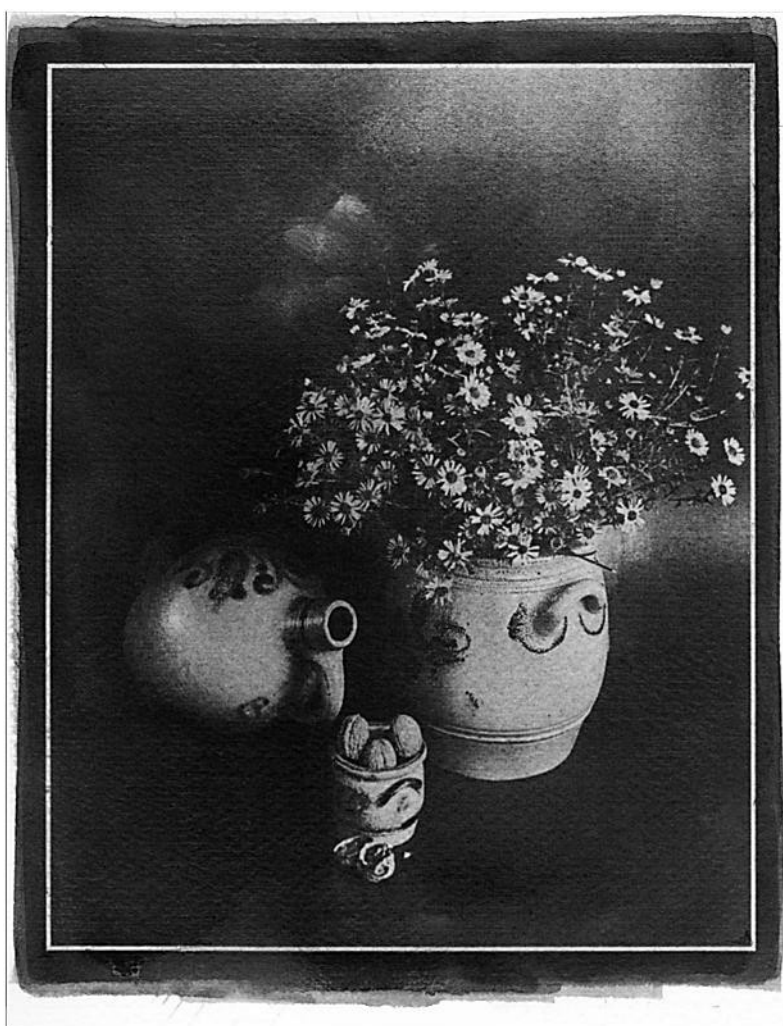




GUM PRINTING



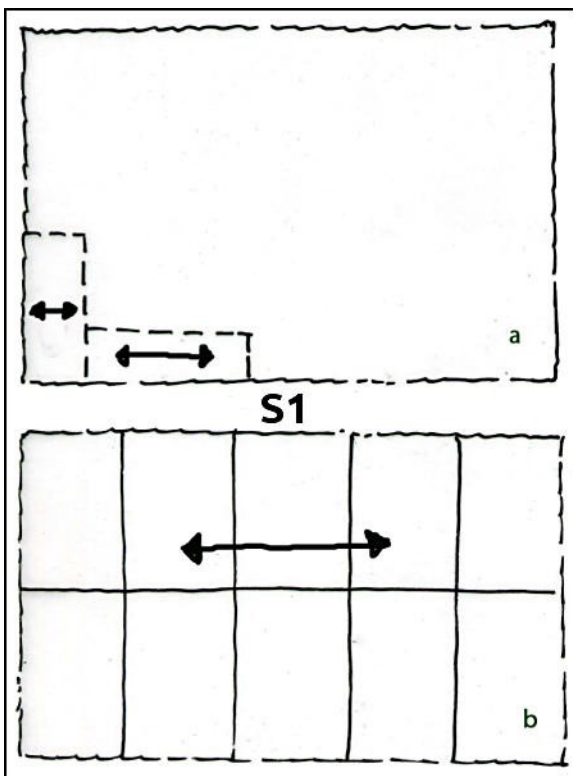
René Smets
January 2015

GUM PRINTING

This description is focusing on the practical gum printing aspects; the history of the technology and other theoretical developments, which can be found easily on Google, will therefore not be dealt with.

