Hand-drawn art
– making it digital, making it colourful

Conrad Taylor explains how to make the most of old-style drawings and cartoons in a digital environment.

Last October in this publication (*Line thickness – a means of expression*), I described various tricks for how to produce more expressive drawings, with variable thickness of lines, using computer illustration software.

However, the lines that an artist can produce with pens, brushes and other traditional drawing tools are much more spontaneous and lively! Cartoonists traditionally drew their high-contrast line images using black ink flowing from flexible steel nibs or springy brushes. (Kolinsky sable brushes are my favourite…) I have also found several brands of fibre-tipped pen that are useful tools for cartooning and informal illustration.

For decades, print publishers favoured high-contrast black and white drawings because they were so simple to reproduce in the pre-digital era. If they were the right size, they could be glued directly onto the 'camera ready copy' and photographed to make a printing plate for the press; they also photocopied well. Most illustrators created drawings larger than they were needed, and a sharp photographic copy called a 'bromide' was made to glue onto the artwork.

These days, line art has to be scanned to prepare it for our all-digital workflows. Of course, a scanned image can be manipulated afterwards. No longer do I keep white paint for corrections; I clean up the errors in my drawings using Photoshop.

Line art requires the highest resolution

Some kinds of line image are truly challenging to scan, if we want to get the very best out of them.

Compare any greyscale photograph with a wood engraving like the one shown left. A photograph will be rendered in print through a pattern of halftone dots – generated within the digital workflow. All we need to capture is just enough detail to allow that halftone pattern to be computed. Typically, 360 pixels per inch resolution is adequate for a printing process that uses a halftone screen of 180 lines per inch, i.e. most magazines.

In comparison, the shading patterns that we want to reproduce in the engraving are those that were created by the craftsman, working away at the woodblock with his razor-sharp engraving tools. We should reproduce this detail 'line-for-line' as much as possible – or maybe, as we will be scanning the image, I should say 'dot-for-dot'.

Suppose this image will be used same-size, printed from a litho plate imaged at 3,000 dots per inch. Ideally, then, we should scan that image at 3,000 dots per inch too, to get the maximum practical fidelity to the image – if our scanner is capable of that resolution. (In fact, to keep file sizes reasonable, the image is reproduced here at 1,200 dots per inch.)

Fig. 1 – wood engraving
In this charming wood-engraving from the 1920s, produced as advertising art, the shading lines cut by the artist not only give tonality, but also texture and shape information in a way that conventional halftone shading cannot. This image is shown here as a 1,200 dpi bit-map.
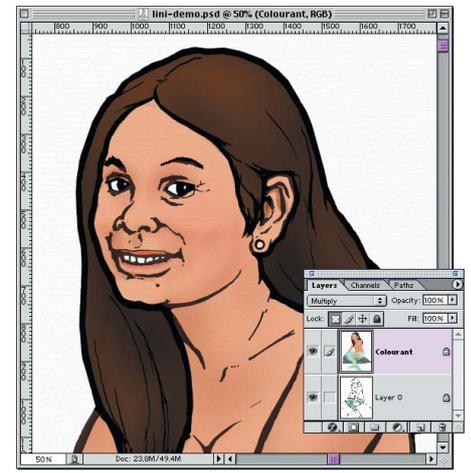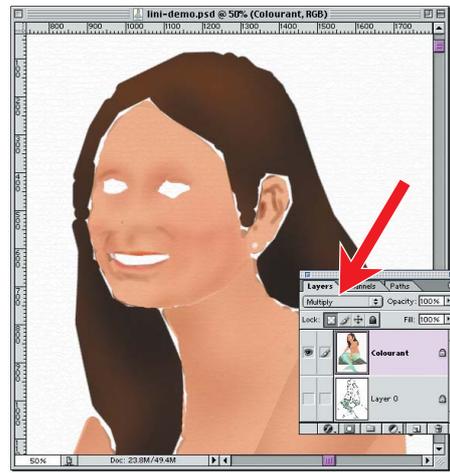
Recipe for scanning line images for excellence in print

This is how I processed the old engraved image on the opposite page:

- I scanned it at the full true optical resolution of the scanner – as a greyscale image. The file size was huge!

- Because it was greyscale, the image could be re-sized using Photoshop **Image Size** controls. I made the final size exactly as it will be on the page, and set the resolution high (1,200 dpi, to be exact).

