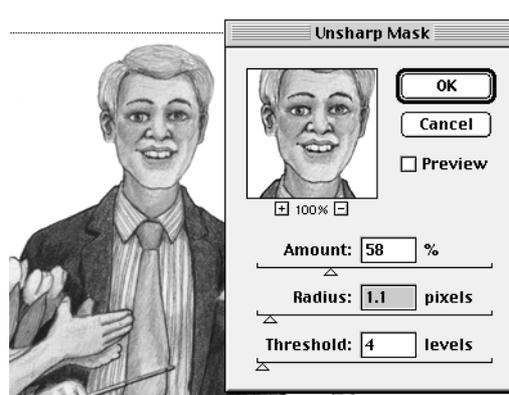


Cropping to a fixed target size is a convenient technique in Photoshop for getting a picture to fit a Fabula image frame. Note that in this case the requested dimensions are actually a little larger than the image frame; later, we will make final adjustments to the cropping in Fabula Editor.

Sharpening the picture

Often when you have resampled an image, it loses some of its original sharpness, and you may wish to do something about that. Image editing programs can improve the apparent sharpness of a picture by increasing the amount of contrast difference between pixels that sit next to each other, especially if there is already some strong difference (as there often is along the edges of objects in a picture).

This facility is called different things in different programs: in Photoshop there are several sharpening filters and the best one is confusingly called 'Unsharp Mask'. Below you can see it being applied to our example image (note how the preview lets you see what the effect of the filter will be.)



Photoshop 'Unsharp Mask'

The Amount setting varies the strength of the sharpening effect.

The Radius setting varies how far back from an 'edge' the effect of sharpening will be applied. This is usually best set very low.

The Threshold setting tells Photoshop to ignore differences in brightness between pixels next to each other if it is less than this level.

Now that we have made all these adjustments, we are ready to save the image. But which file format shall we use?

About file formats

Computers are not good at solving ill-defined problems. When you want them to read in a picture file from your disk, the information in that file has to be presented according to a predefined set of rules. This is even more important when a picture is created by one program (such as one that runs a digital camera), edited in a second program (such as Photoshop), and finally viewed in another (such as Fabula or another multimedia program).

To solve these problems, committees of experts have got together to define the rules for storing the data in image files. The agreed rules are written down as a 'file format specification'. So long as people who write computer programs follow the same rules, images can be exchanged between their programs.

There are dozens and dozens of image file formats, and you might wonder why the world needs so many. The brief answer is that the people who devise them have been trying to produce a particular mix of benefits: for instance to allow the use of millions of colours, or to let some parts of an image be transparent so that the background shows through, or to make the files as small as possible through compression.

Formats supported by Fabula

Three image file formats are supported by Fabula:

- Joint Photographic Experts Group format (**JPEG**)
- CompuServe Graphic Image Format (**GIF**)
- Portable Network Graphics format (**PNG**)

The first two formats have been very common on the World Wide Web for a number of years, and since Fabula Reader software is in essence a modified Web browser it is no surprise that they work with Fabula too. PNG can be seen as an improvement on GIF, but one that is not yet been well established for Web use. Some image editing programs cannot yet make PNG files.

These three file formats have these features in common:

- they all use compression techniques so that the files do not take up much storage and can transfer quickly across networks; and
- they work on many different kinds of computer e.g. Windows and Macintosh.

JPEG format: the good news...

This file format was devised by experts in photography looking for the best way to compress digitised photographs so that they could be transmitted electronically. Their main aim was to help the newspaper industry, but JPEG has become a very popular file format for the World Wide Web, and is the format in which most digital cameras store their images internally.

JPEG has two big advantages for Fabula authors:

- the format supports what is known as ‘24-bit colour’ or ‘truecolour’, an enormous palette of 16,707,216 different colours which preserves the subtlety of digital photography;
- JPEG files are compressed by a very efficient method of encoding that saves a lot of disk space and helps the files to transfer very quickly over long-distance networks such as the Internet.

We recommend JPEG for Fabula pictures which are photographs, or for paintings and drawings without sharp edge details. Probably JPEG should be your first choice of file format, and you should only choose something different if you notice the kind of problems we are about to describe.

...and the bad news

The one problem with JPEG is that its compression technique is not lossless; when an image is saved as JPEG, the true values are taken away and replaced by an ‘encoding’ – and when the image is opened again for display it is not possible to retrieve the original values, but only an approximation to them.