1. The paper

The most appropriate ones are the thicker, 100 % rag, acid-free papers such as a.o. Arches or Hahnemühle, weighing 300 gsm (gr/sq.meter) or more. Following papers have proved to be excellent for the process: Fabriano #5, Fabriano Artistico, Canson Montval, BFK Rives, Whatman Watercolour, Arches Platine, Hahnemühle etching paper.



During the process, the paper is soaked/dried several times, and this usually causes some shrinkage. The negative needing to be printed precisely in the intended position, it is essential to evaluate accurately this shrinkage. As the paper also has the tendency to shrink more in one direction than in the other, we therefore have to determine first the shrinkage direction of the paper.

Here is how:

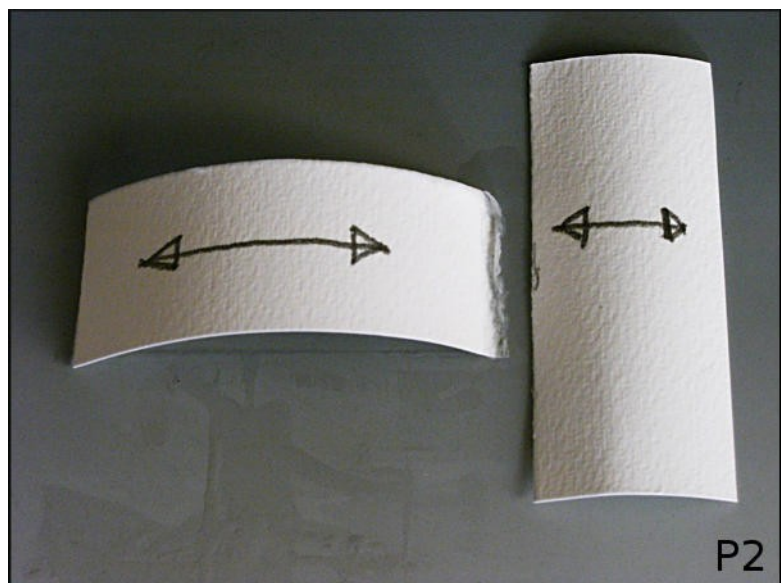
Draw two arrows in the same direction on the sheet (see sketch S1a).

Now cut two equal straps paper, one along the direction of the arrow, a second in the other direction (see sketch S1a).

We moisten the front side of these straps and let them dry on a flat surface. After a while, we see that the straps curve in one direction. (see picture P2).

This indicates the fiber orientation of the paper which gives the most shrinkage.

Using the arrows, we can now cut from our large sheet of paper the pieces that we need, making sure that the shrinkage direction follows their short side. (see sketch 1 b).



2. Pre-shrinking the paper

As said above, we first have to ensure that the shrinkage direction goes in the direction of the width of the paper. This depends on how the paper is cut from the large sheet.

Pre-shrinking of the paper is done as follows:

Place all the sheets in a tray with lukewarm water, that allows for keeping comfortably a hand in it. Let the sheets in the water for a couple of hours.

Now dry the paper as fast as possible in the same room where it will be put to dry during next stages.

Allow the paper to dry thoroughly. Next, moisten the back of the sheets with a damp sponge and stack them with blotting papers in between. Put a board and weight on the stack and leave it for a few days. The sheets will flatten out nicely. Some papers are said to be factory-sized, but one can never be sure to what extent they are – so it is safer to size them yourself.

3. Sizing the paper



This is traditionally done with gelatin, coming in the form of sheets, granules, or powder. (see picture P3)

Other materials (PVA..) can be used, but will not be discussed here.

For our purposes, ordinary food grade gelatin sheets will do.