- I used Photoshop's **Levels** and **Curves** controls to bring the ink colour to a full black and the paper tint to complete white. Manipulating the shape of the tonal adjustment curve also helped me sharpen the lines and control how thick they appear.

- I converted the image to a Bitmap (pure black-and-white image – one bit of data per pixel). I did this by applying the **Threshold** command (which let me choose the level of grey at which the split between black and white was effected), then converted to a bitmap afterwards.

But if you want to scan a line image for presentation on a computer or TV screen, the formula is very different (see box at foot of page 3).

The mermaid's secret

I shall now explain how to take your scanned black-and-white image, and lay colour on it – as if you were filling in a child's colouring book.

Let me introduce my mermaid. This is a caricature of Lini, a young lady from an island off the coast of Sumatra, who married the son of an Indian friend of mine. The young man visited her island to learn scuba-diving – and made a bigger catch than he'd expected! I was asked to video their wedding celebration, and to introduce my edited video and DVD of the event I made a 'fifties-style title sequence – including this image.

Video title art is like art for the Web (or PowerPoint): the image is seen on a continuous-tone colour device. For PAL-format television, as in most of Europe, the screen is 720 x 576 pixels. Because I intended my sequence to zoom in on Lini's face, I created the image at a much higher resolution: I then used *Adobe After Effects* to pan across the images and zoom in close.

In Figures 2a to 2c above you can see how I used Photoshop layers to process my original brush-and-ink drawing into a computer-colourised one. I started with a greyscale scan of the brush-and-ink drawing, cleaned it up, then switched to a colour mode. (For Web, presentation and video work, choose RGB;

Figs. 2a, 2b, 2c above

(2a, left) – a close-up of the image, showing the line layer only. This had been scanned from a brush-and-ink drawing.

(2b, centre) – The colour layer viewed on its own. Note that the blend mode has been set to 'Multiply' (see red arrow)

(2c, right) – the combined effect of the two layers.

Fig. 3 – composite print image

Instead of blending the two layers into one, as I did for my video title screen, here I have converted the image into a 300 pixels/inch colour layer and a 1,200 pixels/inch black bitmap layer, assembled into a composite image in Adobe Illustrator – as described on the following pages.
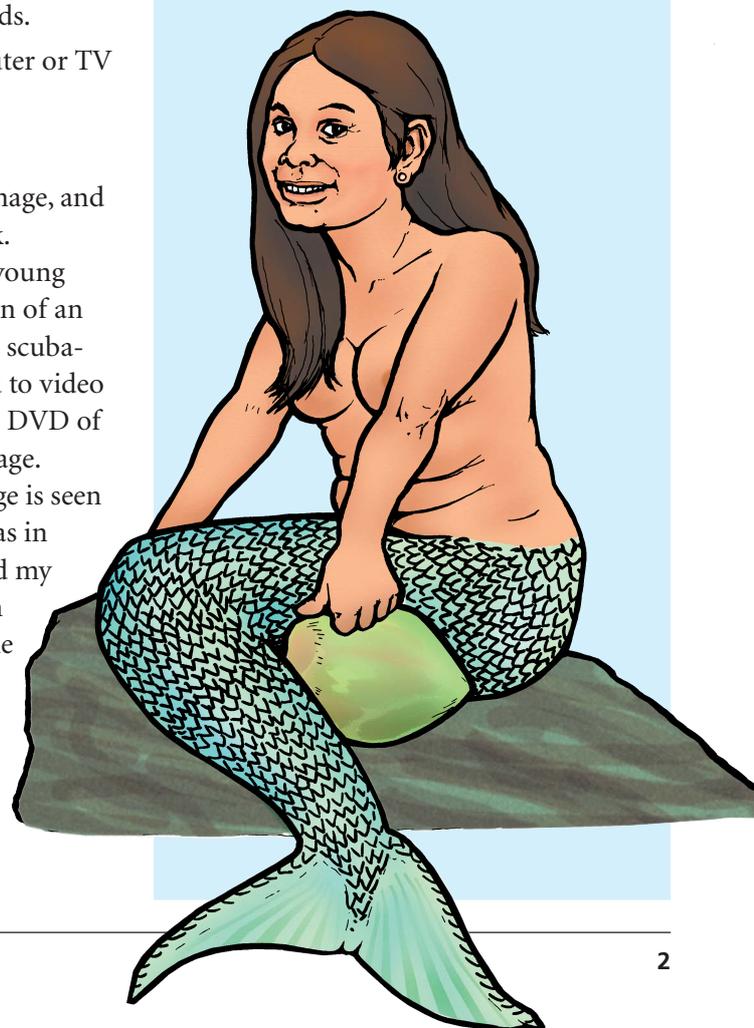
Fig. 4: airbrush
Ever wondered what a real airbrush looks like? See below, my Aerograph deVilbis Super '63.
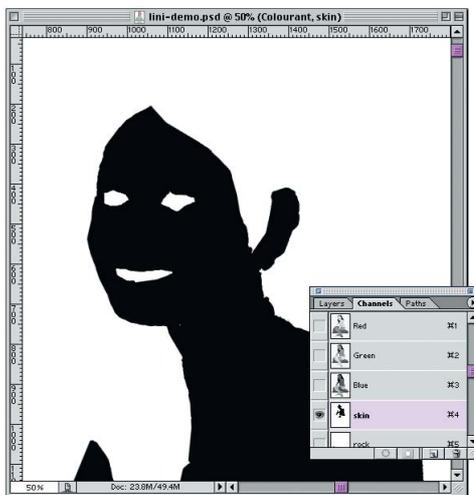
Fig. 5: The alpha channel, a re-usable mask
By making a careful selection and saving it as a Channel in Photoshop, you create the equivalent of a stencil or mask to prevent 'overspray' in airbrush work.

