Panel Painting in Egg Tempera

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History of Egg Tempera

Egg tempera is a painting process using egg yolk to bind the pigments. It is painted on wooden panels covered with gesso made from rabbit skin glue and whiting (chalk), and is most commonly seen in the form of icons and altarpieces. It is one of the oldest painting techniques documented, used by the ancient Greek master painter Apelles in the fourth century BC. None of these very early examples survive. The earliest surviving examples are Byzantine-style icons painted in the sixth century. Egg tempera gradually gave way to oil paint in the fifteenth and sixteenth centuries, in part because of technical effects possible in oil not achievable in egg tempera, but also because oil paintings could be done on the much lighter-weight support of canvas rather than panel. Despite this, egg tempera on panel has significant advantages over oil on canvas. It is much less prone to cracking and discolouration. Barring physical damage to the support and the paint, many panel paintings in egg tempera remain as vivid and fresh as when they were painted six or seven hundred years ago. At their peak in the fourteenth and fifteenth centuries, large panel paintings such as altarpieces were the product of workshops with many different specialist craftsmen involved. The master would draw a design, then a cabinetmaker made the frame and a gilder gessoed and gilded the panel using hand beaten gold leaf prepared by a goldsmith. Pigments were mined or chemically prepared, ground and extracted ready for sale to workshops (often through apothecaries) but would usually need further preparation before use. Apprentices did the messy, smelly and poisonous jobs such as grinding the pigments, preparing rabbit skin glue and sifting and slaking the chalk or plaster for the gesso. Workshop painters often did the bulk of the painting, with finer details done by the master.

Selecting and Preparing a Panel

The earliest panel paintings were slightly hollowed out in the centre to create an integral frame (fig 1). This was partly aesthetic, but also reduced the overall weight of the panel while minimising warping and the risk of abrasion of the surface of the painting. Another common format was the folding panel which opened out to reveal the painting. This protected the painting for travel and allowed for greater scope in the imagery, including combinations of painting and sculpture, such as in portable altars and icons (fig 2). Later frames such as tabernacle frames and reliquaries were much more elaborate, built out of many separate frames and mouldings (fig 3).

In preparing a panel for your own painting, you can use either a plain panel with or without a shallow edge (either hollow out the panel or glue a thin, bevelled strip of timber to the edge), make your own composite frame + panel, or use a flat panel that can be framed later in a picture frame with an extra-deep rebate.

- pale, fine grained hardwood preferably quarter-sawn eg English oak, poplar, willow (tasmanian oak is ok)
- free of knots and sap
- thick enough to minimise warping : for an A4 panel about 20mm thick works well, or use bracing on the back
- furniture is a good source of large flat pieces of timber that has aged sufficiently not to warp further, and may have its own decorative elements already: tabletops, bedheads, doors.
- if you are recycling timber make sure there are no nails or rust stains, paint, varnish, grease or glue on the panel
- when joining timber try to avoid using nails and screws. Use dowelled or mortise and tenon joints

Gessoing the Panel

You cannot paint in egg tempera over acrylic gesso: you must make your own gesso, which is applied warm. When your panel is ready coat it with a layer of hot rabbit skin glue size* on all sides and allow to dry. For extra stability a layer of thin, old linen soaked in the diluted size and wrung out can be laid on the panel after the first layer of size. Smooth it out with your fingers until it is free of wrinkles. Once the sized panel is dry coat it with hot gesso* wherever you wish to paint or gild - if you are using a separate frame you’ll only need to gesso the front, however if you do this on really large panels they are prone to warp. Each new coat of gesso is applied just as the previous layer has lost its gloss. If you let the gesso dry completely between layers you are more likely to get pinholes in the gesso or separation of the layers. It is also important to keep the unused gesso covered between coats so that water does not evaporate. Applying this stronger gesso over weaker layers will cause cracking. If necessary add a little hot water to maintain the consistency of thin cream. You’ll need to apply somewhere between 8 and 12 coats (1-2mm thick). Allow to dry thoroughly. Sand or scrape the panel flat, then using a barely damp linen cloth, polish the surface until it resembles eggshell.