We have to prepare two solutions (a picture with products used is shown under appendix 1, p.9):

1: gelatin sheets 30 gram + distilled/DM water 1liter

2: chrome alum 5 gram + distilled/DM water 100 ml.

We cut up the gelatine sheets into smaller pieces and let them soak for half an hour in cold water. Now we heat the mixture in a bain-marie to about 45°C. We take 5ml. of our chromium alum mixture, warm it up too and then mix it with the warm gelatin.

We pour the gelatin in a tray slightly larger than our paper sheets and dip them herein. The cold papers will stiffen our gelatin, unless we maintain the temperature of the bath in one way or another, either on a hot plate or in another large tray with warm water.

We let the paper soak in the liquid for about 15 minutes, before pulling them out one after the other, taking care to rub slightly their front side over the edge of the tray in order to eliminate possible air bubbles. After drying our paper is ready.

Alternatively, the sheets can also be sized with pure gelatin without chrome alum; after drying, the sheets are then soaked in the following bath:

- Formalin 25 ml
- distilled/DM water 1 liter

After a few minutes' stay in this bath, the hardening of the gelatin will be completed.

NOTE: It is advised to do all formalin work outside, or at least in a well ventilated place and wearing a protective mask.

4. Arabic gum

This is also supplied under various forms, from chunks to fine powder. (see picture P4).

If you want to get good quality, it is best to take chunks that you will break and grind by yourself.

The gum is done in a pouch which is suspended in water, as one would do with a teabag.

Recipe:

- Arabic gum 40 gram
- distilled/DM water 100 ml

After a few days the gum is dissolved in the water; after filtering it is immediately usable.



This solution will keep for a short time only. Its shelf life can be significantly extended by adding one of the following preparations to 1 liter of gum solution:

- 10 drops of a 2% methyl paraben solution – or:
- 10 drops of a 0.25% sodium benzoate solution – or:
- 1 to 5ml of a 10% thymol solution (1gr thymol in 10 ml isopropyl alcohol.) – or:
- 5ml of a 10% salicylic acid solution

I am using 5 ml of a 10 % mercury chloride working solution.

NOTE: Mercury chloride is toxic, and not advised for those who are not familiar with the manipulation of dangerous chemicals...

5. The light-sensitive emulsion.

The gum is sensitized with potassium dichromate. It causes the gum to harden when exposed to light. The peculiarity of this chemical is that the more of it you use, the more the image becomes contrasty, while it also increases the light-sensitivity of the emulsion. That property is quite convenient for us, when we have to build up the contrast in our image.

Recipe:

- Potassium dichromate 10 gram
- Distilled/DM water 100 ml
- Ammonia 2 ml

This solution has a long shelf life when stored in a brown bottle. Some sludge might settle on the bottom of the bottle, as 10% is a saturated solution.

6. The gum mixture.

A gum print can be made in almost any color. In the case of multiple print runs, one can either stick with the same color, or use a different color for each print run.

Watercolor pigments in tubes can be used, as well as pigment powders, grounded and mixed by yourself with the gum.

Best is to start mixing the gum with the pigment, adding the orange potassium only afterwards; in doing so one has a better control over the color he wants to use.

With gum printing, it is almost impossible to get maximum black, as well as all possible intermediate shades of gray, in a single pass. One has to build up the contrast. This is done by printing different precisely superposed layers, each with different amounts of potassium, pigment and an appropriate exposure time. One could print three layers for example: one each for the light, the dark and the middle tones of the picture.

7. Exposure.

This can be done in daylight, but the major drawback is that this light can be quite changing – a variable that doesn't simplify the calculation of the correct exposure time... Therefore working with UV artificial light might be preferred. Several trial exposures will lead to the correct exposure time, allowing for a reproduction of the highlights as pure white.

In our case, we got a 5 minutes exposure using a Philips facial tanner.

(Note: With multiple layer printing, the negative has to be precisely positioned for each pass: that's what printing registration is about. More on this in Appendix 3, page 9).

