Photogravure An Archaeological Research

Jan Pettersson 2002
Kunsthøgskolen i Bergen

Notes to include:
Definition of Photogravure.

Ch.2 General Introduction to the Photogravure Method

Photogravure is one of the most complex, time consuming and demanding techniques for transferring a photograph to printed media.

Four Basic Approaches

Note that the pigment paper is not photographic material, only a carrier for information. This leaves photogravure open to many different approaches.

1. The Analogue Photograph
The most popular.
2.4 x 3.6cm to 20 x 25 cm negatives can be used
The key to success is a well exposed negative with detail in both shadow and highlights.
The negative is transformed to a film or paper positive using the enlarger.

2. The Analogue Abstracted Photograph
A large scope for creativity and Jan's preference.
Black and white pictures/ slides can be sandwiched between one another. For abstract colour work, this is ideal.
The denser the information, the closer to the original.

3. The Digital Photograph
Digitalisation gives us three possible approaches to photogravure; digital halftone, digital halftone diffused into continuous tone or continuous-tone Lambda / LVT. The latter produces a precise result due to the cleanliness of the media.
There are no problems achieving a good four-colour or hexachrome print as colours are separated and contain exactly the correct amount of information.

4. The Handmade Positive
This involves working directly onto clear or frosted Mylar using tusch, pencil, gouache etc.
As in point 1 the key to success is detail through the shadows to the highlights in order to reflect the actions of the artist clearly in the final print.

Using Aquatint or a Screen

In order to support the gray scale, the gelatine is provided with a carrier grain using the following different methods:

Aquatint, consisting of asphaltum, Xerox powder or rosin powder, is dusted onto the plate. n.b if rosin is used, do not use an alcohol solution as this will dissolve the rosin.
Aquatint is dusted on top of the gelatine, asphaltum, Xerox powder or rosin.
A Screen (Stochastic, Aquatint or Machine made) is exposed into the gelatine.
A Screen (Stochastic, Aquatint or Machine made) is exposed onto the plate with photo etching emulsion. It is developed and the exposed pigment paper is laid down on top.
A Previously Screened Image is exposed into the gelatine and laid on top of the plate.

Although the key to success is a well exposed negative containing detailed information throughout, all these approaches will render a different visual result in the final print.

The first three approaches involve either grain or a screen which act as a barrier and prevent an accurate reading of the image. However, the fourth approach uses an emulsion such as fish glue or PVA, which must be burnt in. The result is that, when etched, the acid will read the exact image that was originally exposed into the gelatine.

The final approach involves the halftone dot rather than the continuous tone. The dot may be diffused by exposing a further additional screen to improve the quality of the image. This method is applied to commercial rotogravure printing.

Differentiating Between Pure Photogravure and Hybrids

Analogue B/W and CMYK Separations

The true handmade photogravure should exhibit a continuous running gray scale in relief on the plate. It must correspond with the tonal density of the positive, be it on film or paper. The grain that supports the information can be a screen, an aquatint or a screened emulsion.

Hybrids of Photogravure

The first involves exposing the screen into the film together with the positive. This handmade photogravure process derives from rotogravure. The continuous tone is replaced with a halftone (a hard dot). This dot produces similar visual results but without the relief element present in the etched gelatine. The high contrast dot is easier to bite although it must be etched to a calculated depth in order to produce a high quality plate. Course or dense resolution can both be applied to the positive and the etching time will vary accordingly.

The second uses the same positive as the previous process but with a coarser density so that it is possible to expose an extra screen into it. This softens the image by creating a tone between the dots and therefore moves closer to the true photogravure.

The third hybrid is achieved by using a machine made dot screen which is exposed into the gelatine followed by a continuous tone positive.

The machine made screen provides precise spacing between each dot and when it is copied into the positive using the hybrid process, the etch is easy to achieve.

Using Digital Images for Photogravure

Digital Continuous Tone

Two methods can be employed to produce the digital b/w or colour image; By printing out the positive at the required size on to Lambda film or by printing a digital LVT negative from which the continuous-tone positive is created. Approaches 1-5 in the section 'Using Aquatint or a Screen' establish the grain to support the tonalities.

Digital Diffused Halftone

The digital b/w or colour image is printed as a halftone positive. New negatives can then be created using a copy camera but the dot is diffused to give the appearance of a continuous-tone. Approaches 1-5 in the section 'Using Aquatint or a Screen' establish the grain to support the tonalities.

Digital Halftone

The digital b/w or colour image is printed as a halftone positive at the required size. Approach no.5 in the section 'Using Aquatint or a Screen' or Hybrid methods 1 & 2 establish the grain to support the tonalities.

Ch.3 The Basic Photogravure Method

The brief overview:

> The negative is placed into the enlarger and the photographic positive is made

> The positive is placed face down onto a sensitised piece of gelatine paper and using a vacuum frame to create absolute contact, the gelatine is exposed to a strong light source e.g. a metal halide light.

> After exposure the gelatine is soaked in a solution of alcohol and water before being placed on a prepared aquatint copperplate.

> After leaving the plate to rest for 10 minutes, it is developed in hot water and the unexposed gelatine is washed away, leaving the image on the surface of the copperplate. The plate is then dried with a fan and left overnight.

> The next day, the plate is etched in different concentrations of ferric chloride. Due to the various layers of gelatine that exist on the plate, the etch will start in the thinnest areas of gelatine (the darkest areas of the positive). And gradually works its way through the different layers, thereby creating a continuous-tone scale in the plate.

> To print, the plate is inked up with intaglio ink, wiped with different pieces of tarlatan and placed on the bed of the etching press. A damp piece of printmaking paper is put on top of the plate, together with a number of felts, and run though the press.

> The result is called 'dust grain gravure'.

The Positive

Making the Photographic Positive

To make the positive, we need a b/w negative. The negative is placed into the enlarger in reverse. The positive can either be a continuous-tone film (Bergger for example, is a good but expensive brand) or alternatively a halftone film. For the last seven years, Jan has favoured the American halftone film Arista APHS. The availability of this brand in future years will be determined by the popularity of digitalisation. Arista APHS is presently easier to purchase than the less popular and pricier continuous-tone film, and is available in sizes ranging from 8" x 10" to 20" x 24" or as a 36" wide roll. The advantage of Arista, depending on which developer used, is the low cost and the long tonal curve.