We will spare you the technical details of *why*, but just tell you what to watch out for: in areas where there should be smooth changes of colour, patches or blocks of 8×8 pixels appear like patchwork; and where there are very sharp and high contrast details, as there often are in illustrations, the details get shattered into loose pixels, as shown below:

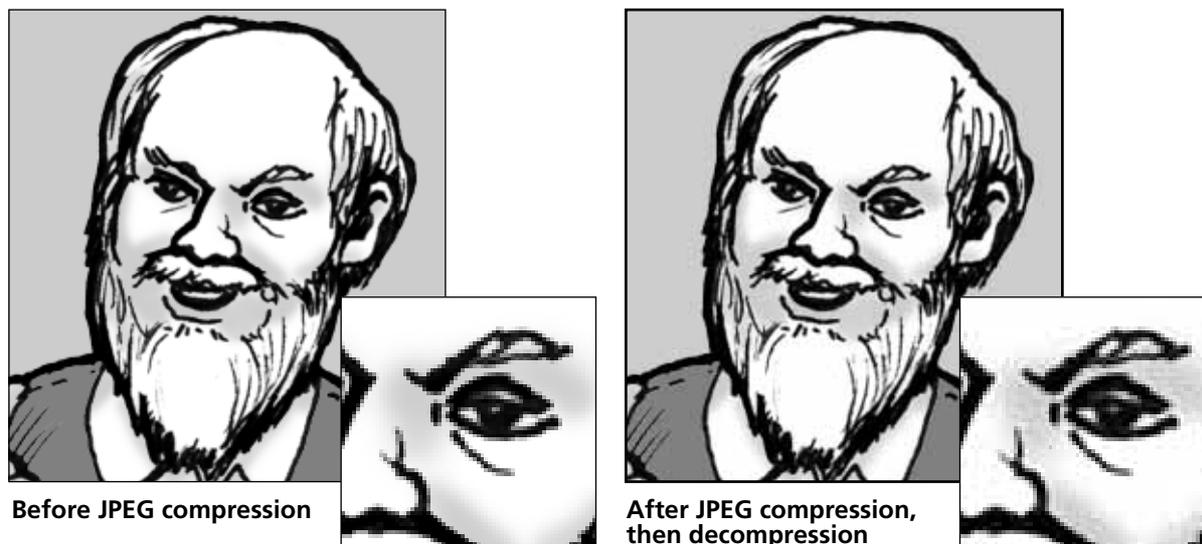
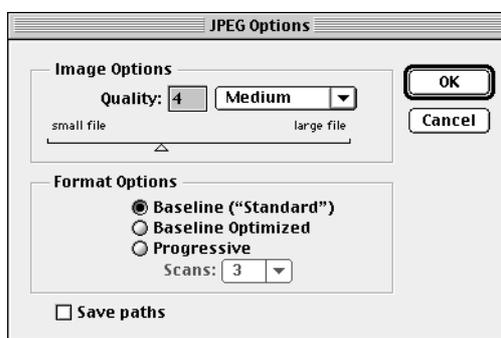


Image editing programs which allow you to save files in the JPEG format usually let you set the degree of compression on a slider control or a pop-up menu of choices (see below for a Photoshop example).



JPEG options: this dialogue box appears when you start to save an image as a JPEG from Photoshop.

Setting the slider far to the right results in reasonable compression with minimal loss of image quality.

Moving the slider to the left improves compression, but risks damaging the image quality.

The less compression you request, the less damage will be done to your images – and I have to admit that to make sure that the damage in the image at the top of the page would show up well in print, I applied an unusually strong degree of JPEG compression!

You may find that the results you get by saving as JPEG are quite acceptable, If not, you may wish to consider one of the alternatives...

The GIF format

GIF was defined by the CompuServe on-line service in 1987, which makes it the oldest of the file formats we are considering here. It was also the earliest image file format to be used on the World Wide Web and is still very widely used for e.g. buttons, logos and other simple graphics requiring few colours.