8. Processing.

Processing a gum print actually means washing away the gum that wasn't cured by light. After exposing, the paper is slid image down into a water bath and quietly let there for at least 30 minutes; the development can then be accelerated with a simple plant sprayer projecting a fine mist on the parts to be cleared, or the print can be left in the water until no pigments are coming off any more (this usually provides the finest detail; a forced wash might be too rough and eliminate some delicate tones)

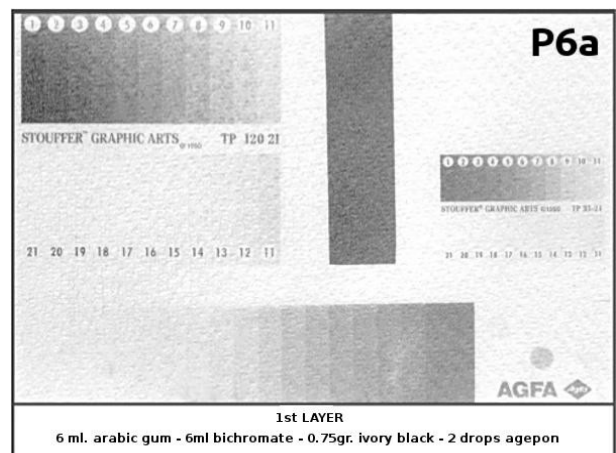
First layer for light tones:

Prepare the following mixture:

- 6 ml. gum*
- 6 ml potassium dichromate*
- 0.75 gram pigment*
- 2 drops Agepon (wetting agent)*

Exposure time is about 5 minutes.

(See picture P6a).



Using a pencil, mark the position of the image corners on the paper.

Coat this surface with a soft nylon brush, a Hake brush works well also. Use only a small quantity of mixture and spread it with brush strokes in cross directions; continue until the layer becomes as even as possible. A wetting agent such as Agepon helps to get a better spread.

Finally, the layer has to be evened with a thick badger brush; this is done by wagging soft, short brush strokes over the layer until one sees that the pigment is evenly distributed on the paper.

Leave the paper lying flat for a few minutes, allowing the layer to stiffen somewhat before hanging the paper to dry. The drying time is about half an hour at room temperature.

Picture P6b shows what the image should be looking like after the first layer.



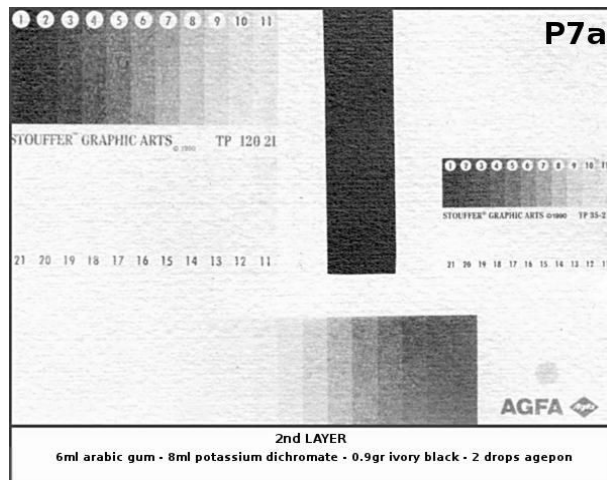
Second layer for the middle tones:

Prepare the following mixture:

- 6 ml. gum
- 8 ml. potassium dichromate
- 0.9 gram pigment
- 2 drops Agepon (wetting agent)

Exposure time is about 4min 30 sec.

(See pictures P7a & P7b).