but for colour print work, switch to CMYK). Then I created a new, blank layer, onto which the colour would be laid.

The default blending behaviour of a layer in Photoshop is to act as if the colour applied is opaque, and hides anything on the layer below. You should use the pop-up menu for the colourisation layer to ensure that its blending mode should be '**Multiply**' instead. Now the colour you apply will behave like transparent ink over opaque black. (This also has the advantage that you don't even need to be particularly accurate in laying down the colour: the black lines hide the joins. You can see how sloppy I was from figure 2b.)

The smooth shading in Lini's skin was achieved by using a large, soft Photoshop brush in '**airbrush**' mode, to 'spray digital ink' gently around the contours. As in real airbrush painting, this would be a messy business if you didn't use a mask to protect the surrounding bits. In Photoshop this is done by making a **Selection** and painting within that, and it makes sense to save that Selection to an **Alpha Channel** in the image so you can re-load it again and again (see Figure 4).

When I completed the job to my satisfaction, I discarded the extra alpha channels and flattened the image to a single layer before saving it as a TIFF file for animation in *Adobe After Effects*.

Print dilemmas and resolutions

As explained in the panel on the next page, line artwork for computer or TV display can only be at one, relatively low fixed resolution. But scanned images printed to paper can be at *any* resolution: for line drawings, the higher the better. The dilemma is, what resolution to use for a *colourised* line image?

When I first met this problem, I pondered long and hard. To be usable in a printed publication, colour would need to be in CMYK mode, and the printing process would represent it as a halftone screen, typically with a frequency of 180 lines per inch. There would be no point in exceeding an image resolution of 360 pixels/inch. (As the colour has so little detail, I could probably get away with less, and so keep the file size down.) But how could I present the detailed black lines as sharply as possible?

My answer is to layer two image files on top of each other: a relatively low resolution colourisation layer as CMYK, and a high-resolution black bitmap on top for the line component. What makes this layering possible is that most print publishing applications treat TIFF bitmap files not as *black-and-white*, but as *black-and-transparent*.

And so we separate, to meet again later

To achieve this effect, I work with a two-layer file, in CMYK colour mode. I use the **Image Size** command to set the nominal size of the file to the dimensions at which I want it on the printed page, and set the resolution very high, e.g. 1,200 pixels per inch. This often makes for a very large file, but with today's computers that is not much of a problem.

After colourising the image, I use the **Duplicate** command from the menu in the Layers palette to save each layer as a separate file. These two files now get a different treatment.

For the file made from the colour layer, I use the Image Size command to reduce its resolution to 300 pixels/inch or less. When you do this it is important not to allow the height and width of the image to change – this information tells your page make-up software at what size to import the image, and you want this to co-ordinate exactly with the size of the file you will make from the black bitmap layer. I save this as a CMYK TIFF file.

I convert the file derived from the line layer first to a Greyscale file, then to a Bitmap file, keeping its resolution the same all the way through the process. I save this file also in TIFF format.