Positive on Arista Film
The procedure is similar to exposing a positive on paper. Enlarge the negative to the size of the final image (1:1). Proceed with a step exposure, for example, 1 to 10 seconds at f 5.6 on the lens. Use a the b/w developer Dektol for developing. This should be diluted from a the stock solution 1:4 or alternatively HC 1100 diluted 1:4 can also be used. Kodak's developer Selectol Soft has recently been taken off the market, so Ansco 120 solution can be created using the recipe below. Develop the positive and find an area that exhibits a wide tonal range. Take a fresh piece of film, expose and develop the positive for 3 to 8 minutes in Ansco 120 and then place it into the Dektol developer for 0.5 to 2 minutes. The advantage of using two developers is that you will be able to achieve a long continuous-tone curve and increased contrasts in the shadows and highlights. Make sure that the tonal range of the film has a full body.

Recipe for Ansco 120 (Soft Working Paper Developer)

Water (125˚f / 52˚C)	24 oz	750 ml
Metol	70 grains	12.3g
Sodium Sulphite	1 oz, 88 grains	36g
Sodium Carbonate, monohydrated	1 oz, 88 grains	36g
Potassium bromide	27 grains	1.8g

n.b Always wear gloves and a mask when handling dry chemicals.

For regular use, dilute 1:2 and develop for 2 minutes. To use Ansco 120 for a two-way development, first use the soft developer at a dilution ratio 1:4 and followed by a regular or high contrast developer.

Handmade Positive on Film
For handmade positives use clear Mylar for India ink and tusch. Dilute the ink to achieve a continuous-tone gray scale. If the positive is created using pencil, a gray scale can be achieved using frosted Mylar. Any transparent material will work well for b/w and colour prints.

Humidity

The Importance of Humidity
Due to its composition of gelatine, the pigment paper used in the photogravure process as a highly sensitive material. It is affected by many factors including heat, humidity, light, water and a sensitising solutions. In order to keep the pigmented paper at its highest peak at all times, the humidity in the work process is crucial, especially for colour work. Alternatively by burning the aquatint into the gelatine, controlling the humidity is less crucial. This works well, but control of the environment should remain a priority. Often, the high the humidity, the better the pigment paper works. Always ensure that the humidity remains between 65-70%.

The Humidity Set Up
The humidifier's capacity stands in relation to the size of the room. A small room only requires a couple of regular size humidifiers. In order to prevent the humidifiers running out of water during the gelatine's curing time, a test run should be completed before hand. A small room benefits from the combination of a regular and drum humidifier to produce excellent results. Industrial digital humidifiers will regulate the humidity to an exact degree and can be connected directly to the water system or operate from a refillable tank of water.

Working with Humidity
Humidity should be considered throughout the entire photogravure project. Before cutting the pigment paper, leave it in a room with 50% humidity for at least one hour. This will make it easier to unroll and prevents the gelatine cracking. Drying and sensitising the pigment paper should also be performed at 50% humidity. During exposure, development and drying, the humidity should be between 65-75%. The drying process is critical. Use a fan and turn the pigment paper 45˚ every 15 minutes. This should achieve a fairly even drying process across the surface of the paper. A plate-swirler with heating elements is ideal. The plate should be spun at 100-120 rpm and the heating elements) will dry the gelatine very evenly, from the centre out to the corners. The plate-swirler will also produce an even shrinkage of the gelatine which is crucial when registering four-colour plates. The gelatine should be dry to the touch but will still contain a good deal of moisture. Finally, humidity should be maintained between 65-75% during the etching process.

The Pigment Paper

Autotype is the only remaining company that still manufactures pigment paper. They are based in England, with a branch in the USA Brands include the G25 and G35. For the basic photogravure method, as presented by Jan, use the G25 which can be purchased as rolls of 20m in varying widths.

Mixing the Sensitising Solution for the Pigment Paper
Mix 30g of potassium dichromate/ammonium dichromate to 1L of distilled water to produce a 3% sensitising solution. Store in a dark glass or plastic bottle, clearly labelled, and store at 8-9˚C in a refrigerator. Rubber gloves and a mask should be worn at all times as potassium/ammonium dichromate can induce allergies if inhaled.

Cutting the Pigment Paper
Roll out G25 pigment paper under regular yellow lighting conditions. The paper will tend to curl back so ensure a heavy weight is at hand to keep the paper flat. The surface and all tools must remain as clean as possible. The paper should rest for 30 minutes in 50-65% humidity so that it absorbs moisture from the air and will be easier to handle. Using a ruler, a matt-knife and wearing cotton gloves, cut the pigment paper so that it is slightly larger than the positive.

Sensitising the Pigment Paper

Sensitising requires the following materials:
Clear sheets of 40 x 50cm Plexiglas
(this depends on how many pieces of pigment paper is prepared each time)
One rubber squeegee
Rubber or surgical gloves
Goggles 99% denatured alcohol or 70% rubbing alcohol
A plastic photography tray that is larger than the pigment paper
Thermometer
Timer
Sensitising Solution
Paper Towels or Clean rags

Pour the solution into the tray and ensure the temperature is between 13-18˚C. Clean the Plexiglas thoroughly with alcohol. Put on the rubber gloves and goggles. When it has reached the ideal temperature, completely immerse the pigment paper face down into the solution. The paper tends to curl inwards before flattening out. Keep the tray in continuous motion during the process. After 1.5 minutes turn the paper face up and continue to agitate the tray for a further 1.5 minutes. When sensitising, small bubbles may appear on the surface of the paper and should be carefully removed using your finger. After 3 minutes has passed and the paper is beginning to curl backwards, lift it out of the tray and allow the excess solution to drain off.

Hold the sensitised pigment paper by two ends and centre it face down onto the Plexiglas. Whilst anchoring with two fingers, wipe the squeegee with firm but concise pressure along different paths over the surface. This will evenly adhere the sensitised pigment paper onto the Plexiglas. Wipe the back of the Plexiglas dry with paper towels or a clean rag before placing it in a darkroom (with a subdued light) to dry. The humidity should be 50% although if the weather is hot, increase to 65%. Allow the sensitised pigment paper to dry over night and carefully peel it off in the morning. To speed up the process, an oscillating fan will dry the paper in two to three hours. The paper can be used immediately or wrapped in aluminium foil, placed into a sealed black bag and stored in a freezer. Frozen pigment paper will keep for years but must be placed in a darkroom box at 65% humidity a number of hours before exposure.

Preparing the Copper Plate

Copperplates can be brought directly from a manufacturer (or art supply stores) and a full sheet can usually be cut to the desired size for an extra sum. The copper should be 'cold rolled' and between 0.7-1mm thick.