Transferring Your Design

You can start either with an existing painting which you wish to copy, or an original drawing. To copy an existing painting, make a colour and a black and white copy the same size as your panel. The colour copy shows you the colours and brushwork details; the black and white copy the tonal values, which becomes very useful later on. To work with an original drawing, the
more tonal detail the better - use the examples of the Renaissance masters. You can either sketch directly on the panel or transfer an image using graphite paper. Drawing in pencil tends to leave a smudgy mess, and if you rub it out, traces of eraser can stop the egg tempera from sticking properly. The traditional method described by Cennini was to sketch the design in fine willow charcoal, rub it out almost completely with a feather then go over the outlines and shading in very dilute ink with a fine brush (use India ink not soluble ink). You could also transfer the design in the same way as for fresco, using a drawing with the design pricked out with a pin and pounced with powdered charcoal. Go over the charcoal dots with a fine brush and water to create an outline, then ink over it as before. When you are satisfied, gently inscribe the outlines of the area to be gilded using a fine etching tool. This is the time to apply any raised gesso effects or gesso carving.

Gilding

Gilding should be done before painting so that any burnishing does not damage the painting, and gold does not accidentally stick on painted areas where it is not wanted. For water gilding, apply 4 thin coats of gilding bole* to the areas to be gilded. For oil or mordant gilding, the areas can be painted with egg tempera in any red-earth colour then sealed with shellac* (or use acrylic bole). Gild in your usual fashion. If you have gilded over any areas where you intend to paint, gently scrape back to the gesso. Apart from burnishing, a number of decorative effects can be applied to the gilding. The gilding can be stamped with decorative punches. A pattern can be applied to oil gilding by laying a layer of tracing paper over the gilding and drawing a design on top of it. It is also possible to create a brocade effect by painting over the gilding with egg glair* then with paint, then gently scratching back through the paint with a wooden skewer to reveal the gold (the glair allows the paint to stick to the gold).

Painting

Use a china palette in period if possible. Plastic ones are ok but tend to get quite stained and scratched from the pigments. Shells were also used in period but tend to slide around the table. Put a small quantity of pigment into the palette well. Add a couple of drops of vodka and enough water to mix to a thick smooth paste. The alcohol helps wet the pigment better than plain water. Add an equal quantity of egg yolk mixture and blend. Add water until desired consistency is reached. Different pigments will behave differently, for example cadmium red and yellow mix easily to a brilliant, smooth paint which stays well emulsified; earth colours need frequent re-mixing as the pigment tends to settle out; and titanium white may need extra grinding before using as it is often gritty and coarse if mixed as-is. If you are doing this sort of painting a lot, consider investing in a glass muller and plate for grinding the pigments. You are now ready to paint. It is important not to touch the surface of the gesso with your hands, as skin oils may stop the egg tempera adhering. When you are not painting, cover the panel with a cloth to keep it clean.

Egg tempera dries quite quickly so you cannot use the same techniques used in oil or acrylic painting of blending colours on the surface as you paint. Instead, the technique is to make an underpainting of areas of solid colour (usually two or three thin layers are required for an even tone) and then to blend the tones with successive layers of fine brush hatching. The direction of the brushwork can be used to emphasize folds and lines within the area being painted. Edges are often painted in with a fine line, emphasizing the drawing-like quality of the painting.

The colours used in panel painting often have particular symbolism. Icons, for example are painted from the darkest tones through to the lightest, symbolising bringing out the light of God. Flesh tones are painted in earth pigments symbolising man’s creation from earth, and the robes of the Virgin are often painted in ultramarine blue symbolising heaven (and also because the expense of ultramarine pigment honoured the subject). Particular saints were recognised by (among other things) the colour of their robes.

Cennini recommends painting the background and drapery before the flesh. This may be because it allows the flesh to be painted in such a way that the shadows and highlights can be put in with reference to the rest of the painting, or because it allows the preliminary, less skilful aspects of the painting to be painted by the workshop and the more detailed faces and hands by the master himself. Whatever the reason, it seems to work well.

Foliage and grass is painted light over dark. As titanium white is less opaque than lead white, several layers of the lighter tones may be needed for coverage.

Drapery is painted using a monochrome technique, using three tones for shadows, body and highlights. The tones employed are usually either colour/ colour + white / colour + more white / or colour + burnt umber/ colour/ colour + white. Start by blocking in the three tones on the area to be painted. Then go over the drapery again, blending the colours with fine brush strokes of each tone. Finish by deepening shadows if necessary with a wash/glaze of burnt umber mixed with black, and adding final highlights with pure white. It can be very helpful to have a tonal sketch in pencil or charcoal to work from, or if you are copying an existing painting, a black and white photocopy.