The two files can now be imported into Quark, PageMaker, InDesign or whatever you use, placing first the colour layer, then – exactly on top of it – the high-resolution black-and-transparent bitmap layer. (In some software you have to define the background of the bitmap as transparent *after* importing it, in others that is how it comes in anyway.)

Integration in Illustrator makes an easier pre-packaged image

To make it easier for our editor to receive my composite mermaid image to place on page 2, I pre-assembled the image components in Illustrator, and saved the result as an Encapsulated PostScript (EPS) file. I also created a Bézier-curve mask – a compound path layered above the colour image component. Turning this into a **Mask** hides the opaque white parts of the colour layer, very similar to a clipping path as defined in Photoshop. That is why our mermaid's tail can overlap the line at the bottom of the page, and the blue rectangle (which is not part of the image, but created in the page make-up software) shows behind her, and beneath her right arm.

Another trick: making woodcut-like shading for line art

More recently, I have developed a similar technique that makes my line drawings look as if they have been shaded by wood-engraving.

Recently I was asked to start contributing a regular illustrated column to the newsletter of the Tenants' Association for the housing estate where I live, about the wildlife in our midst. The newsletter is produced by the Association's secretary, who prints one copy on her 600 dpi laser printer, and gets this photocopied. How could I produce shaded illustrations that would look attractive, and survive the copying process?

I've been producing easy-to-print art for community newsletters for decades, from the earliest days of photocopying – and I know that the shading for such primitive reproduction has to be rather coarse. I could have used a technical pen to draw parallel lines on my illustrations, but I decided to try an electronic trick instead…

From greyscale shading to Line Screen

As Figures 6–7 overleaf illustrate, my technique for this starts out very much like my mermaid project – except that I am working in greyscale.
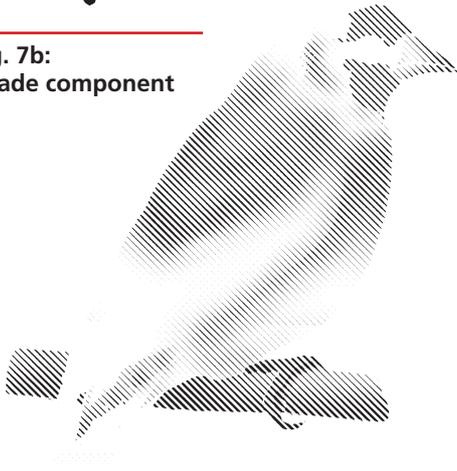
Fig. 6: Two layers, several masks…