Preparation of the copper plate requires the following material:
A small propane or gas torch
A soft brush
Alcohol
A metal grid (a rack from an old refrigerator will do)
Whiting (chalk powder) mixed with paste and tap water

Take the copper plate and peel off the plastic coating. Clean the surface with alcohol and evenly brush over with whiting paste. Place the copperplate onto the metal grid, light the torch and heat the plate slowly from underneath. As the paste dries it will absorb any residue oil and completely free the plate of grease. When ready to aquatint the plate, remove all the chalk with a clean rag.

Aquatinting the Plate

In order to transfer the information from the positive film, the copperplate requires a fine texture on the surface. There are various aquatinting techniques that can be applied. A dust box is ideal but a cardboard copy is a suitable alternative. Asphaltum powder, rosin powder and Xerox powder are three types of aquatint all of which produce different results.

Asphaltum Powder
Also known as Syrian, Egyptian, Bitumen powder. They vary in colour and the grain size should be checked before hand. A hand or electric coffee grinder can be used to mill the grain to a finer consistency. Place the powder into the dust box and stir it up. The powder can either settle onto a prepared blank plate or on top of the image on a plate after it has been developed. When it is eventually time to remove the aquatint, after the copperplate has been etched, it can be dissolved in white spirit.

Rosin Powder
Rosin can be purchased as a fine powder or in lumps that must later be ground to the appropriate consistency. As with asphaltum powder, the powder can either settle onto a prepared blank plate or on top of the image on a plate after it has been developed. Alcohol solution cannot be used on a blank plate as it will dissolve the rosin. Therefore water must be used for the transfer. Coverage with rosin powder cannot be as dense on the plate as asphalt or Xerox powder because rosin tends to expand when melted. A coverage of 50-60% will prevent the grains fusing together. Rosin will also produce a coarser texture compared with the Xerox or asphaltum powder. The distance between etched peaks in the plate is wider and therefore an increase in pressure is needed on the print-bed. In addition, the inks need to be mixed differently. Asphalt and Xerox produce a finer resolution compared to the grainier rosin image. When it is eventually time to remove the aquatint, after the copperplate has been etched, it can be dissolved in alcohol.

Xerox Powder
This man-made product consists of coal, iron and polymer plastics and the has advantage that all the particles are the same size. This allows optimum resolution in the final print. It is dusted and fired as in the previous methods. The second advantage is its easy removal by running the flame of the torch on top of the plate. Any remaining Xerox powder can be easily be cleaned off with white spirit or kerosene (Unfortunately the recently developed Xerox brands can only be removed with strong solvents such as lacquer thinner).
Asphaltum and Xerox powder can both be used directly in the plate with the exposed pigment paper on top. All three can be used if the pigment paper is laid down first, developed and then dried. These two approaches require different etching methods as well. Never place two kinds of powder into the same box.

Dusting the Plate with Asphaltum Powder

There are two different methods to applying asphaltum powder to the plate. The first is to apply it directly onto the plate followed by placing the pigment paper on top. The second is to place the pigment paper on top first and after the plate is developed and dried, dust the aquatint directly onto the image and burn it in. The first method is described in the following details.

Powder coverage on the plate is extremely important. A high coverage with fine grain will produce a sharp image. A low coverage with a course grain will produce a grainy image. Therefore, always aim for maximum coverage and density of grain on the plate. In order to achieve this, dust the plate several times. As previously mentioned the asphaltum should be left to settle in the dust box for 2-3 minutes after stirring. Leave the plate in the dust box for at least 20 minutes. Once an even coating has been achieved transfer the plate to the metal grid. Ensure the grains are not disturbed on removal of the plate. When burning in the powder, the grains turn a paler colour and then gradually to a black gloss. Be careful not to over heat the plate as asphaltum has a tendency to turn into ash and the entire process will have to be repeated. After the plate has been burned in, check the aquatint with a loupe or magnifying glass. If the coverage has not reached the desired density, keep repeating the process (3-4 times). Once the optimum coverage is achieved, the plate is ready for receiving the exposed pigment paper. At this point, the plate is now extremely sensitive to grease and oxidation. Care should be taken to store it in a clean space.

Follow this procedure for dusting the plate with rosin or Xerox powder.

Working with the Pigment Paper

Transfer solutions for the pigment paper

The following pigments must be mixed before transferring the exposed pigment paper to the prepared copperplate:

1. 1L of degreasing solution, consisting of 50% vinegar, 50% tap water and 1 tablespoon of salt.
2. 25% alcohol solution, consisting of 2.5dl denatured ethyl solution at 99.5% (or 70% rubbing oil) and 7.5dl of distilled water. This will result in 1L of solution.
3. 50% alcohol solution, consisting of 5dl denatured ethyl solution at 99.5% (or 70% rubbing oil) and 5dl of distilled water. This will result in 1L of solution.
4. 1L of 99.5% denatured ethyl alcohol or 70% rubbing alcohol.

Exposing the Pigment Paper

Pour the different solutions into four photographic developing trays. Line them up in the following order: Degreasing solution, 25% alcohol solution, 50% alcohol solution, 99.5% denatured ethyl alcohol (or 70% rubbing alcohol). Ensure the humidity of the room is at 65%. The pigment paper is exposed in a vacuum frame using a strong UV light source. There are several different brands of low budget, exposing units on the market. An exposing unit with a metal halide light is ideal.

Turn on the dark room light (either the normal yellow light bulb or the yellow fluorescent dark room light). Cut the pigment paper to the same size as the positive. Place the paper together with the positive marked out with red litho tape, reverse side down, in the centre of the vacuum table. Line up the positive on top of the paper ensuring the red litho tape is facing up. Close the lid carefully and turn on the vacuum. Allow the vacuum to adhere the paper, the positive and the vacuum glass before exposure.

The correct exposure time should have been previously established by a number of preparation test exposures. Set the timer and expose the pigment paper to the halide light source. During exposure, take the aquatinted plate and place it into the degreasing solution. This will ensure that any oxidation, due to the firing, is removed. When clean, take the plate out of the tray and rinse both the front and back with cold water. Place it into the 25% alcohol solution, face down.

After the exposure turn off the vacuum and place the pigment paper, face down, into the 25% alcohol solution. Agitate the tray so that the paper is completely submerged. After a couple of minutes the pigment paper will begin to flatten out. At this point turn it face up and continue to agitate the plate. When the paper

starts to slightly curve towards the bottom of the tray, it is ready to be transferred. The pigment paper is now at its optimum adhesion level. Hold the edges, carefully remove the paper from the solution and centre it onto the copperplate. Whilst pinning the paper down with 2 fingers, use a squeegee to firmly adhere onto the plate. Wipe the surface dry with a paper towel, use 99% or 70% alcohol on the backside to remove excess water, before laying it flat or propping it up against a wall. Allow the plate to rest for 10 minutes.