To paint flesh, the underpainting is done in an earth colour. Cennini uses terra verte, although some other painters use a more brown-toned underpainting. Paint two coats on all flesh areas. Next take verdaccio, and paint in the shadows over the terra verte. Then redraw the outlines of the flesh: eyes, mouth, nose etc also in verdaccio. Touch in the lips and apples of the
cheeks with a pink of cadmium red and titanium white.

Next mix up three values of flesh colour, each lighter than the other, from yellow ochre, titanium white and cadmium red. Paint in the the lightest areas with a thin layer of the lightest flesh tint, the mid-tone areas in the mid flesh tint, and the darker areas in the darkest flesh tint. The very darkest shadows should be left as verdaccio. Next go back over the flesh, blending the areas of different tone with fine brushstrokes of flesh tint, always thinly enough to allow a hint of the terra verte to show through.

When you have finished creating the contours of the face, touch in the very lightest highlights and the whites of the eyes with pure titanium white. Use pure black for the top eyelid and eyelashes and the pupil, then reinforce the shadows on the face using the black/umber, well diluted. If the flesh is too pale it can be warmed up with a wash/glaze of venetian red or burnt sienna.

Shell Gold Highlights

Shell gold is finely ground gold mixed with gum arabic or egg glair. It can be used to paint in extremely fine gold details such as lace and lettering. If you do not have shell gold or are not confident in working with it, gold gouache or calligraphers’ gold is a reasonable substitute. Gold acrylic paint tends to sink into the tempera and fade away and is not recommended.

Varnishing the Painting

Egg tempera and gilding done with genuine gold leaf can be left unfinished, and in fact varnishing gold will make it lose some gloss, however silver leaf and imitation gold leaf must be varnished to prevent tarnishing. These latter can be carefully varnished straight away, but egg tempera takes many months to fully dry and cure and must not be varnished until then. Wait six months to a year after completion for best results. Temporary protection can be obtained by painting a thin layer of egg glair over the surface.

Handy Hints from Cennini

Submit yourself to the direction of a master for instruction as early as you can; and do not leave the master until you have to.

Set yourself to practice drawing, drawing only a little each day, so that you may not come to lose your taste for it, or get tired of it...You should constantly copy from nature with steady practice.

Endeavour to copy and draw after as few masters as possible,. to get a grasp of one style and spirit... and you will eventually acquire a style individual to yourself.

Save and spare your hand, preserving it from such strains as heaving stones, crowbar, and many other things which are bad for your hand, from giving them a chance to weary it

There is another cause which, if you indulge it, can make your hand so unsteady that it will waver more, and flutter far more, than leaves do in the wind, and this is indulging too much in the company of woman
The Medieval/Renaissance Colour Palette

Many of the original pigments were quite toxic and also chemically unstable, reacting with air or with other mineral pigments and discolouring if not handled correctly. Modern substitutes are listed below for these pigments. It is still possible to obtain the original pigments if you are prepared to observe the necessary safety precautions and restrictions on buying/importing, using and disposing of them.

**WHITE** lead white is very dense and opaque, but also quite toxic. Titanium white +/- added zinc white is used as a substitute, but is not quite as opaque or smooth. Zinc white is rather grey, but is only semi-opaque and can be used to create translucent veils.

**BLACK** ivory black (or bone black)

**BLUE** ultramarine blue was originally obtained by grinding lapis lazuli and extracting the pigment. Modern ultramarine blue is chemically the same but as it is manufactured it is considerably cheaper. Azurite was used as a cheaper source of blue. Modern cobalt blue pigment is roughly equivalent.

**GREEN** verdigris, malachite and blends of indigo and yellow were used. Chrome oxide provides an equivalent strong green, or mix from blue and yellow. Earth green (terra verte) is covered in the earth pigment section.

**RED** vermilion (mercuric sulphide, either as naturally occurring cinnabar or manufactured by smelting together mercury and sulphur) is highly toxic. Any free mercury will also damage gilding. Cadmium red is the modern equivalent. Red earth colours are covered in the earth pigment section.

**YELLOW** orpiment (arsenic sulphide) is also highly toxic and can damage other pigments in contact with it. Cadmium yellow is the modern equivalent. Yellow earth colours are covered in the earth pigment section.