It seems a shame to have to render so colourful a bird as a goldfinch in grey, but that's all our simple newsletter can afford. Again, you can see here the two-layer technique and airbrush masks in use.
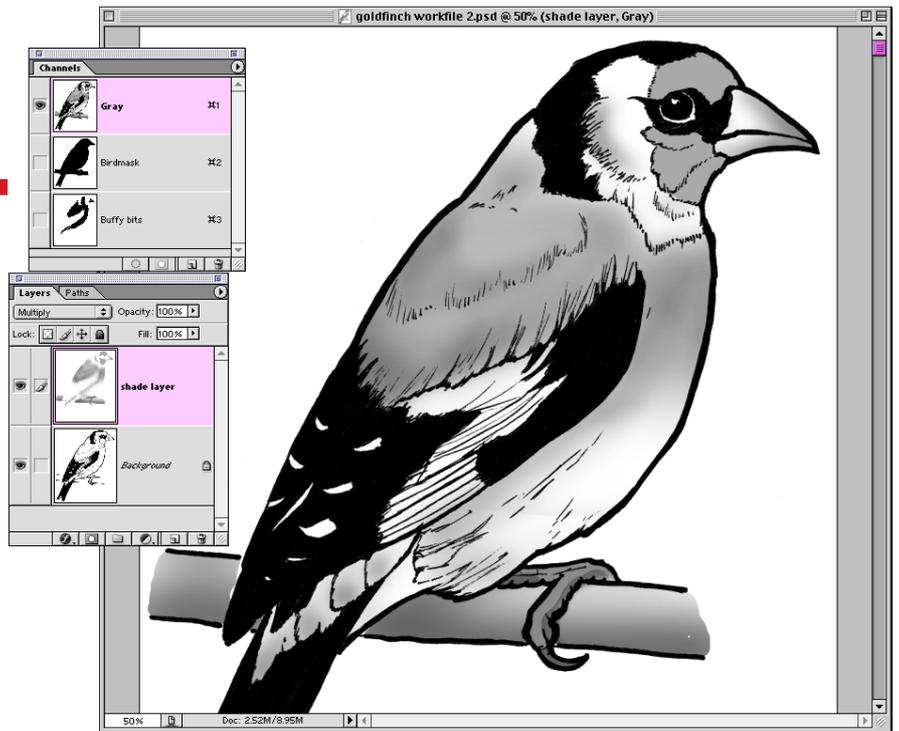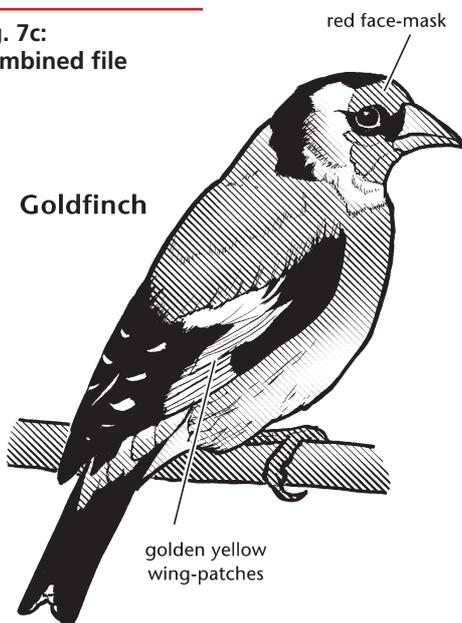
**Fig. 7a:
Black component**
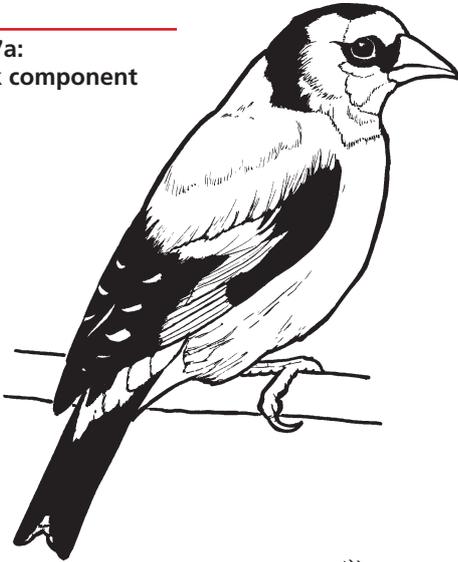
**Fig. 7b:
Shade component**

**Fig. 7c:
Combined file**

red face-mask

Goldfinch

golden yellow
wing-patches

- The goldfinch was drawn with brush and ink, then scanned to produce a contrasty 600 dpi greyscale image.

- A shading layer was created, with blend mode set to Multiply, and 'airbrushed' through a series of masks (see Fig. 6 above).

- The two layers were duplicated to separate files, and the line version was converted to a 600 dpi bitmap quite conventionally (Figure 7a).

- The shading layer got unusual treatment. When I converted that also to a 600 dpi bitmap, I chose the 'Halftone Screen' method and was then presented with a subsequent dialogue in which I chose these Line Screen settings, which makes a shading effect using coarsely-spaced lines of varying thickness:
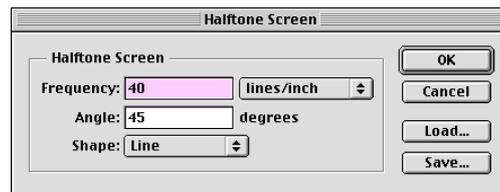
- This produced the shading I was after (Figure 7b). I selected the whole shading image and copied it, then re-opened the line image so I could paste the shading on top of it.

- In fact, I had first to convert my line image back to greyscale – this is because Photoshop does not allow bitmap images to have layers. Only then could I paste the shading layer on top. At first the upper layer is completely opaque and hides the line layer, but if you set the blend mode of the upper layer to Multiply you see the correct effect.

- Finally I flattened the image and converted back to a pure bitmap after adding annotations. Figure 7c shows the drawing as it appeared in the newsletter at 600 dpi, looking very nice despite the photocopying!

Don't you think drawings bring a more human touch to publications and presentations? That's why I continue to experiment with these techniques.