Developing the exposed pigment paper
After resting, place the copperplate into the 99% alcohol solution (or 70% rubbing alcohol) for a couple of minutes. This ensures an easy development. When the backing paper is completely soaked with alcohol, remove and place into a clean tray filled with hot water. The temperature of the water should be as hot as your fingers will allow. After a short time, the gelatine begins to bleed from the edges of the paper. With both hands, carefully grip the edges of the paper and peel it back slowly towards you. When the paper is completely removed begin developing the image by continuously agitating the tray. The unexposed gelatine will turn the water slightly red. As the water becomes cloudy, empty the tray and fill it with fresh hot water. Continue this process until the water remains clear. Cool down the hot water with cold, tap water. Next place it into the 50% alcohol solution. Let it rest for four minutes and using a soft brush (a Japanese watercolour brush is ideal), carefully remove the bubbles from the surface of the plate.

Drying the Gelatine Resist
The relationship between the humidity of the room and the dimensional stability of the pigment paper is critical. The aim is to achieve an even drying technique for minimum gelatine shrinkage. There are several ways of drying the gelatine resist. The simplest method is to place the plate flat on top of a box with a facing fan. The plate should be rotated every 15 minutes to ensure even drying. The humidity must remain at 65%. The drying time is approximately 4hrs. After which, allow the plate to rest over night at 65% humidity. After a number of experiments with several ways of drying, the most efficient method seems to be drying the plate at 120 rpms in a plate whirler on a low heat from the built in heating elements. This is the ideal solution, especially for four colour separations. It is important that exposing the pigment paper, developing the paper and drying the gelatine resist steps take place within the same room under a controlled environment.

Etching The Plate

Preparing the plate for etching
The surface of the plate contains the area of the image and the surrounding edges that need to remain unetched. Use masking tape to cover the edges and packing tape or contact paper to protect the underside of the plate (cut the contact paper slightly larger that the plate and fold over the edges). Finally, attach a handle made from the packing tape to either side of the plate.

The mordant used for etching is ferric chloride. This is purchased either as a liquid form (with a usual strength of 46-48 Baume) or in lumps, which are dissolved in water. The liquid form should be specified by the manufacturer as ‘ferric chloride, technical, clean, about 72%’ and is easy to dilute. Starting with a stock solution of 46 Baume, dilute four solutions at 45, 43, 41 and 39 Baume. One interesting point to note is that the more dilute the ferric chloride solution, the faster it will etch. Use a tall beaker for the mordant and a hydrometer to measure the strength. Pour the stock solution into the beaker (at 46 Baume) and slowly add the water until the ideal Baume strength is achieved. If the mordant is fresh, place a small piece of copper in each container to prevent the acid creating a rough etch. In order to immediately interrupt the etch when the plate been correctly etched, a stop bath is required. This bath consists of 2L of tap water and two tablespoons of caustic soda.

It is difficult to adequately describe the etching process since it is completely dependent on the information that each plate contains. A good etching time to aim for is 45 minutes to 1 hour. If the etching time appears to be 10-20 minutes, this indicates that the gelatine is too dry and has absorbed the water in the acid too quickly. The rapid etching will result in a faint, flat image with low contrast. The plate will not hold the ink during the final printing stage. In short, I recommend that each image is treated individually and that a thorough understanding of the material is gained before hand.

Pour the four different Baume solutions into the four trays. Starting with the 45 Baume, take the plate by the handles and it into the mordant. Make sure the plate is covered completely. If you have determined the right

exposure time, the etch should start within a minute. The thinnest areas of resist are the ones that with start to etch first. If nothing happens after 5 minutes, move the plate to the 39 Baume bath and, as soon as its starts etching, move it back to the 45 Baume bath. You will see how the colour of the plate will change from a reddish brown colour as the etching begins, to a dark-brownish colour as the etching proceeds in the plate. Keep etching the plate in this bath as long as you can see that the etch is proceeding through the gelatine at an even rate. When nothing more seems to be happening, move the plate to the 43 Baume bath. It is in this bath that most of the etch will take place. This, of course, also dependant on the exposure. Let the plate sit in this bath as long as the tones keep coming at normal intervals. When the penetration of the ferric into the gelatine slows down, move it to the 41 Baume bath. This one will etch the highlights in the plate. If the etch seems to be slowing down, move the plate to the 39 baume bath and finish the etch. After the last highlights have started to etch, keep etching for 1 minute and then put the plate in stop bath. The plate is finished when the gelatine has completely absorbed the acid and has an overall dark brown tone.

Take the plate out of the acid and put it into the stop bath. As soon as the plate hits the stop bath, dark sludge will appear on the surface that indicates that the etch has stopped. Put it into the sink and run hot water over it. The gelatine that is left on the plate will start to swell up and can be removed. Be very careful not to scratch the surface. From now on, any sharp objects, even a fingernail, will produce marks in the surface that will be difficult to remove. To remove the gelatine quickly and without scratching the surface, use a cleaning compound such as Twinkle (a cleaning paste for copper), or some thing similar, along with a soft foam sponge. When the plate is completely clean, blot it off with paper towels to make sure that it is completely dry. The plate is now finished and ready to be printed.

Printing

Printing the photogravure plate

Before printing the plate, it is necessary to remove the aquatint on the surface. This is done by soaking the plate in kerosene or white spirit for 10-15 minutes, and then gently brushing the surface with a soft brush. When the plate has been cleaned of the aquatint, dry it, polish up the highlights with some Never Dull, Brasso or some other compatible metal polish. At this point corrections can be done in the plate. Afterwards, we can mark out the plate to the size it should be cut down to. After cutting, the plate also needs to have its edges bevelled to the angle of 45 degrees. There are many different ways of printing the plate.

Papers for printing photogravures

When it comes to papers, there are hundreds of kinds to choose from. This can sometimes make it difficult to choose.

Hahnmemüle (German Etching) paper contains very little sizing and ideal for b/w. Do not use for colour printing as the third plate has a tendency to stick.
Lana Gravure, Arches Cover white, Arches platineé, Somerset Satin, BFK Rives and Zerkall; Heavily sized and good for both colour and b/w.

Ink

For b/w there are several good brands. Charbonnel from cool to warm (RSR Concentre is a good ink). Other brands include Øiffer, Daniel Smith and Graphic Chemical. The viscosity of the ink differs from brand to brand, hence a nit of adjustment is usually needed. This can either be done by using magnesium and the different plate oils 3,5 and 7. Adding a touch of vaseline to the ink also makes the plate release the ink better in the printing, rendering a fully loaded print.