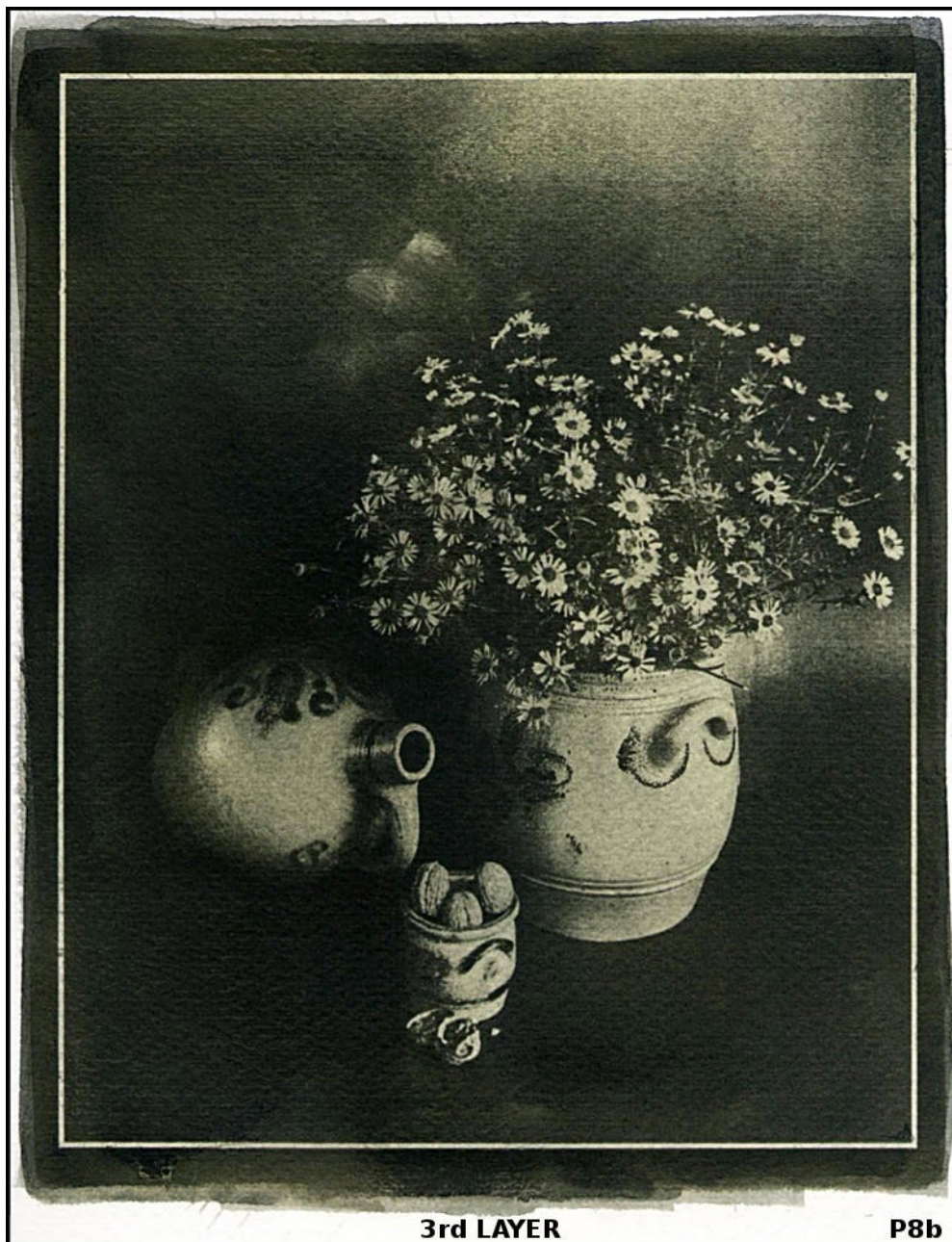
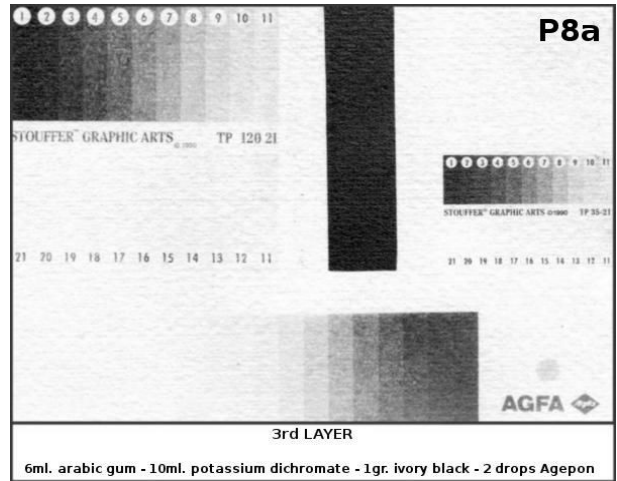
Third layer for the shadows:

Prepare the following mixture:

- 6 ml. gum
- 10 ml. potassium dichromate
- 1 gram pigment
- 2 drops Agepon (wetting agent)

Exposure time is about 4 minutes.

(See pictures P8a & P8b).



Normally our print will show now a full tonal range, from white to black and all the intermediate shades.

The orange potassium might cause a slight yellowish stain in the paper. This can be removed with a 5% potassium metabisulfite solution. In this bath the color should quickly disappear.

Thereafter, the gum print is thoroughly rinsed and dried. Please note that the layer, which constitutes a real relief on the paper, is very fragile while it is wet.

APPENDIX.

1-Products

This picture shows various products that can be used to harden the gelatin (formaline and chrome alum), and to keep the gum solution (mercury chloride).



2- My personal procedure

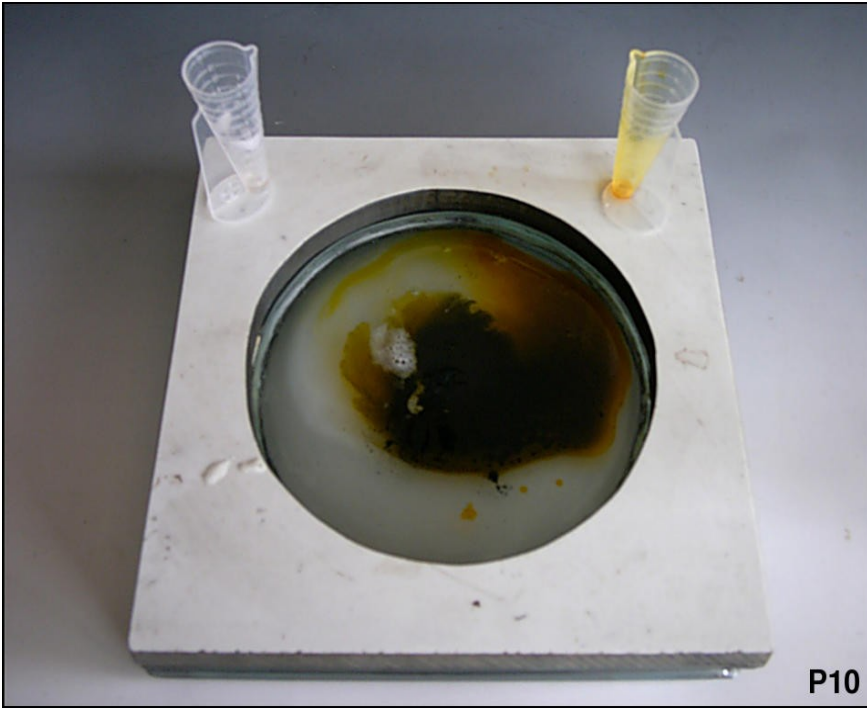
The pictures below illustrate my working procedure: the products used for the emulsion on picture P9 (from top to bottom, & from left to right: mercury chloride, potassium dichromate, Agepon, ivory black & Kassel earth pigments), as well as a few accessories for easier pigment manipulation.



The measuring boards have different holes corresponding to various amounts of powder pigment in grams: I fill one of the holes with powder pigment, turn the bottom away, and the powder falls in the gum.

The lower tool is used for pigments in tubes: after adapting the pigment tube on the flexible cylinder, I slide the pin with the red dot onto the tag on the cylinder indicating the desired amount of pigment. I then pinch the pigment tube until the pigment reaches the pin (this is visible, as the cylinder is

made of transparent plastic). When the piston is moved forward, the pigment falls in the gum solution.