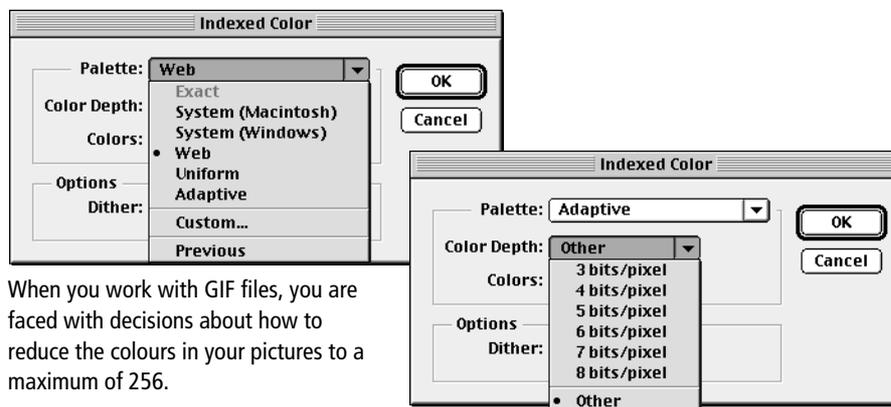
The GIF format has some special characteristics which JPEG cannot match, and because Fabula is a modified Web browser these characteristics could be exploited by adventurous Fabula authors:

- Multiple images can be compiled into a single GIF file which then runs as a simple animation. For example you could make a picture of a farmyard in which a couple of the chickens are pecking at the ground. (Note that you need to find special GIF animation software for this.)
- GIF files can be defined as being transparent in parts, so that the background shows through. This could give extra flexibility in placing pictures within the frame on storybook pages.

GIF is a file format that is well suited to images with sharp edge details, because its compression scheme is completely lossless: none of the messed up edge details that you can get with JPEG files. It's a compression method that works well with large areas of flat colour, however, so the more detail there is in a picture, the less good a job GIF will make of compressing it.

The main problem with GIF is that it is limited to the display of a limited palette of 256 colours in any single image. This can be seen as a sign of its age, since in the late 1980s very few computers could display more than 256 colours; most colour computers could only manage 16! From a practical point of view this limitation causes two kinds of problems...

- **The hassle of managing Indexed Colour.** When you have scanned a colour image, it is encoded as a Red-Green-Blue (RGB) truecolour image, with a possible range of 16,777,216 colours. Before you will be allowed to save a file in GIF format, you will have to deal with the complexity of converting from RGB colour to one the Indexed Colour palettes, as the views of the relevant Photoshop dialogue box below illustrates.¹



When you work with GIF files, you are faced with decisions about how to reduce the colours in your pictures to a maximum of 256.

¹ This was written before the versions of Photoshop that have the 'Save for Web' option under the File menu. This works in a different way to create an Indexed Colour palette for GIF and PNG, gives an instant preview of how the resulting image will look, and is the best way to move out to a GIF-format image these days. However, I decided to let the above description stand: please read Photoshop documentation to find out how to use 'Save for Web'.

- **A limited range of colour expression.** It is possible to produce some very effective colour illustrations as GIF files, especially if most of the work in making them is done in a computer illustration program, and careful choice is made of colours. However, if you are starting with a scanned image rich in colours, converting to an indexed colour palette may often be a disappointment.

The PNG format

The Public Network Graphics format was developed by Thomas Boutell and others as a replacement for (and improvement on) the Compuserve GIF format. However, its adoption has been slow: few Web browsers support it, and your image editing program may not even let you create PNG files.

However, if you find that you do have the facility to create PNG files (it's pronounced 'ping', by the way), it is very much worth considering for the following reasons:

- Like JPEG, it can support truecolour images with millions of colours, thus avoiding the key limitation of GIF.
- Like GIF, it uses a compression scheme which is lossless, so there is no risk of the kind of quality loss that can occur to detail in JPEG files.
- Also like GIF, PNG files can have areas defined as transparent. It's a more sophisticated form of transparency too, as a pixel in a GIF file is either fully opaque or fully transparent, whereas pixels in PNG can have graduated degrees of transparency. (However, your image editing program may not support this feature.)

In principle, the PNG format would seem to be an ideal file format for Fabula authors. The two problems with it are that its compression is not as effective as that of JPEG so the resulting files are larger and slower to load; and it may be more difficult to find software to create PNG image files with.

(Note that you can also use PNG images with Macromedia Director and Macromedia Flash.)

Post-Fabula Postscript

The initial concept for the Fabula project was to create a custom computer application, where good design would be guaranteed by built-in templates, and usability enhanced by a system of compact menus and guided editing processes. I left Fabula after a year because this aim was abandoned in favour of a solution built on top of Netscape and Microsoft Office products, which guaranteed neither ease of use nor good design. However, my advice about preparing images remains valid, not only for Fabula storybooks but for other multimedia applications as well.

CONRAD TAYLOR
May 2002