With colour gravures there are other problems: the commercial printing industry uses yellow, magenta, cyan and black. These colours are already transparent and are formulated for offset printing. It is necessary to find other colours that are compatible for intaglio printing and modify them. The most useful are as b/w plus Casco Nobel. Inks should have a high content of strong pigment for good transparent colours and special attention should be paid to magenta and yellow. As none contain the amount of pigment needed, Yan combines good strong yellow and magenta with fluorescent offset yellow and magenta. The extra colour make the ink stronger and luminescent. This is very important because each time the print is run though the press, it looses ink to the next plate.

For printing four colours the order should be yellow, magenta, cyan and black. The yellow will loose colour three times and should therefore be compensated for colour loss when making the films as well as when preparing the inks. A hexachrome (6 colour) print will have tow extra plates. They consist of a second magenta plate printed with orange-white ink and a second cyan plate with a baby blue colour. Compensation is crucial for a good result (sequence Y, Or, M, C, Cc, K)

Another important factor is the viscosity of the colour. High viscosity means tacky ink, low viscosity means wet ink. In order for the inks to mix on the paper during printing, the tackiness of the inks will have to be adjusted to range from yellow: very tacky, magenta; less tacky, cyan; even less tacky, black; the least tacky. Adjust the ink by adding linseed oil. The more you add, the less tacky the ink gets, or the less viscous. Depending on what brands you sue, sometimes the inks are very similar in viscosity. It then makes it difficult to adjust them only with linseed oil. The best thing to use then is the plate oils 3,5 and 7. You can also use magnesium powder for adjusting the inks. For normal four colour printing, there is little problem getting the viscosity right. However, when you move into printing six colours on top of each other, adjusting the viscosity is important. If the inks are not correct, you will end up with a mottled effect.

Ink release from the plate should be as follows:

Yellow 90%
Magenta 75%
Cyan 45 - 50%
Black 30 -35%

Printing techniques

Use two felts: one thick and one thin. Pressure should be heavy but not so that it will cut the paper.

Jan used 3-4 pieces of tarlatan that have been washed so that they have different stiffnesses. Plus two pieces of cheese cloth and sometimes silk lining from a jacket, panty hose or old screen mesh. These very dense wiping materials are used for the final touch of the plate, especially for the high lights.

Wiping sequence

1. Put the copper plate on the hotplate (to become warm not scorching). Ink up the roller, then proceed to ink up the plate with the roller. The roller should be made out of polyurethane or gelatine.

When working in colour I have one brayer from each colour.

2. With the stiffest tarlatan, I do a quick wipe with circular motions on the hotplate and then move it over to the cold side and continue wiping. This first wipe is to remove excess ink on the plate. Switching to the second softer tarlatan, I continue wiping until the image begins to appear.

3. This is followed by the softest tarlatan and continue until the image is clearly visible. If I print as this stage, the highlight areas will produce a tone. This is very useful in b/w though for colour the highlights must remain clear. The highlights will show a bluish tone if the plate is tilted in the light.

Curing: The need to rest the gelatine after being dried and become acclimatized.
Exposing Units: Sun lamps, tanning bulbs, uncoated street lights and UV bulbs together with a piece of foam and a heavy piece of glass.
Exposure times: Do a step exposure on the pigment paper together with the positive using minute intervals. In Jan's experience a metal halid light results in 2-3 minutes for film and 4-5 minutes for multigrade paper. This is the same for pulsed xenon lights. Sun lamps (300w) intervals should be 5 minutes.
Dry the resist: Run the record player at 78 rpms and a blow dryer or fan (only suitable for b/w prints).

Chapter 4: Development and Research in Photogravure

Different processes: simplifications, problem solving and aesthetic aspects of photogravure.

Making the Positive

There are several ways of making the positive and the following examples are in combination with the aquatinted plate.

Making the positive from the aquatint plate
By producing an aquatint structure to the plate we produce a 'corona'. If there is not enough info in the positive this corona will read less information. Therefore the information in the positive needs to be exaggerated; each tonal step in a positive will have to be increased with one or two steps. The following examples use the Arista APHS film.

1. Developers; Kodak Dektol and Ansco 120 (similar to Selectol soft). Expose and develop the film using the soft developer and develop for 30 secs - 2 minutes. Developing intuition is something you should bare in mind during the entire process.

2. Another method is to first develop it in the softer developer and then another film with a shorter exposure time developed in Dektol (sometimes a third may be necessary). By sandwiching the films together, a rich tonal range is achieved. Bare in mind that there should be information even in the highlights of the film for photogravure.

3. Instead of using the aquatint, we can use a screen to create the structure on the surface. This is easier than the time consuming aquatint box. The screen will read the information from the positive much better and will also increase the tonal scale derived from the positive. This means the positive will have to be developed with this in mind.

Develop the positive in soft developer for 1 minute and 2 minutes in the Dektol. If you have a contrasted negative you would develop 3 minutes in the soft and 1 minute in the Dektol. Usually measure the density with a step tablet or a densitometer if available. But this can be unreliable and only experience will determine the correct development.

The percentage pigment paper and percentage of sensitising solution will now vary the results.

4. Another way that is even cheaper is to work with Ilford Multigrade paper in combination with filters. Use the glossy type and proceed with filter no.2, do a step exposure and develop in Dektol for 3 minutes. Ensure a full range of information. The lower the filter the softer the image. Use a soft followed by hard if in combination.

Positive factors to multigrade
Much better tonal gray scale than film.
Developed only in Dektol for 3 minutes.
Easier to control the Density.
Inexpensive and readily available.
Multigrade paper has no text unlike Kodak.
The exposure time on the paper is three times that of film although the image softens a little, it is easier to keep tonalities in the highlights.

Working with gelatines and different Pigment Papers
The pigment paper consists of a carrier coated with gelatine. By making the gelatine light sensitive with potassium/ or ammonium dichromate, it is hardened when exposed to a strong light source. The linear curb of the gelatine is very consistent. Due to hardening the melting point of the gelatine is raised from 35C to 93C. This is because the gelatine molecules have been polymerised. In other words, they are connecting up like chains in the exposure. The gelatine is coloured with burnt sienna, an iron oxide pigment, in order to make it easier to see the image. Since it is red, the pigment blocks out the blue ultraviolet light that is in the other end of the light spectra. Using different types of pigment paper can control the contrast on the gelatine.