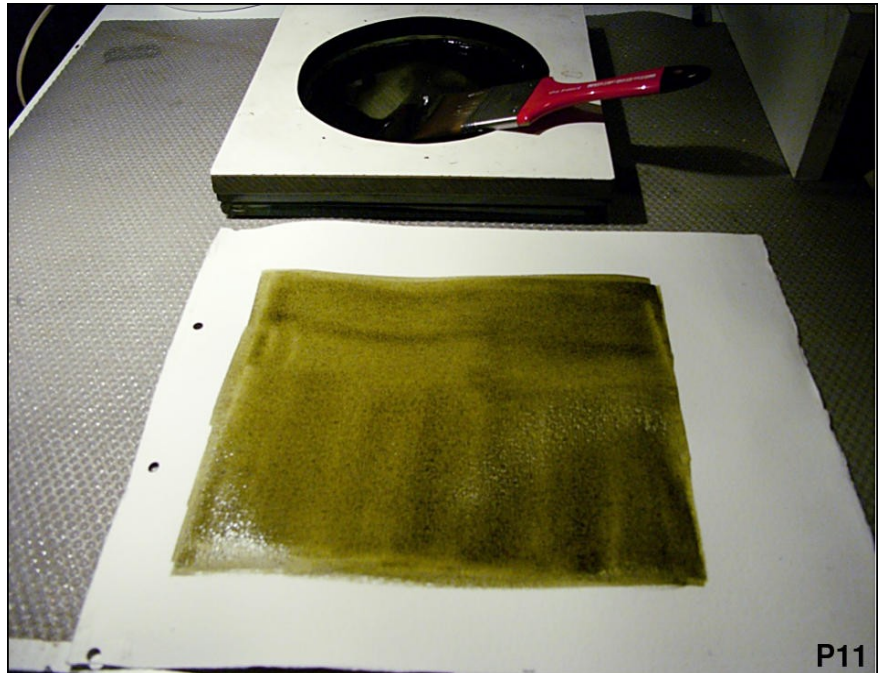


Here is the dish I use to mix the pigment with the gum solution.

It consists of a frosted glass plate and, glued on top of it, a solid surface, non-porous panel with a circular cutout.

I use a glass muller for the gum/pigment mixing.

The first gum layer was applied on the paper; it now has to be evened with a badger brush.



3- Registration printing



A good gum print usually has a minimum of three superposed layers, each with a specific gum, potassium, pigment and exposure time combination. Positioning our negative exactly in the same position and alignment for each

layer is of utmost importance. This is called registration printing.

This can be achieved when pricking four holes through the negative and the paper in the corners of the image with a needle; using the same needles at every exposure ensures that these holes perfectly overlies each other. A much safer alternative is to work with a hole punch and registration pins mounted in the contact print frame. (see picture P12).

4- Pigment tests

Since we work with colour pigments on white paper, chances are that the paper sometimes will be permanently stained by the pigment. To avoid this, it is advised to size the paper.

But even so, some pigments can leave a permanent stain, which prevents us from getting real white in our image.

On the right, a test that I've done with various colour pigments:

- Various proportions of gum and pigment are simply mixed together, as shown in the top line.

- Once the gum is dry, the paper is soaked in water. The gum dissolves, leaving or not a pigment stain. It is easy to see for each color how much pigment was mixed, and what limits shouldn't be passed to avoid staining.

As you see, some pigments will stain the paper, whatever the quantity used. These pigments are not adequate for our use.