**EARTH COLOURS** these are essentially unchanged from the Medieval pigments. Many of them are iron oxides, and as their name implies, are obtained from clay soils. They are often named for the region from where they are obtained eg umber (Umbria), sienna (Siena), venetian red (Venice). They are beautiful soft colours with a colour range from soft green (terra verte), yellow (yellow ochre, yellow oxide) through to red (red oxide, venetian red, burnt sienna), purplish-red (caput mortuum) and brown (umber).

**VERDACOIO (or BAZZEO)** is a dark greenish-gray blend used for shading and outlining. It translates literally as “waste green” and although a number of recipes are given for it it is not a fixed colour: one source says that it was the product of mixing all the paint scraps left over at the end of the day.

**FLESH COLOUR** is created by mixing white with yellow ochre and a tiny bit of cadmium red. This needs to be used over a greenish underpainting to get the correct finished tone.

A recommended starter range of pigments is:

- titanium white
- zinc white
- ivory black
- cadmium red
- cadmium yellow
- ultramarine blue
- cobalt blue
- chrome oxide
- yellow ochre
- burnt sienna, red oxide or venetian red
- earth green (terra verte)
- burnt umber

Gold gouache or calligraphers’ gold makes an adequate substitute if you are not ready to tackle shell gold.
Recipes

Rabbit Skin Glue Size
1 part rabbit skin glue to 12 parts water (about 6 tablespoons RSG to 1 litre water). Leave to soak for at least 2 hours. Place in a double boiler with the lid on and heat until glue is melted. Do not allow to boil.

Gesso
Take the hot size described above and slowly sprinkle in whiting, stirring gently, until you get a liquid the consistency of thin cream. Keep warm over the lowest heat, keep the lid on when not using and stir gently before each application. Add a little water from time to time if necessary to maintain the correct consistency. Do not stir too vigorously or you will introduce air bubbles.

Egg Glair
Whisk the white of an egg until stiff like meringue. Cover and leave overnight. In the morning, scoop off all the foam. The clear liquid remaining at the bottom is glair. It will keep indefinitely but does start to smell after a while.

Egg Yolk Medium
Take the intact yolk of an egg and roll carefully on a piece of paper towel to remove all traces of egg white. Pinch the yolk membrane and allow the contents of the yolk sac to drip out. Discard the membrane. Mix with an equal quantity of water and a few drops of white wine vinegar. The vinegar helps the mixture stay emulsified and improves its keeping qualities (keeps for a few days in the fridge).

Gilding Bole
1 part Armenian bole paste to 2 parts prepared rabbit skin glue (or egg glair diluted to half strength).

Gilding Water
Equal parts water and brandy. Brush over the gilders bole to moisten before laying on the gold leaf.

Shellac
1 part bleached shellac flakes to 3 parts pure methylated spirit (has no water in it which will cloud the finished shellac). Strain before use. Commercially available pre-mixed as French Polish.
Links and Resources

_The Craftsman’s Handbook_ - a translation of Cennino d’Andrea Cennini’s “Il Libro dell’ Arte” by Daniel Thompson Jr - available for purchase at Angus & Robertson online. The entire book is also published online at:

http://www.noteaccess.com/Texts/Cennini

Recipes for rabbit skin glue and gesso

http://www.langridgecolours.com/RSG.htm

Instructions for water gilding

http://www.betsyporter.com/gilding.html

Step by step illustrated instructions for preparing egg tempera:

http://www.eggetempera.com/paint.html

Egg tempera and gilding techniques demonstrated by Fred Wessel using 14th century techniques as described by Cennini

http://home.comcast.net/~f.wessel/tech.html#

Historic paints and pigments educational resource site

http://naturalpigments.com/education/default.asp

Materials safety data sheets for pigments and media

http://www.langridgecolours.com/MSDS.htm

Where to get the pigments and other supplies:

http://www.stlukeart.com/ - St Luke Artist Colourmen, stock everything you’ll need, very helpful

http://www.langridgecolours.com/ - Australian manufactured pigments, binders etc (mail order available)


http://www.ashcroftgold.com.au/ - gold and silver leaf (mail order available)

*note that the correct address is 51 Westminster St, Oakleigh not Preston* ph (03) 95682344