It is worth noting that gelatine is measured in ‘bloom’; the harder the gelatine, the higher the bloom number and vice versa. Using different strengths of sensitising solutions can also change the contrast. The amount of pigment in the gelatine will also change the contrast. Pigment paper in combination with the positive plays an important roll in photogravure, since it acts as the carrier of the image. As mentioned before, there are several different types of pigment papers and they all have different properties;

The G25 is a hard pigment paper that has higher contrast and can be used with both aquatint and screen. The G35 is a soft pigment paper that has a lower contrast. It can be used with both a screen and aquatint.

The properties of the positive used with G35 have to be different from that of the G25 paper. If using the same type of positive as for a G25, the G35 will increase and even out the dark and middle tone areas, rendering a perfect result in the highlights. Therefore it is better to use a more contrast positive with the G35.

The basic, traditional sensitising solution we described was 3%, but we can also play around with other solutions. The most common problem with the 3% solution is that we generally will have problems getting around other solutions. The most common problem with the 3% solution is that we generally will have problems getting the highlights in the final etch. This occurs with both the use of the screen and aquatint. Since our goal is complete the etch in an uninterrupted curve, the technical problem occurs when combining the positive and the pigment paper. We will have fewer problems using a positive with a full body tonal scale, but if we use a positive that is thinner in the tonal scale, we will never be able to reach the final highlights. Hence we will not be able to close the curve of the etch. Yet by treating every positive as an individual, we can customise each planned etch.

Different percentages of sensitising solutions and how they affect the gelatine paper. If we use 3% or 3.5% solution, we are working with very low contract and high sensitivity. This means that we have to use high contrast positives in the exposure and also a courser aquatint screen to compensate for the low contrast. If there are very delicate tonal gradations, we risk having problems with them in the etch. In other words, the weaker information in the positive, the weaker the percentage solution of bichromate needs to be. In short we will loose this information. A way to control this is to adapt the percentage solution for each image. By making five mixtures 3.5%, 3%, 2.7%, 2.5% and 2.3% we can control the etch of the tonalities much better. With the solutions below 3%, it is possible to heighten the contrast and lower the sensitivity, thus making it easier to achieve the desired results. This is especially good for four to six colour gravures.

If you are working with different percentages, be sure to label the paper on the backside with a pencil, together with the type of paper you are using. By preparing five solutions, sensitising a piece of pigment paper in each of them and using the same positive with the same exposure time, we can determine how the curve of the etch will reach its peak in relation to each of the solutions.

We will also be able to notice variations in prints made with these solutions. The starting point fro the etch will also differ. For example 2.3% will almost start etching immediately; 2.55 will start within a minute; 2.7% will start etching in 1-2 minutes and the 3.0% will start within 3-4 minutes. 3.5% would start within 5-10 minutes. The starting point for each pigment paper/ solution combination also determines the closure of the etching curve. This means that the 2.3% will close sooner than for example the 3.0%. The adaptation of different percentage solutions in combination with different types of images enables us to determine how to get the best result from the positive.

The three minute timings are good. The G25 gives a very clean and distinct etch, which will be reflected in the final print.

Different types of screens

Instead of using aquatint powders, a screen can be used. It is basically the same as aquatint except the dot structure is on a piece of film, which can be used repeatedly. Using a screen also simplifies the photogravure process.
There are different types of ready made screens available; regular hard dot, mezzotint and stochastic screens. All of these screens behave differently. You can make your own screens. For example, frosted Mylar, contact printed with an auto-chromatic film or day light film, renders the structure of the Mylar onto the film. Different types of film or day light film, renders the structure of the Mylar onto the film. Different types of screens will also affect how the perfect continuous-tone grey scale is achieved.

The photogravure process needs different screens for different purposes. To get a screen with high density you can dust a clear piece of daylight film with either asphaltum powder of Xerox toner using an aquatint box. After dusting, carefully remove it and do a contact exposure on daylight film, then develop and fix. The result is an irregular texture that is the exact copy of the powder. This works very well. I use two different types of screens that are made this way: one with a dot density of 75% the other at 90%.

There of course different arguments for using screens, especially with reference to affect the coarseness/ fineness of the print itself. A screen at around 50% density will give a coarse look to the print as opposed to one with 90% density. The percentage will also affect the plate. A course screen will give a deeper etch and the etching time will be longer compared to when a finer screen is used. The finer screen will give a denser plate, a denser continuous-tone grey scale and the etching time will be much shorter. This will also grant a more even grey scale in the print.

Large Format Photogravures

The larger the print you want to make, the larger the screen has to be. The larger the photogravure, the more complicated it gets. In order to do large format photogravures, the key is to work with as large a negative as possible. Getting special large format enlargers than can accommodate a size of around 30 x 40 cm can be very difficult. Using an old copy camera that is turned upside down and hooked up in the ceiling can solve this problem however. With the proper lens and a special table with vacuum that can be adjusted for height, the problem is solved inexpensively. With this large size enlarger, one can now do a maximum positive at 100 x 180cm. For the film, use Arista APH on a roll, or Multigrade paper, glossy on a roll. Using the multi-grade paper also cuts the cost of film to a minimum - otherwise exposure testing can be very expensive.

The negatives can be made in four different ways:

1. Tmax 100, either 9 x 12 cm, 13 x 18cm or 8 x 10”
2. LVT digital negatives 30 x 40
3. LAMBDA digital continuous tone films 30 x 40 cm
4. Positive digital halftone films 30 x 40 cm at very high resolution (dpi) that were then diffused in the copy camera.

By working with these large negatives, you loose very little information through the enlarging process. The positives are developed in a large tray or by using a long plastic tray (say for example a flower box). For exposing the positives onto the pigment paper, use a large vacuum frame.

Etching Problems and Solutions

Etching the plate in different Baume of ferric chloride
As described before, we start with 46 baume solution to which we added water to make 45,43,41 and 39 Baume solutions. I have found that by using higher Baume solutions, it is possible to control the etch much better. The less water in the solutions, the slower it penetrates the pigment paper. Since we are looking for an ideal etching time of around 30-45 minutes, using the higher solutions seems to work the best. If you used solutions in the range 42, 40, 38 and 36, the etch will proceed too fast and you risk undercutting the shadows. This is my experience after having tried different combinations of solutions.