Proportion Gum / Pigment	GOM 2CC PIGMENT 1	GOM 2 CC PIGMENT 2	GOM 2 CC PIGMENT 3	GOM 2 CC PIGMENT 4	
Tube Aquarelle Lucas					
Kadmium gelb					
Goldocker					
Vandyckbraun					
Grüne Erde Gebrannt					
Englischrot					
Umbragebrannt					
Krapplack dunkel					
Pariserblau					
Indigo					
Paynesgrau					
Zinnobergrün					
Elfenbeinschwarz					

PAPER: CANSON MONTVAL SIZED GELATIN 30 %

5- Overprinting

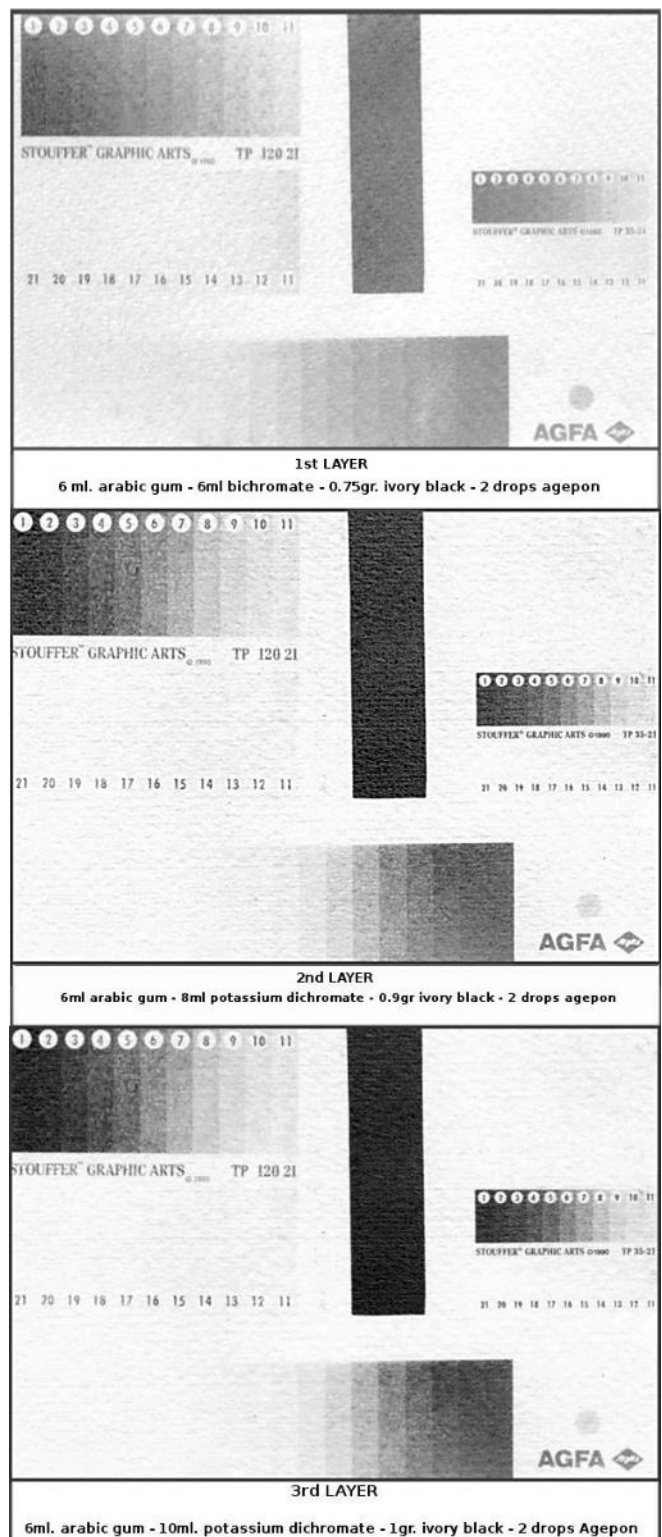
It is almost impossible to get pure white, maximum black, as well as a broad range of gray shades from a single pass in gum printing. This appears clearly when reproducing a step wedge, as shown here.

This means that we have to build the contrast with multiple layers.

We have thus to print several layers in registration on each other, each with different amounts of potassium, pigment and a specific exposure time

*On the right three separate layers are shown separately:
one for the light tones, one for the shadows and one for the middle values of the image.*

When printing them exactly over each other, one can achieve an almost full tonal scale.



*RENÉ SMETS
January 2015
(translation dutch-english: Jacques Kevers)*

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