Re-etching the plate
After the plate has been etched and a print has been taken, it might appear weak. If it looks like the middle tones or the shadows need more information, it can be re-etched. This is done by using special re-etching ink or by mixing stiff lithographic ink with some magnesium powder. The ink is rolled with a hard rubber roller (50 to 60 durometors). The roller is then passed over the plate in an even pattern until the etched structure in the plate has received enough ink to be able to be re-etched again. If you only need to etch the shadows, roll up the highlights and the middle tones heavily so that they completely fill in leaving the shadows open to receive the etch. Flood the plate with alcohol to speed the dry the ink, or if using litho ink for the roll up, dust it first with some fine asphalt powder. Then use talcum powder and a cotton ball to remove the excess powder and fire the plate as you would for an aquatint. The plate is now ready to be re-etched. Etch it in 43 Baume for the required time, usually not more than 3-4 minutes. Rinse with cold water. Clean off the roll up resist and pull a new print.

An argument against agitating the plate in the etch
All the books I have come across that discuss the photogravure processes recommend that the plate should be agitated in the etch. The reason for this is to continually allow new acid to reach the gelatine surface while at the same time washing away etched copper. This makes sense in certain types of etching, however, with photogravure, I have found it to be fatal. If we etch an image with continuous agitation, the end result will be grainy. On the other hand, if we etch the same image just by letting it sit in the acid, the result is a denser and highly distinct image. Agitation makes the acid undercut the aquatint or gran structure in the gelatine and breaks down the aquatint or the screen structure more quickly than it would if it just sat still in the acid. By letting it sit still, the acid penetrates straight down and yields a clean etch with straight pitches in the plate. Agitation breaks down the pillars that we are trying to create and gives them a rounded tip. It seems unreasonable to destroy the image definition after having put so much time into creating a fine aquatint, or exposing in a screen. Avoiding agitation seems to be the way to produce an image that will hold up in printing much longer than one that has been made with agitation.

How to insure optimum results every time
You need to standardise your work method. For example, never take out more pigment paper than you think you are going to need. Do not let it sit for days at room temperature, because reactions will occur that change the properties of the sensitised gelatine. Try to keep the humidity within the same range when you work. Gauge the exposure times in relation to the screen and the positive. Bare in mind that a lamp exposure unit will wear according to usage. To keep the exact amount of exposure, you can install a sensitometer that will calibrate the light according to the wear of the lamp. This will render the exact amount of light each time you make an exposure. A rule of thumb is that the longer you expose the gelatine with the screen and the positive, the thicker it gets and the longer it takes for it to start and finish etching. Always coordinate the information in the image to the exposure time. If you are going to change any variables in your work process, only change one variable at a time. Keep a notebook on everything that you do so that you can go back and refer to previous projects.

The most accurate method for achieving a tonal range

Etching a photogravure plate coated with photo-etching emulsion
This way of making photogravure has proven to be the most accurate for achieving the tonal range that matches the positive precisely. The main difference is that by working with the emulsion as a carrier of the grain, which is then exposed in by using a screen, we have no barrier that thwarts an exact reading of the information exposed into the gelatine. The thin layer of emulsion runs closely to the plate surface, reducing the distance between the plate and the gelatine to an absolute minimum. The etching time is determined according to the coarseness or fineness of the screen. The difference in time is due to the direct contact between the gelatine and the plate.

In general, several baths are necessary. However, if the positive has only a few mid tones and highlights, it is mostly black and white and etching in 43 Baume, with maybe an extra bath for back up, will work perfectly. It is important to use a loupe and closely examine the gelatine during the etch.

For the photo-etching emulsion, you can use either Norland Photoengraving glue, which is sensitised with ammonium/potassium dichromate and then diluted with water or you can buy pre-sensitised plates. The advantage of the Norlan photo-etching emulsion is that it is inexpensive and you can control the thickness of the coating if you have access to a whirler. This approach is excellent for both black/white and colour photogravure.

Norland Photo-engraving Glue Recipe

Ammonium/ Potassium dichromate 3.5g (Use respirator/mask and gloves for protection)
Distilled Water 120ml
Emulsion 45ml (Norland photo-engraving glue)

This is enough for a plate 20 x 25cm

Measure 120ml of distilled water. Making sure to use gloves and a respirator; grind the dichromate into a fine powder or use a chemical mixer if you have access to one. Add the dichromate to the water and make sure it dissolves completely. Then measure up 120ml of emulsion and add it to the dichromate water mix. Mix it up thoroughly and filter it using a funnel and a coffee filter. Let it rest for 2 hours. The emulsion will keep fro three days in the refrigerator, or it can be frozen. If frozen, make sure it is in a dark container and well marked.

Prepare the plate to be coated the following way: Cut the plate 2cm larger than the pigment paper that is going to be exposed and laid down onto it. Degrease it using chalk, water and vinegar. If the water makes an even film over the whole surface - it does not ball up - then it is free of grease. Place it in the whirler and lock it in position. Pour half the amount of emulsion to spread evenly across the plate. Shut down the whirler and pour the rest of the emulsion onto it, whirl it at around 70-120 rpm, depending on the required thickness of coating in relation to the density of the screen. Use the heating elements to dry it. The drying time is 10-15 minutes. The average exposure time should be around 3-4 minutes, depending on your light source. Expose in the screen and develop the plate in water with methyl-violet; this makes it easier to see the screen. Rinse it in 99% alcohol, whirl it dry, and then burn the emulsion in with a gas torch until the plate turns a medium brown colour. When cooled, rinse it in vinegar and then water. Put it in the 25% solution and proceed with the lay-down as usual.

Carona: Material that covers each grain or point of aquatint.
Bloom: Accurate measure of the maximum value of molecular cross links per cc under known conditions.

Chapter 5: Four Colour Photogravure Research

Most four colour photogravure is produced by the industry on cylindrical machines. This would include a screened halftone dot called rotogravure. The bulk of colour work within both photography and printing is based on dyes and transparent inks piled on top of each other. The configurations of colour percentages for halftone must be altered for continuous tone. Photogravure starts with full colour and can be made more transparent if necessary.

The function of colours

Yellow
As this is the first and lightest, the positive is determined by visual judgement and a densitometer. Each image must be treated seperately but hte yellow grey scale must be a little heavier that for a black and white positive. Yellow is stolen by the following plates adn must be compensataed for this.

Magenta
What applies to Magenta, see notes to Yellow. Always remeber the lightest colours will suffer the most when printing.

Cyan
This is the third and outlines the structure. It is a stong and dark colour and should not be over compensated for. Shadows and highlights should have special attention paid on the negative but there should be a straight correspondance.

Black
There should just be a thin mist (key information) and the positive should therefore be lighter than a regular black and white gravure.

Making a standard analogue four colour seperation, using four filters

Use a view camera on a fixed object usually 9 x 13 or 13 x 18cm mounted on a sturdy tripod. DO NOT move the camera between exposures.Filters shoudl be Kodak Wratten Filters no.47 (blue), no. 58 (green), no.25 (red) and no.9 (yellow). Follow the exposure recommendations that come with the black and white film (Kodak Tmax 100).

Making a colour seperation from a slide in the enlarger
With this method, we need a colour transparency or slide as the starting point in order to make a four colour seperation: from this we will make four new negatives on panchromatic film.

An enlarger, Kodak's Wratten filter no. 47B (blue), no. 29 (red), no. 61 (green) and no. 9 (yellow). Panchromatic sheet film; Kodak T-max 100 9 x 12 cm (4 x 5 no.); a grey card; one light meter; four plastic trays; developer Kodak HC 110; fix : stop; surgical gloves; two film holders size 9 x 12 and 13 x 18; scissors, a timer that can be read in the dark; a black plastic bag.

Cover the head of the enlarger with a balck plastic bag so no light is emmited. Put the slide in the enlarger, emulsion side up. Focus and choose the whole image or a section. Remove the slide and, with the enlarger turned on, open up the aperture to the widest position. Turn off all lights and place the film holder in the position corresponding to the image projected from the enlarger. Put the grey card with the white side up on top of the film holder; with the light meter set at 100 ASA, take a reading of the reflective light from the surface. Turn the aperture of the enlarger down until you get a reading of 1/8th of a second at aperture 22 or its equivalent. Put the slide back into the film holder. Refocus and turn the aperture down 1, 2/3rd of a step. Make sure all lights are turned off.

Your two film holders shouldbe marked out with the corresponding colours for each filter that you are going to be using. Open them ready to load the film. Each film should be marked as you load it: leave the yellow uncut, cut the magenta in one corner, the cyan in two corners nad the black in three corners. then load up each film in the corresponding holder.

it is important to describe how the colour filters correspond wit the colour information on each of hte negatives. Since the whole porcess in based on the primary colours, we need to refer to the colour wheel with its complementary colours: The correspndence between the colour of the filter and the colour of the negative:

Fo standard analogue seperation, the following filters are used for doing a four colour seperation from the slide:

No 47B filter gives a yellow negative / positive for pigment paper
No. 29 red filter gives a blue negative / positive for pigment paper
No. 61 green filter gives a red negative / positive for pigment paper
No. 9 yellow filter gives a black negative / positive for pigment paper

Load up each film, amking sure they are marked with the corresponding negative colour.

Insert the no. 47B Blue filter. Open the film holder and expose for 40 seconds. After exposure, close and turn the film holder upside down, revealing the next film. Insert no. 61 green filter. Open and expose for 35 seconds and then close the film holder. Exchange the first film holder for the second and repeat for 29 for 25 seconds. Insert the no.9 yellow filter, decrease the aperture by two steps and expose for 15-20 seconds (this will vary depending on how much black is needed in the photogravure print).

For each set of separations you need ot mix a fresh developing solution of HC 110 developer. The lights can be on for mixing and dilute to B 1: 31 at 20 degrees C. Pour the solution into a tray and put on the rubber gloves. The developing times for the different negatives are as follows:

Yellow filter: 7 minutes
Magenta, Cyan and Black : 4.5 minutes.

Turn of all lights before you remove the negatives from the holder. Agitate the tray continuously and remove to the stop bath. It is important to use fresh fixer since the T-Max 100 film has a very strong pink coloured anti-halation backing that needs to be gotten rid of in the fixing.When the pink colour has disappeared rinse the films and hang to dry (ensure all films are hung from the same corner). After drying put the negatives in the film holders to protect them.

Making the continuous tone positives for the colour gravures
Make some contact prints of the negatives to be used as reference and inspect each to ensure the sheet film has been loaded properly.

Use the Arista with Ansco 120 1:3, 4-8 minutes and Dektol 1:4, 30 seconds - 1 minute to sharpen the image, or if using Multigrade paper, Dektol 1:4, 3 to 4 minutes. These times are approx. When making the films ensure that they remain all the same size. Do a test strip to see if the negatives are suitable as they are or if they needany dodging, burning etc.

Chapter 6: Development and Research in Colour photogravure

There are still many problems with analogue separations but as follows:

The screen exposure is very dense and a fine aquatint screen around 70% is used.
Sensitising the plates are as follows:

3% for the yellow plate
2.7% for the magenta and orange plate
2.5% for the cyan and blue/white plate
2.3% for the balck plate

By lowering the sensitivity of the pigment paper I heighten the contrast. Etching the plates will be finished in 45 minutes but also effects the tonal range especially in midtone and dark areas where close tonal values in the etch merge together.

Analogue four colour seperation using the Bosse Jemseby Methos

By using masking and filter no 25 instead of 29 we can get a clearer colour and image information. Plus change sensitising solution tto 3.5% for yellow, Magenta and Cyan, and 2.7% for the black. Higher sensitivity in the pigment paper evens out hte tonal range adn achieve a better result.

Digital four colour seperation using halftone

The digital appraoch gives us a much more specific result, due to the cleanliness of hte media. There are no flaws to be considered. Scan at 300dpi, tiff formated. Do standard colour seperation using the dot and print it our on a high resolution printer, or printed professionally. The draw back is a very hard dot, whoch moves us closer to the commercial rotogravure.
There is no problem achieving a result close to the original iamge. The pigment paper is sensitised in a 3.5% solution for all the colours. This equals high sensitivity and low contrast. This is perfect as we are etching a black dot and not a continous tone. Inorder to work with continous tone we have to manipulate the digital material further and diffuse the dot in a copy camera. THe higher the resolution the less diffusion. eg 90 lines per cm will give a 0.7% diffusion. The lower the resolution, the higher amount of diffusion. Working with these variables, we can fill the space between each diffused dot with information etc etc etc
Use the defocus on the copy camera to diffuse at 3.5%.

Sensitising was as follows:
3.5% for the yellow, magenta, cyan
2.7% for the black

The snake screen is ideal for cleaning up the iamge and produces a more predictable etch.
Or place all the negatives in the copy camera to create the ultimate black and white positive.

Photography

Cyanotype
Van dyke brown
Carbon
Bromoil
Liquid Light
Gum Bichromate
Albumen
Salt Paper
Platinum / Palladium
The Photographic Process Photography
The digitalised photo

Photomechanical Processes

Photogravure
Rotogravure
Photo-etching
photopolymer
Collotypy
Photo silkscreen
Photo silkscreen
Photo lithography
Wodburytype
the digitalised print